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Original Research Article

Prevenance, Risk Factor, Clinical Presentation, and Management of Retinal Vascular Occlusion: A Cross Sectional Study at a Tertiary Eye Care Center in Western India

Kinjal Y Trivedi[1], Hemangi R Ganvit[2], Devangini G Patel[3]

[1]Assistant Professor, M & J Western Regional Institute of Ophthalmology, Civil hospital, Asarwa, Ahmedabad-380016, Gujarat.

[2]Junior Resident, M & J Western Regional Institute of Ophthalmology, Civil hospital, Asarwa, Ahmedabad-380016, Gujarat.

[3]Junior Resident, M & J Western Regional Institute of Ophthalmology, Civil hospital, Asarwa, Ahmedabad-380016, Gujarat.

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Corresponding Author: Dr. Kinjal Trivedi

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Abstract

Introduction: This study examines the prevalence, risk factors, clinical presentation, and management outcomes of retinal vascular occlusion (RVO) at a tertiary eye care center in Western India.

Materials & Methods: We included 122 patients with RVO presenting at tertiary care center in western India. We collected demographic data, vision, presenting clinical features including complications. We did OCT scan whenever applicable. We managed the patients with help of intravitreal injection anti- VEGF, vitrectomy, sectoral / pan retinal photocoagulation and supportive management as per required. Both quantitative and qualitative variables were studied using SPSS version 2.0 and data was imported into Excel.

Results: The mean age was 55±10 years, with a majority (54.34%) being female. Branch retinal vein occlusion (BRVO) (48%) was the most common type, followed by central retinal vein occlusion (CRVO) (31%) and hemi retinal vein occlusion (HCRVO) (12%). Hypertension (68 patients), diabetes (49), and hyperlipidemia (40) were frequent risk factors. Clinical presentations predominantly involved diminished vision (89.85%), with macular edema being the most common complication (66.66%). Treatment included anti-VEGF injections (73.91%) and laser photocoagulation (81.15%).

Conclusion: This study highlights the high prevalence of RVO in older adults, especially females, with hypertension and diabetes playing significant roles. Management with anti-VEGF and laser therapy is effective, consistent with international standards. Further population-based studies are warranted for better understanding and prevention of RVO.

Introduction

Retinal vascular occlusion is the second most common cause of blindness from retinal vascular disease after diabetic retinopathy. The terminology broadly includes retinal vein occlusion (RVO) where retinal vascular blockage involves the retinal veins, and retinal artery occlusion (RAO) where the blockage is at the retinal artery tributary. The prevalence of RVO is estimated to be 0.7–1.6% of the general population, whereas RAO is much less common [1,2]

RVO, which may affect either the main or a branch retinal vein, is a blockage of the retinal venous system. External compression or diseases of the vein wall, such as vasculitis, are potential reasons. Depending on the location of occlusion, RVO may be classified into two main categories: branch RVO (BRVO) and central RVO (CRVO), with BRVO happening more often than CRVO. If there's enough pressure on the capillary system to cause portions of CRVO to become ischemic (i.e., without blood flow). CRVO is deemed non-ischemic if there are no regions of capillary non-perfusion. The degree of capillary non perfusion (CNP), as determined by fluorescein angiography (FA), allowed the Central Vein Occlusion Study (CVOS) to separate CRVO into non-ischaemic and ischemic variants. When more than ten disc areas (DAs) of CNP were seen on the FA, CRVOs were deemed ischemic. [3]

The pathophysiology of CRVO is still debatable and poorly understood.

The variation in the clinical picture can be attributed to a variety of factors, such as changes in the vessel wall, hemorrhagic and thrombotic tendencies, and local anatomical susceptibility. The degree of obstruction to venous outflow in the lamina cribrosa region varies. The CRV can be completely or partially occluded. [4, 5] Anatomically, the central retinal vein and artery are situated at the arteriovenous crossing, posterior to the lamina cribrosa, and share a shared sheath of adventitia. It is possible for the artery to compress the vein as a result of atherosclerosis. A central retinal vein blockage may result from this. [6] The symptoms of CRVO include optic disc enlargement, cotton wool patches, retinal venous engorgement and tortuosity in varying degrees, as well as superficial and deep intraretinalhemorrhages in all four quadrants of the retina (CME). Baseline visual acuity (VA), which is affected by retinal ischaemia, CME, and the extent of macular intraretinalhemorrhage, indicates the severity of the venous occlusion. Presenting VA is less than 6/12 in the majority of studies that have been published, and it drops to less than 6/60 for many people with ischemic-type CRVO [7]

Neovascular glaucoma, retinal detachment, and vitreous hemorrhage may result from retinal neovascularization brought on by prolonged retinal ischemia [8].

Numerous systemic comorbidities, including hypertension, atherosclerosis, hyperlipidemia, diabetes, and hyperhomocysteinemia in adults over 50, are linked to retinal vein occlusions [9] particularly in individuals under 40 years of age, thrombophilic illnesses, hyperviscosity blood disorders, systemic vasculitis, and autoimmune diseases [10].

Materials & Methods

Ours is a cross sectional observational study conducted between January 2020 to July 2021 at a high workload tertiary eye care centre in western India. We had adhered to declaration of Helsinki of 1964 throughout the study .We enrolled patients by consecutive sampling of all ages that presented to us with any retinal vein occlusion. (macular branch retinal vein occlusion (MBRVO), sectoral branch retinal vein occlusion (BRVO), hemi retinal vein occlusion (HCRVO), central retinal vein occlusion (CRVO).

We thoroughly examined patients initiated with detailed history to inquire about all possible risk factors. Vision was assessed by a snellen's chart and grading of visual impairment was done according to WHO classification system. [11] During the ocular examination, a detailed slit lamp examination, followed by a thorough fundus examination was performed using indirect ophthalmoscope. Whenever possible fundus photo was also taken for documentation.

Posterior segment optical coherence tomography (PSOCT) was done in all patient whenever ocular media was found to be clear.

Whenever not available with patient we ordered various investigations to find the cause of retinal vein occlusion. These investigations included routine blood tests, lipid profile, serum homocysteine,2D echo, carotid doppler. We managed the patients with intravitreal injection anti- VEGF for macular edema (ME), vitrectomy for complications like nonresolving vitreous hemorrhage (VH) and tractional retinal detachment (TRD) and sectoral / pan retinal photocoagulation was done for capillary non perfusion areas. Supportive management in form of cryotherapy and topical and oral medications was done for eyes with neovascular glaucoma with nil visual prognosis.

Data Analysis

After filling out a pre-tested structured questionnaire, the data was imported into Excel. With SPSS version 2.0, both quantitative and qualitative variables were studied. Proportions were employed to represent qualitative factors, whereas averages and standard deviations were used to convey quantitative variables. P-values were calculated using both non-parametric (chi-square) and parametric (paired t-test, ANOVA) testing.

Results

We studied 122 patients (138 eyes) with RVO with mean age of participants were 55+/-10 years. Majority of the patients belonged to age group of 60-70 years. Majority of patients 75(54.34%) were female and 68 patients (48.27%) were housewife/retried by occupation and 54 patients (44.26%) were having incomplete school education. Out of all, 91 patients (65.94%) were from urban area and 47 patients (34.05%) were from rural area.

Following details are showings demographic data, clinical relevance of patients with RVO at tertiary eye care centre.

Here is bar chart showing risk factors for RVO. (Figure 1)

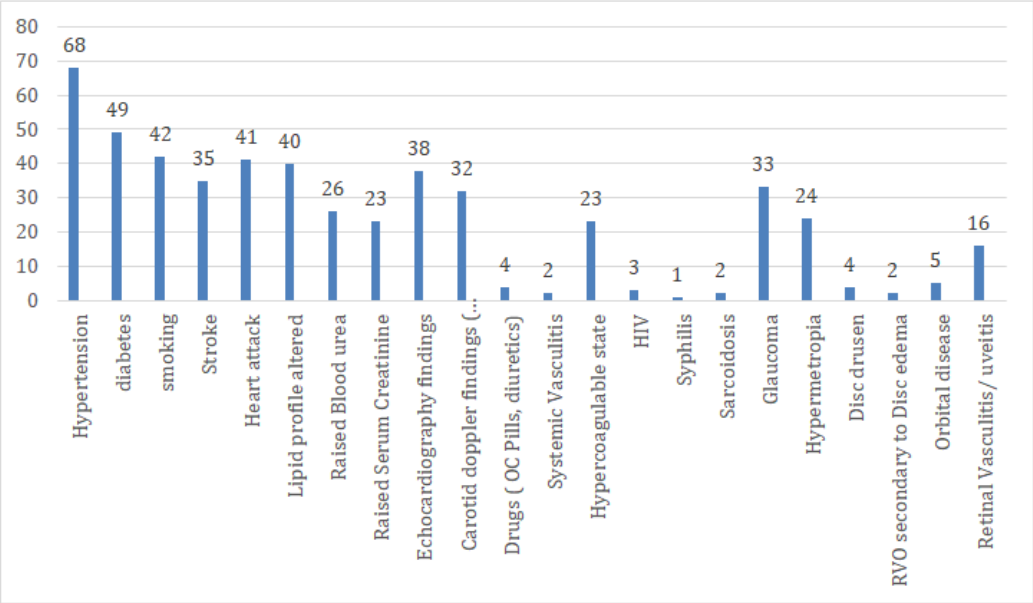

Figure 1: Risk factors of RVO

In a decreasing manner, signs and symptoms exhibited by patients were diminution of vision 124patients (89.85%), metamorphopsia 39patients (28.26%), Ocular pain21patients (15.21%), No Symptoms (accidental finding) 14patients (10.14%) observed during the examination.

In our study 106 patients (76.81%) presented with unilateral eye involvement. Rest 16 patients had bilateral eye involvement.

Here is pie chart regarding duration of complain presented by patients. (Figure 2)

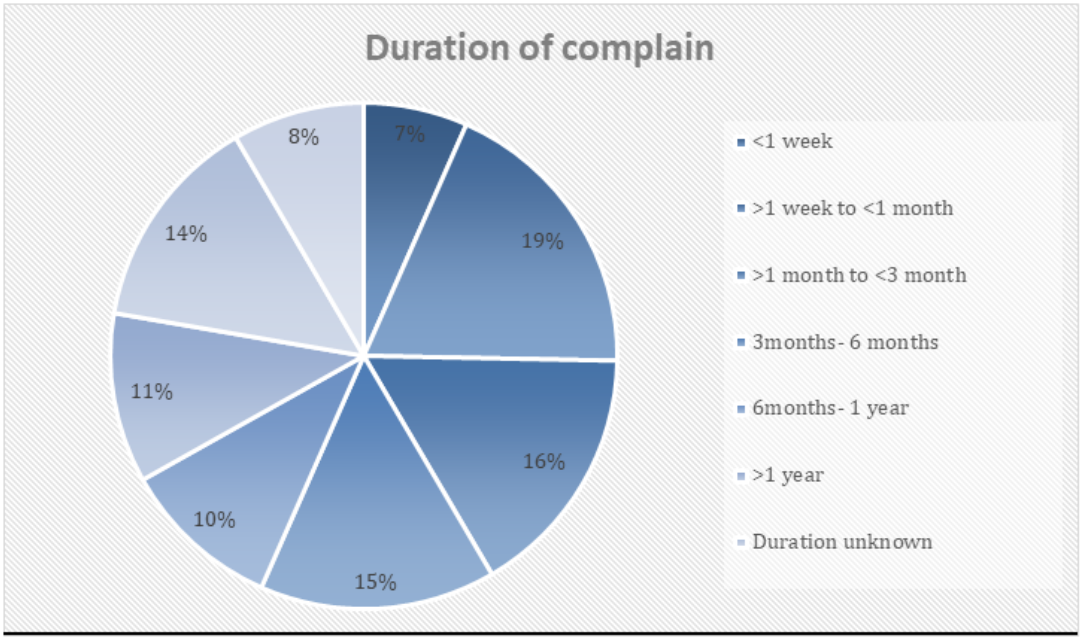

Figure 2: Duration of complaint in patients with RVO

In our study,43 patients (31%) had CRVO,12 patients (9%) had HCRVO,17 patients (12%) had MBRVO, 66 patients (48%) had BRVO.

Here is table regarding vision at time of presentation and it's grading according to WHO Category for visual acuity. (Table 1)

Table 1: Visual acuity of RVO patients at time of first presentation

Vision at first presentation	Patients	WHO Category for Visual acuity[11]
No PL	8(5.79%)	Blindness
HM +/- PL + PR 4+/ defective	19(13.76%)	Blindness
<=CF 1 mt	21(15.21%)	Blindness
>CF 1 mt- <=CF 3 mt	20(14.49%)	Blindness
>CF 3 mt- <=6/60	21(15.21%)	Severe visual impairment
>6/60- <=6/18	28(20.28%)	Moderate visual impairment
>6 /18- <= 6/12	13(9.42%)	Mild visual impairment
6/9 – 6/6	8(5.79%)	Normal

During ocular examination,96 patients (69.56%) had normal pupillary reaction,26patients (18.84%) had relative afferent pupillary defect(RAPD),16patients(11.59%) had semi dilated/ Dilated fixed pupil with sluggish/ no reaction.

Here is bar diagram showing ocular findings at time of presentation. (Figure 3)

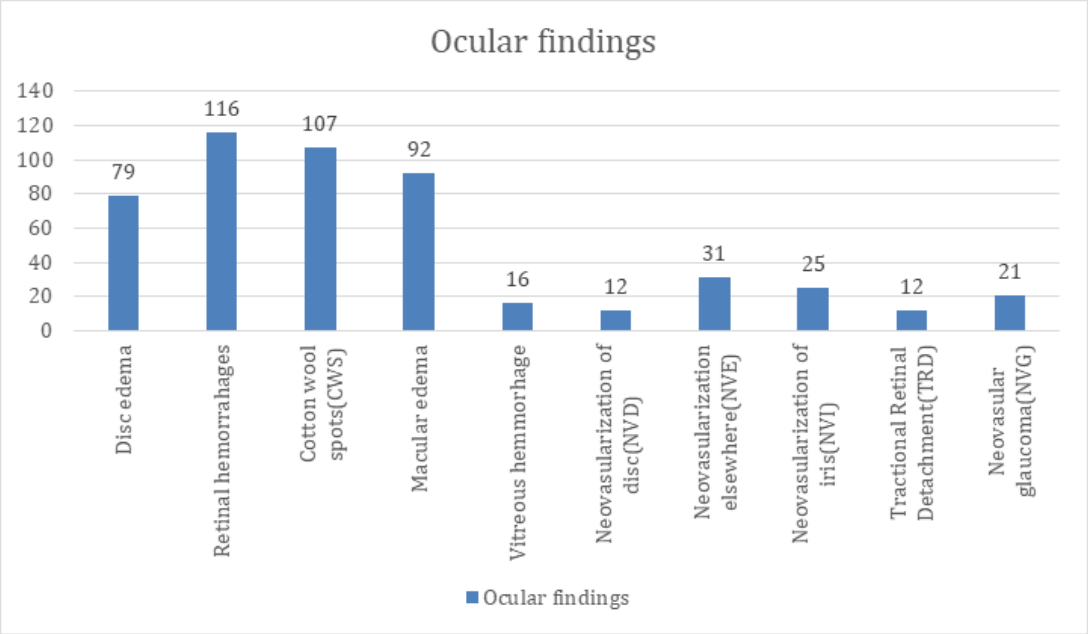

Figure 3: Clinical ocular findings at time of first presentation

On PSOCT, findings were 8 patients (5.79%) had normal foveal contour, 92 patients (66.66%) had macular edema, 11 patients (7.97%) had foveal atrophy suggestive of macular ischemia, 27 patients (19.56%) OCT was not possible due to unclear ocular media.

After meticulous ocular examination and investigations, appropriate treatment modalities were advised. 102 eyes (73.91%) were injected anti-VEGF intravitreally. Laser photocoagulation (sectoral/ pan retinal) was performed on 112 eyes (81.15%). 28 eyes (20.28%) had vitrectomy for nonresolving VH and/or TRD, whereas 21 eyes (15.21%) had supportive care for NVG.

Discussions

In our study commonest age range affected by RVO was 60-70 years with mean age of 55±10 years. This is comparable with a study done in Nepal (69.64 ±7.31 years), Nigeria (62.7 ± 10.4 Years), central India (>= 60 years) and Australia (>=80 years). [12,13,14,15]

Out of 122 patients, majority 75 patients (54.34%) were female. This was in contrast with the study done in Nigeria (70%) and a study done in Germany which showed that men were 1.7 times more affected by RVO than females. [13,16]In a nationwide study done in South Korea the weighted mean incidence rates of RVO by sex were 46.32 cases/100,000 person-years for males and 55.65 cases/100,000 females, respectively which are in concordance of findings of our study [17]. In a meta-analysis of global epidemiology of RVO done by Song et al, they could not find discernible difference in the prevalence estimates between the sexes. [18]

In our study, BRVO (48%) was more common compared to CRVO (31%)

and HRVO (12%). Our findings matched with a hospital based study done in Nepal which showed BRVO (70%) to be more common than CRVO (26.6%).([12]) In contrast to our findings, a tertiary hospital in Nigeria reported that CRVO (68.2 %) was the commonest followed by BRVO (13.6%) and HRVO (18.2%) [13]. Central India Eye and Medical Study found BRVO prevalence to be 0.66% ± 0.12% per subject, and CRVO prevalence to be 0.11% ± 0.05% per subject which is in line with our findings. [14]

Sixteen (13.11 %) of our study patients had bilateral RVO and this number was higher compared to literature which states incidence typically <10%, [19] the reason might be attributed to ours being a tertiary care referral center and higher presentation of complicated cases. The reported bilateral involvement in various studies is 10% [13] and 5.1% [15].

The commonest risk factors (found in number of patients) that were identified in our study were in descending order as follows. **hypertension :68 patients, diabetes :**49, smoking: 42,**heart attack:** 41, altered l**ipid profile:** 40, positive e**chocardiography findings:** 38, s**troke:** 35,**Glaucoma:** 33,**Carotid doppler findings (atherosclerosis plaque):** 32, **Hypermetropia:** 24,**Raised Blood urea:** 26, **Raised Serum Creatinine:** 23, **Hypercoaguable state:** 23, **Retina Vasculitis/uveitis:** 16, **Orbital disease:** 5, **Drugs (OC Pills, diuretics):** 4, **Disc drusen:** 4, **HIV:** 3, **Sarcoidosis:** 2, **Systemic Vasculitis:** 2, **RVO secondary to Disc edema:** 2, **Syphilis:** 1. We found that many patients had multiple risk factors.

Also, large population-based studies conducted in Germany, Australia, Korea, and central India have identified these as the main statistically substantially related risk variables. [9,15,16,20]

In a meta-analysis, the authors examined 197 CRVO patients between 1980–1985, with complete follow-up for 191 cases, to evaluate the risk of systemic disease and mortality. CRVO cases showed greater incidences of diabetes ($P < 0.005$) and hypertension ($P < 0.03$, 0.005) than their institute's cataract patients and National Health Interview Survey (NHIS)subjects. There was no higher death rate for CRVO cases, as evidenced by similar mortality rates and incidence of cardiovascular and cerebrovascular illnesses across all categories. [21]

Link of hypertension with RVO has been also proven by Mahoney et al. and Lim et al. [22]. Similarly, Ponto et al. [24], proved that 68.5% of RVO patients had hypertension. Stem et al. found hypertension in 88.9% of CRVO patients. [25]Sperduto et al Wong et al study stated that systemic hypertension is a risk factor linked to RVO. [26,27]

Previous Lim et al. studies linked retinal vein obstruction to hyperlipidemia. [23] According to Paul Mahoney et al., hyperlipidemia was the most common risk factor for RVO in adults, followed by hypertension. [22] Liu et al. found hyperlipidemia in 42% of RVO patients. [28] Our findings revealed hyperlipidemia in 40 patients (32.38%) of RVO patients.

In contrast to Ponto et al.'s 6.5% diabetes rate, 40.16% of participants in this study had diabetes. [24] The study's smaller sample size and regional epidemiology might explain this. Stem et al. identified diabetes in 42.9% of CRVO patients, while Hayreh et al. and Wang et al. discovered a link between diabetes and RVO, especially CRVO. [25,29,30] Diabetes is a risk factor for RVO, according to this study.

We found that 31.14% patients had positive echocardiographic findings, which is higher than Ponto et al.'s 5.4%. (7)Our study's descriptive technique and smaller sample size varied from Chen YY et al. and Wong et al., who found higher incidences of myocardial infarction and cardiovascular disease in BRVO and CRVO persons just like our study. [27,31]

We had 34.42% smokers in our study which might have contributed to the pathogenesis of RVO in them. Ponto et al. discovered that 10.9% of RVO patients were smokers in their study. [24] 28.68% of participants had a history of stroke in our cohort, compared to 34.5% in Stem et al., 11.1% in MI, and 4% in DVT/PE. [25]

Calguru D et al. discovered that hyperhomocys - teinemia was a risk factor for arteriosclerosis-related venous occlusions. [32] Similar to a study conducted by Lahiri KD, Dutta J et al., 62.5% of RVO patients had high blood homocysteine levels. [33] Cahill et al.'s meta-analysis related retinal vascular occlusion to high plasma homocysteine and low serum folate levels. [34]. 18.85% patients in our study had hypercoaguable milieu which might have contributed to incidence of RVO in them.

In Kirwan et al.'s study, 66.0% of female patients under 35 who used the OCP had retinal vascular obstruction. In our study, 53% utilized OC pills throughout their reproductive period. [35] In contrast to these findings, our study had only 3.27% participants who used drugs precipitating RVOs such as OC pills and diuretics.

In a meta- analysis they found relationship between glaucoma and CRVO (OR: 6.21), BRVO (OR: 2.38), and HRVO (OR: 4.60). Primary open-angle glaucoma (POAG) and chronic open-angle

glaucoma (COAG) were significant risk factors for RVO with OR: 5.03 and OR: 2.36 respectively. Additionally, there was a correlation between RVO (OR: 1.85) and primary angle-closure glaucoma (PACG), with particular hazards for CRVO (OR: 5.3) and BRVO (OR: 0.65). [36] In our study prevalence of glaucoma was 27.05

Chen TY et al studied RVO in young population with average age of 31.44 ± 6.41 years in 95 subjects. They concluded that POAG (OR 836.72, $p < 0.001$), retinal vasculitis (OR 705.82, $p < 0.001$), pseudotumorcerebri (OR 35.94, $p < 0.001$), hypercoagulable state (OR 25.25, $p < 0.001$), history of DVT/PE (OR 21.88, $p < 0.001$), and hyperlipidemia (OR 3.60, $p = 0.003$) were significantly associated with CRVO. Contrary to hyperlipidemia, conventional risk factors including diabetes and hypertension and systemic inflammatory diseases which didn't seem to pose a problem. [37]

The major complications identified in our study were macular edema (92 cases)retinal neovascularization NVE (31 causes), iris neovascularization NVI (25 cases), neovascular glaucoma NVG (21 cases), vitreous hemorrhage VH (16 cases), optic disc neovascularization NVD (12 cases), tractional retinal detachment TRD (12 cases). These results are in agreement with a study done in a tertiary hospital in Nigeria in 2016 where macular edema (68.2%), NVE (22.7%), NVG (13.6%) and VH (9.1%) were among the major complications identified. [13]

The cases with macular edema were higher in our patients which could be due to use of OCT which helped us pick up the slightest edema in our patients.

Quinlan et al. found macular edema in 89% of RVO patients, which was the most prevalent ocular consequence. They also found vitreous hemorrhage in 18.3% patients. [38] Ours prevalence of VH was lower than in prior studies probably owing to a smaller sample size.

Hayreh SS, Zimmermann et al found that ischemic CRVO patients had 49% NVI and 29% NVG after 6 months. [28] Eight (5.79%) eyes were blind, 71 (51.45%) had severe visual impairment, 49 (35.50%) had moderate visual impairment. In a study done by Mittal et al visual acuity at the time of presentation was <6/60 in 32.5% patients whereas 50% patients had BCVA ranging between 6/60 - 6/18 and 17.5% had it in the range of 6/18 - 6/9. [38] In a population based study done in Australia, 60 % and 14 % of the study eyes had best corrected VA of < 6/60 from CRVO and BRVO respectively and the association was statistically significant. [15]

Anti-VEGF was intravitreally injected into 102 eyes (73.91%). 112 eyes (81.15%) underwent sectoral/pan retinal laser photocoagulation. For non-resolving VH and/or TRD, 21 eyes (15.21%) received supportive treatment, while 28 eyes (20.28%) had vitrectomy. This management has been done following the international standard of care for the RVO. [40,41]

An in-depth investigation including a bigger sample size is necessary to analysed risk variables. Since this was a hospital based study it tends to overestimate actual prevalence in the population. More detailed population based study can fulfil this lacuna.

Conclusion

Retinal vein occlusion (RVO) is a leading cause of vision loss, second only to diabetic retinopathy. This study shows that branch RVO (BRVO) is more common than central RVO (CRVO), with more prevalence in females. Key risk factors identified include hypertension, diabetes, hyperlipidemia, smoking, and cardiovascular diseases.

The majority of patients presented with significant visual impairment, with common complications being macular edema, neovascularization, and vitreous hemorrhage. Management primarily involved anti-VEGF therapy and laser photocoagulation, following international standards.

To better understand and prevent RVO, further population-based research and public health initiatives targeting systemic risk factors are essential.

A cross-sectional observational study was conducted between January 2020 and July 2021 at a high workload tertiary eye care center in western India.

A study of 122 patients with Retinal Vein Ocular Disease (RVO) found that the majority were aged 60-70 years, with a majority of females (54.34%). The majority of patients were housewives or those with incomplete school education. The majority of patients were from urban areas, with 65.94% from urban areas and 34.05% from rural areas. Symptoms of RVO included diminished vision, metamorphopsia, ocular pain, and no symptoms. The majority of patients presented with unilateral eye involvement.

The study found that 31% of patients had CRVO, 9% had HCRVO, 12% had MBRVO, and 48% had BRVO. The majority of patients had normal pupillary reactions during ocular examination. After meticulous examination and investigations, appropriate treatment modalities were advised, including intravitreal injection of anti-VEGF, laser

photocoagulation, vitrectomy for nonresolving vitreous vitreous retinopathy, and supportive care for nonresolving vitreous vitreous retinopathy.

The study found that BRVO was more common than CRVO and HRVO, and that 13.11% of patients had bilateral RVO, which is higher than literature.

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