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Research Paper

"A Study of Various Risk Factors Affecting Visual Outcomes in Retinal Vein Occlusion"

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Abstract
Introduction
Branch Retinal Vein Occlusion (BRVO) is one of the most frequent retinal vascular disorders leading to visual impairment. It occurs due to obstruction of a branch retinal vein, usually at an arteriovenous crossing, resulting in retinal hemorrhages, macular edema, and reduced visual acuity. Early diagnosis and appropriate management are essential to preserve vision and prevent complications.
Aim / Objectives
To evaluate the clinical profile, risk factors, and visual outcomes in patients diagnosed with BRVO.
Materials and Methods
*This prospective observational study was conducted on **30 patients diagnosed with BRVO** presenting to the ophthalmology department of a tertiary care hospital, Raichur Detailed ophthalmic evaluation including best-corrected visual acuity, slit-lamp examination, fundus examination, and imaging investigations such as optical coherence tomography and fundus fluorescein angiography were performed where indicated. Demographic details, systemic risk factors, type of BRVO, and associated complications were documented. Patients were followed up periodically to assess anatomical and functional outcomes.*
Results
*The study included **30 eyes of 30 patients**, with the majority belonging to the **50–70 year age group**. Males were slightly more affected than females. The most common systemic risk factors identified were **hypertension, diabetes mellitus, and hyperlipidemia**. The **superotemporal quadrant** was the most frequently involved site of BRVO. A significant proportion of patients presented with **macular edema**, which was the main cause of decreased vision. Following appropriate management, a considerable number of patients demonstrated improvement in best-corrected visual acuity during follow-up.*
Conclusion
BRVO is an important cause of visual morbidity, particularly in older individuals with systemic vascular risk factors. Early detection, careful evaluation of associated comorbidities, and timely treatment can significantly improve visual outcomes and reduce the risk of long-term complications.

Keywords: *Branch retinal vein occlusion, macular edema, retinal vascular disease, visual acuity, risk factors.*

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I. INTRODUCTON:

Retinal Vein Occlusion (RVO) was first described as a clinical condition resulting from venous thrombosis by Julius von Michel in 1878[1]. RVO is broadly classified into three types: Branch Retinal Vein Occlusion (BRVO), Central Retinal Vein Occlusion (CRVO), and HemiRetinal Vein Occlusion (HRVO), which is considered an anatomical variant of CRVO[2].

Clinically, retinal vein occlusions present with characteristic but variable fundus findings such as **intraretinal hemorrhages, cotton-wool spots, dilated and tortuous retinal veins, retinal edema**, and occasionally **swelling of the optic disc**. Diagnosis is primarily established through **fundoscopic examination demonstrating features of retinal vascular obstruction**.

Despite advances in ophthalmic management, achieving significant improvement in visual acuity in patients with retinal venous occlusion remains challenging. Therefore, understanding the **underlying pathophysiological mechanisms and associated risk factors** is crucial for both prevention and the development of more effective therapeutic approaches. If left untreated, RVO may result in several **ocular complications**, emphasizing the importance of timely diagnosis and management[3].

In certain patients, **partial visual recovery or spontaneous improvement** may occur. This improvement is usually associated with the formation of **collateral vascular channels** that help restore venous drainage. In BRVO, collateral vessels may develop across the **horizontal raphe**, facilitating drainage from the affected retinal region. In CRVO, small vascular connections between the **retinal and choroidal circulations near the optic nerve head** may enlarge, forming characteristic **optociliary shunt vessels**. These collateral pathways allow venous blood to bypass the obstructed central retinal vein and drain through the **choroidal circulation, vortex veins, and ophthalmic venous system**[4].

Chronic untreated retinal venous occlusive disease can lead to several **microvascular alterations**, including **microaneurysms, telangiectatic vessels, and macular edema**, which significantly contribute to visual impairment.

Currently, **anti-vascular endothelial growth factor (anti-VEGF) therapy** is considered the **primary treatment modality** for RVO-related complications. Early administration of anti-VEGF agents, particularly in cases with **macular edema**, has been shown to produce better visual outcomes. In addition to improving vision, these agents help reduce the risk of **neovascular complications**. Other treatment options include **intravitreal corticosteroid therapy and laser photocoagulation**, such as macular grid laser or panretinal photocoagulation, which may be used to manage vision loss and associated complications of RVO[5].

AIM/OBJECTIVE: To determine the risk factors that impact visual outcomes among patients with Retinal Vein Occlusion attending OPD at Department of Ophthalmology.

II. MATERIALS AND METHODS:

Study Design

A **bidirectional observational study** was conducted.

Sample Size

The study included **30 patients diagnosed with retinal vein occlusion**.

Source of Data

The data were obtained from a **cohort of patients diagnosed with Retinal Vein Occlusion who attended the ophthalmology outpatient department of a tertiary eye care center.**

Inclusion Criteria

1. Patients aged **above 30 years** diagnosed with **Central Retinal Vein Occlusion (CRVO)**, including both males and females.
2. Patients aged **above 30 years** diagnosed with **Branch Retinal Vein Occlusion (BRVO)**, including both males and females.
3. Patients aged **above 30 years** diagnosed with **Hemi-Retinal Vein Occlusion (HRVO)**, including both males and females.

Exclusion Criteria

1. Patients diagnosed with **Ocular Ischemic Syndrome**.
2. Patients with **arterial occlusive diseases affecting the retina**.

III. METHODOLOGY:

30 patients diagnosed with Retinal Vein Occlusion were included in the study after obtaining informed written consent. A comprehensive history was recorded, including patient age, onset and duration of visual symptoms, laterality, use of corrective glasses, and history of glaucoma or antiglaucoma medication. Systemic history such as hypertension, diabetes mellitus, hyperlipidemia, coronary artery disease, and cerebrovascular events was documented along with duration of illness, treatment status, and level of disease control. Female patients were asked about oral contraceptive use, while male patients were evaluated for smoking habits, number of cigarettes or beedis consumed daily, duration of smoking, and alcohol intake. Family history of systemic diseases was also obtained.

All patients underwent a thorough general and ocular examination. Visual assessment included distant visual acuity using the Snellen chart, best corrected visual acuity, near vision testing, and objective refraction. Slit-lamp biomicroscopy was performed to evaluate the anterior segment, and intraocular pressure was

measured using a Goldmann applanation tonometer. Gonioscopy and detailed fundus examination were carried out to assess retinal and optic nerve changes.

Investigations included fundus fluorescein angiography and optical coherence tomography to evaluate macular edema and retinal perfusion. Laboratory tests and cardiovascular evaluations were also performed. Patients with macular edema received intravitreal anti-VEGF therapy, while panretinal photocoagulation was administered in cases with neovascularization. Follow-up assessments were conducted for every month upto 12 months to evaluate visual outcomes and complications.

IV. RESULTS:

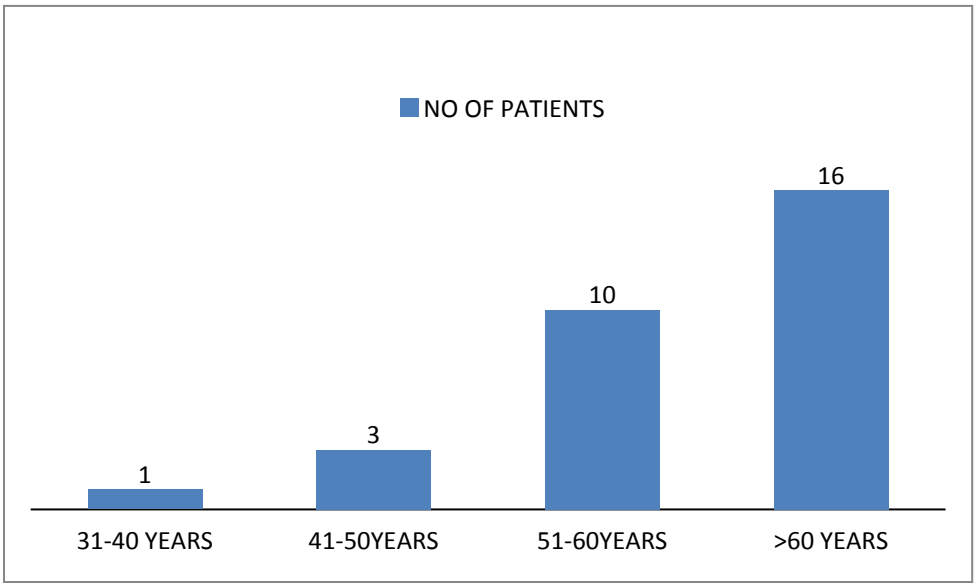

Fig1: Age wise distribution

In this study, among 30 patients, 16 patients were above 60 years, while 10 patients were between 51-60 years, 3 patients were in the age group between 41-50 years and only 1 patient between age 31-40 years.

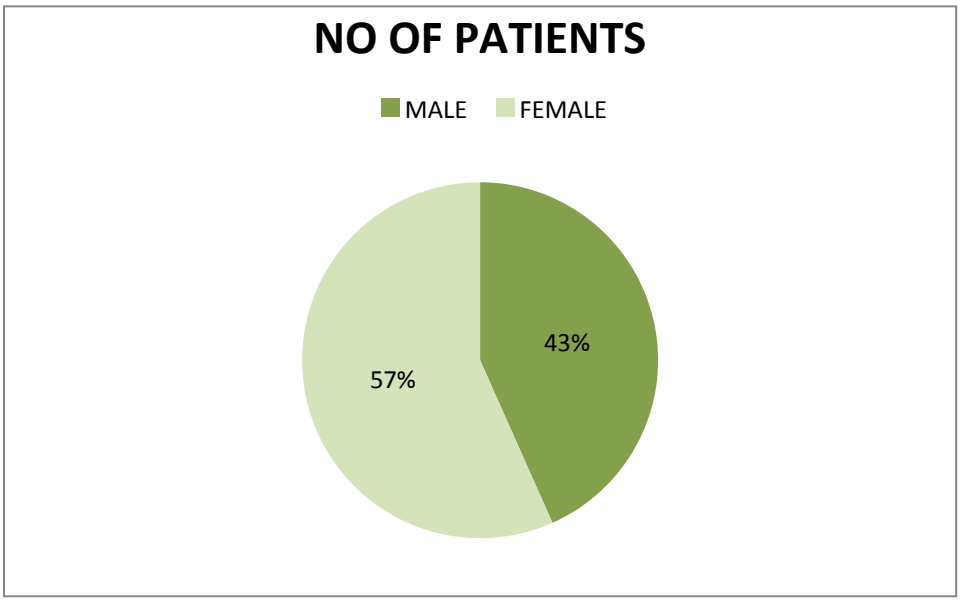

Fig2 : Sex Wise distribution of patients

In this study among 30 patients male were 13(43%) and female patients were 17(57%).

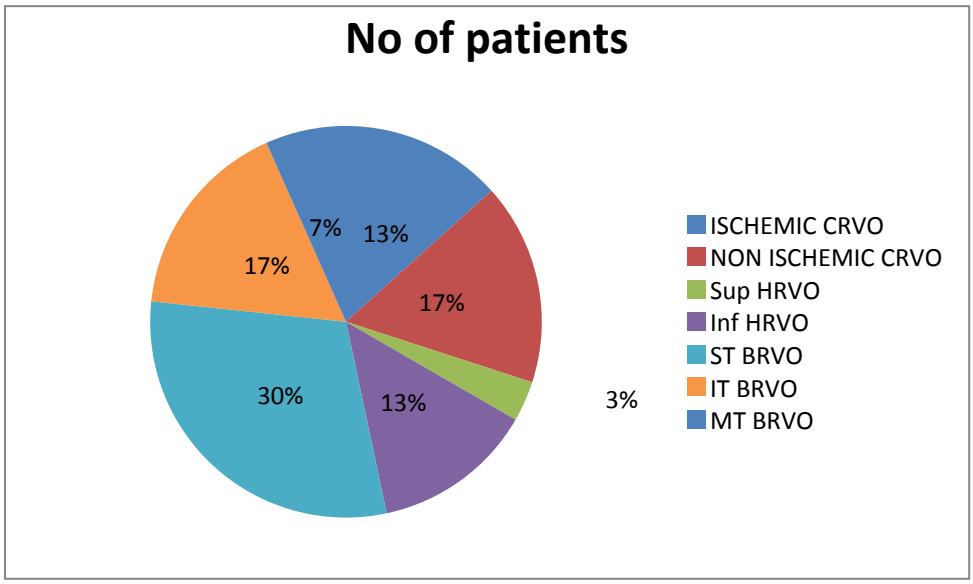

Fig 3: Distribution based on type of RVO

In this study, out of 30 patients 4(7%) were of ischemic CRVO, 5(17%) were of Non-Ischemic CRVO, 1(3%) patient was of Sup HRVO type, 4(13%) patients were of Inf HRVO type, 9(30%) patients were of ST BRVO type, 5(17%) were IT BRVO type and 2(7%) patients were of MT BRVO type. Among all the patients ST BRVO patients were more in number accounting to about 30%.

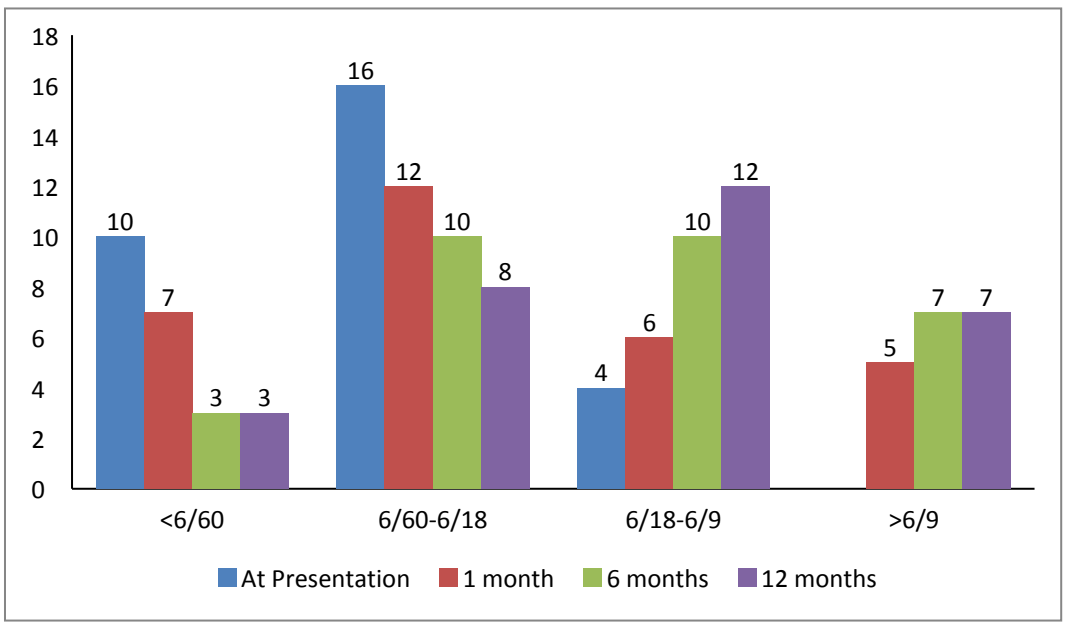

Fig 4: Distribution based on BCVA at presentation and during follow up

In this study, at the time of presentation BCVA at the time of presentation was <6/60 in 10(33.3%) patients, 16(53.3%) patients had vision ranging between 6/60-6/18 and 4(13.4%) patients had BCVA ranging between 6/18-6/9.

At 1 month follow up after Intravitreal injections 7(23.3%) patients had BCVA <6/60, 12(40%) patients had BCVA between 6/60-6/18, BCVA ranging between 6/18-6/9 was seen in 6(20%) patients and 5(16.7%) patients had BCVA >6/9 which was not statistically significant.

At 6 months follow up post Intravitreal Injections, patients with BCVA <6/60 reduced to 3(10%). 10(33.3%) patients had BCVA between 6/60-6/18, 10(33.3%) patients had BCVA between 6/18-6/9 and 7(23.4%) patients had BCVA >6/9 which was statistically improved (p value-0.03).

At 1 year follow up BCVA of patients was as follows, 3(10%) patients had BCVA <6/60. 8(26.6%) patients had BCVA ranging between 6/60-6/18, 12(40%) patients had BCVA between 6/18-6/9 and 7(23.4%) patients had BCVA >6/9.

Sl No	Risk Factors	Frequency	Percentage
1	Hypertension	19	63.30%
2	Diabetes Mellitus	13	43.30%
3	CAD	3	10.00%
4	Smoking	7	23.30%
5	Serum Homocysteinemia	18	60.00%
6	OCP	1	3.33%
7	Hyperlipidemia	13	43.30%
8	Glaucoma	6	20.00%

Table 1: Distribution of Frequency of Risk Factors for RVO (n=30)

In this study, 63.30% participants were had Hypertension, 43.30% participants had Diabetis Mellitus, 10% participants had Coronary Artery Disease, Smoking was risk factor in 23.30% of participants, 60% participants had Raised Serum Homocysteinemia, 3.33% female had taken OCP for Reproductive issues, 43.4% participants had Raised Lipid Levels/Hyperlipidemia and 20% participants had glaucoma.

V. DISCUSSION:

In our study, among 30 patients, 16 patients were above 60 years, while 10 patients were between 51-60 years, 3 patients were in the age group between 41-50 years and only 1 patient between age 31-40 years and among those 30 patients male were 13(43%) and female patients were 17(57%).

In this study, out of 30 patients 4(7%) were of ischemic CRVO, 5(17%) were of Non-Ischemic CRVO, 1(3%) patient was of Sup HRVO type, 4(13%) patients were of Inf HRVO type, 9(30%) patients were of ST BRVO type, 5(17%) were IT BRVO type and 2(7%) patients were of MT BRVO type. Among all the patients ST BRVO patients were more in number accounting to about 30%. The prevalence observed in our study was 0.77% for RVO, 0.52% for BRVO, and 0.11% for CRVO. These findings are in agreement with those reported by Song et al[6]., who documented global prevalence rates of 0.77% for RVO, 0.64% for BRVO, and 0.13% for CRVO among individuals aged 30–89 years

In this study, at the time of presentation BCVA at the time of presentation was <6/60 in 10(33.3%) patients, 16(53.3%) patients had vision ranging between 6/60-6/18 and 4(13.4%) patients had BCVA ranging between 6/18-6/9. Reduced visual acuity at initial presentation was likely due to macular edema, as verified by OCT imaging. Patients were treated with intravitreal anti-VEGF therapy (bevacizumab), with additional doses administered at intervals of at least four weeks when necessary. In this study, approximately 35% of patients required fewer than two repeat injections following the initial dose, while about 65% needed more than two subsequent injections.

At 1 month follow up after Intravitreal injections 7(23.3%) patients had BCVA <6/60, 12(40%) patients had BCVA between 6/60-6/18, BCVA ranging between 6/18-6/9 was seen in 6(20%) patients and 5(16.7%) patients had BCVA >6/9 which was not statistically significant.

At 6 months follow up post Intravitreal Injections, patients with BCVA <6/60 reduced to 3(10%). 10(33.3%) patients had BCVA between 6/60-6/18, 10(33.3%) patients had BCVA between 6/18-6/9 and 7(23.4%) patients had BCVA >6/9 which was statistically improved (p value-0.03). Therefore, our study demonstrated a statistically significant improvement in visual acuity, accompanied by a progressive reduction in macular edema, which is in agreement with findings reported in earlier studies.

At 1 year follow up BCVA of patients was as follows, 3(10%) patients had BCVA <6/60. 8(26.6%) patients had BCVA ranging between 6/60-6/18, 12(40%) patients had BCVA between 6/18-6/9 and 7(23.4%) patients had BCVA >6/9. In a case series by McIntosh et al[7]., through an analysis of seven studies comprising 159 eyes, described the progression and resolution of macular edema over time. Accordingly, the improvement in vision and reduction of macular edema observed in our study were statistically significant and consistent with earlier reports. Chen et al[8]., involving 59 eyes with a minimum follow-up of one year, visual acuity improved by two or more lines in 15% of cases, remained unchanged in 56%, and worsened in 29%.

In this study, 63.30% participants were had Hypertension, These findings are consistent with those reported by Lim et al[9]. Similar observations were also made by Ponto et al[16]., who documented hypertension in 68.5% of patients.

I our study 43.3% participants had Diabetes Mellitus which is in contrary to the previous study by Mohammed et al[10] that concluded that only 5% of RVO cases had been associated with Diabetes and also study by Ponto et al[16] showed Diabetes in only 6.5% patients. This could be due to small sample size, regional epidemiology of the present study. In this study DM can be attributed as a risk factor for the occurrence of RVO

In this study, 10% participants had Coronary Artery Disease This finding is consistent with the results reported by Ponto et al., who observed CAD in 5.4% of patients.

In our study, Smoking was risk factor in 23.30% of participants, this is comparable to the findings of Klein et al[11]., who reported that smoking, as a risk factor, increases the likelihood of developing RVO by nearly threefold.

In this study, 60% participants had Raised Serum Homocysteinemia, This finding are in agreement with the study by Rehak et al[12]., which reported an association between hyperhomocysteinemia and RVO. In the study by Calguru D et al.[17], hyperhomocysteinemia was identified as a key risk factor contributing to arteriosclerosis, which in turn led to venous occlusion.

In our study, 3.33% female had taken OCP for Reproductive issues, this finding is not consistent with the study by Kirwan et al[13]., which reported on the prevalence of retinal vein occlusion in females on OCP was 66%.

In this study, 43.4% participants had Raised Lipid Levels/Hyperlipidemia, this finding is comparable to that reported by Mohamed et al.[10], who concluded that hyperlipidemia was present in approximately 20% of RVO cases and also a study by Paul Mahoney [15]et al also concluded hyperlipidemia as a most common risk factor for RVO.

In our study, 20% participants had glaucoma which contrast to the findings of Mitchell et al[14]., which identified glaucoma as the most common ocular risk factor associated with RVO.

VI. CONCLUSION:

RVO is observed more frequently in individuals aged over 60 years, with no significant gender predominance. Among its subtypes, BRVO occurs more commonly than CRVO, and within CRVO, the ischemic form is seen more often than the non-ischemic type. Superior temporal BRVO (STBRVO) represents the most frequent subtype among BRVO cases.

Systemic hypertension emerges as the most significant risk factor influencing visual outcomes, and effective blood pressure control plays a crucial role in achieving better visual prognosis. In contrast, the association with diabetes mellitus was not found to be significant. Hyperlipidemia shows a positive relationship with the occurrence of RVO.

Factors such as smoking, elevated serum homocysteine levels, Glacoma however, they did not demonstrate a statistically significant impact. Additionally, the presence of ischemic maculopathy on FFA serves as an indicator of poor visual prognosis.

Emphasis should be placed on modifiable risk factors such as smoking and hyperlipidemia, along with systemic conditions like hypertension and diabetes, as these are associated with an increased risk of developing RVO. Addressing these factors also highlights the importance of prevention in disease management.

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