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Clinical profile and risk factors of Retinal Vein Occlusion in a tertiary eye care hospital in Uttar Pradesh-a Case Control Study

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ABSTRACT:
Objective: To assess the various risk factors and clinical presentation in patients with Retinal Vein Occlusion presenting to a tertiary eye care hospital in Uttar Pradesh.
Study design and type: case control study, retrospective study.
Methodology: The study comprised patients with retinal vein occlusion (100) who had been identified using accepted diagnostic standards and who met the prerequisites for participation. The healthy controls (100) who did not have retinal vein occlusion. Patients ranged in age from 18 to 70, and those with liver illness, dense media opacities, retinal vasculitis, kidney dysfunction, a history of systemic vasculitis, or past systemic vascular events were excluded.
Result: A total of 200 people have signed up for this study.in which 100 patients (50%) had retinal vein occlusion (case group) and 100 patients (50%) were healthy (control group).in the study of 100 patients, 43% had branch RVO, 54% had central RVO, and 3% had hemi RVO. The age of patients who presented with retinal vein occlusion varied from 21 to >80. Hypertension was significantly higher in cases (61.0%) as compared to controls (32.0%). Moreover, the mean systolic and diastolic BP were 149.57±22.98 and 92.12±11.66 in cases, and 137.64±13.41 and 83.21±7.60 in the control group. The percentage of cases with diabetes in this study was significantly higher (32.0%) than in controls (13.0%). Conclusion: In our study found that 43% of patients had BRVO, 54% had CRVO, and 3% had hemi-RVO. The males were more frequently affected by RVO. Diabetes and hypertension were significantly more common in RVO patients. Our findings imply that dyslipidaemia plays a major role in the aetiology of disorders of the retinal vascular system. Disorders in lipoprotein metabolism, such as increased LDL-TGS and raised VLDL and LDL, result in the emergence of vascular compromise and subsequent occlusions.
Keywords: RVO, HTN DM Dyslipidaemia

I. INTRODUCTION

Retinal vein occlusion (RVO) has been recognised as a distinct entity and has been called "retinal apoplexy" by Leibreich in 1854 and "haemorrhagic retinitis" by Leber in 1877.[1] Retinal vein occlusion (RVO), a retinal vascular disease, is one of the most frequently occurring causes of visual loss worldwide. [1, 2] It is the second most frequent cause of retinal vascular disease-related blindness, behind diabetic retinopathy.[1] RVO is expected to affect 0.3% to 2.1% of people worldwide. [3-5] RVO results from an obstruction of the retinal tissue's normal venous drainage system. In India, the prevalence of retinal vein occlusion (RVO) is 0.13%–0.45% (95% CI: 0.50–1.00) per subject and 0.07%–0.42% (0.29–0.56) per eye.[6] In India, there are seven times more cases of branched retinal vein occlusion (BRVO) than central retinal vein occlusion (CRVO).[7] Between 10% and 15% of people who are of working age are under the age of 50. Younger RVO patients often have better vision than older patients do. [5,7,8]

Numerous Caucasian studies on adults over 40 years old revealed that BRVO and CRVO were prevalent in 0.6% to 1.1% and 0.4% to 0.4% of cases, respectively. Most studies show that these conditions, which mainly affect the older population, are the main cause of retinal vein occlusions in people over 60. [9]

RVO is categorised according to the place of occlusion. The medical name for obstruction of the central retinal vein at the level of the optic nerve is central retinal vein occlusion (CRVO).

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Obstruction at the major superior branch or primary inferior branch, which affects about half of the retina, is known as hemiretinal vein occlusion (HRVO). The term for obstruction at any more distal branches of the retinal vein is branch retinal vein occlusion (BRVO).[10] BRVO which occurs around three times more frequently than central retinal vein occlusion, is the sixth most common cause of blindness. [10,11]

Cotton wool spots, deep and superficial retinal haemorrhages, dilated and convoluted retinal veins, and retinal oedema are a few of the clinical features of RVO. These traits can be found in each retinal quadrant of the CRVO. Retinal haemorrhages associated with the afflicted retinal sector distinguish BRVO from CRVO. The most frequent causes of vision compromise in RVO are macular oedema, macular ischaemia, and, in more severe situations, vitreous haemorrhage.[12] RVO is thought to be caused by a thrombotic event or vascular wall disease. RVO is primarily brought on by hypertension, diabetes mellitus, atherosclerosis, hyperlipidemia, smoking, and glaucoma in senior individuals. [13] Hypercoagulability and vasculitis are the two main risk factors for the development of RVO in younger people. [14,15] Investigations are frequently carried out with the goal of identifying the underlying reasons for a problem, treating them, and halting its progression or recurrence in the same eye or another. The Royal College of Ophthalmologists' RVO Guideline argues that treating the often-connected risk factors, including atherosclerosis, hypertension, diabetes, and lipid abnormalities, will improve health and be the primary benefit of medical diagnostics in RVO. [16]

Although the fundamental pathogenic mechanisms of RVO are not fully understood, it is thought that a number of complex factors, such as vein compression at the arteriovenous crossing, increased arterial rigidity, arteriosclerosis, thrombus formation following degenerative changes in vessel walls, dysregulated hematologic factors, elevated levels of pro-inflammatory mediators, and decreased levels of anti-inflammatory mediators, contribute to the development of RVO.[17,18] Systemic risk factors for retinal vein occlusion include high blood pressure, diabetes, high cholesterol, arteriosclerosis, inflammatory illnesses, hypercoagulability neoplasia, smoking, and oral contraceptives.[19]

RVOs are common, but their pathophysiology is unknown. Anatomically, the optic nerve's central retinal artery and vein lie next to each other and are covered in a single layer of fibrous tissue. The underlying vein is pinched when this shared fibrous tissue and the central retinal artery thicken and become sclerotic. The resulting hemodynamic alterations that cause CRVO are brought on by the constriction of the venous lumen that results. Arteriovenous crossings and venous compression result in hemodynamic abnormalities and degenerative blood vessel modifications in BRVO. [20,21] Clinicians can better grasp RVOs with Virchow's triad: stagnation of blood in the blood stream, endothelial cell injury, and hemodynamic changes, or blood hypercoagulability, even though the mechanism driving these occlusions is complex and multivariate. The idea that a trio of physiological elements significantly contribute to the aetiology of venous thrombosis was initially put forth by Rudolf Virchow in 1856. The risk of venous thrombosis in a patient is still thought to be increased by blood stagnation, endothelial cell damage, and hypercoagulability, whether they occur independently or simultaneously. [22-24]

Systemic risk factors that increase blood viscosity may have a major impact on RVO because blood viscosity is frequently enhanced during occlusion. Haemostasis plays an important role in the pathogenesis of RVO, as evidenced by the fact that it makes blood viscous and enhances platelet aggregation. [5,10,15,25] CRVO risk is considerably increased by systemic causes of hypercoagulability like antithrombin III, factor V Leiden, hyperhomocysteinemia, thrombophilia, and antibodies against cardiolipin.[26] The goal of this study is to evaluate various risk factors and clinical presentation in patients with developing retinal vein occlusion.

II. METHODOLOGY

In total, 100 healthy controls and 100 confirmed cases were included in this investigation. After receiving the Institutional Review Board's approval, the study was started. The study comprised patients with retinal vein occlusion who had been identified using accepted diagnostic standards and who met the prerequisites for participation. The healthy controls, who did not have retinal vein occlusion, were chosen at random from the department's outpatient clinics. All the patients ranged in age from 18 to 70, and those with liver illness, dense media opacities, retinal vasculitis, kidney dysfunction, a history of systemic vasculitis, or past systemic vascular events were excluded. All the study subjects provided informed consent.

All participants received a questionnaire before undergoing a thorough ophthalmological examination and any necessary research. Blood pressure, height, and weight measurements were

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taken, and the body mass index (bmi) was computed. All the study participants provided a fasting venous blood sample that was used to determine the lipid profile and blood sugar levels. To determine postprandial blood sugar levels, a 2-hour postprandial venous blood sample was also taken. The cases underwent pertinent ophthalmological examinations, such as fundus fluorescein angiography and optical coherence tomography.

Samplesize:

The sample size was calculated based on a previous study that reported that the prevalence of RVO, 95% level of confidence and Error rate, usually set at 0.05 level is 4. Total 100 patients and 100 controls were included in this study.

$N=Z^2 x\ P\ x\ (1-P)/C^2$

N= Sample Size

Z=confidence interval of 95% (1.96)

P=prevalence

C= margin of error (0.1)

Prevalence of retinal vein occlusion in India=0.42

So, Sample size= 100

The study will follow the guidelines contained in the declaration of Helsinki, and approval was obtained from the institutional ethical committee. Written informed consent was obtained from each patient regarding the purpose of the study and the publication of data thereafter. Patients with retinal vein occlusion with symptoms of reduced vision and distortion of images were screened for inclusion and exclusion criteria in the study. Personal and demographic details of these patients and the risk factors contributing to the retinal vein occlusion were noted. A detailed history was taken, followed by a meticulous ocular and systemic examination and tailored lab investigations.

Inclusion Criteria:

- Patients willing to participate in the study by giving written informed consent.
- Patients diagnosed as retinal vein occlusion referred to the retina clinic in a tertiary eye care hospital.

Exclusion Criteria:

- Mentally challenged patients.

Patients work up

Ocular Examination

1. Informed written consent
2. Patients Age and Sex
3. Visual acuity test (UCVA and BCVA) of each eye of the patients.
4. Torch light examination
5. Intra-Ocular pressure measurement by Goldmann Applanation Tonometer
6. Slit lamp Biomicroscopic examination with +90D/+78D
7. Indirect Ophthalmoscopic examination with +20D
8. Optical Coherence Tomography [OCT]
9. Fundus Fluorescein Angiography [FFA]
10. OCT- Angiography (In cases where FFA will be contraindicated)

Systemic examination

1. **Blood pressure** measurement.
2. **Haematological investigation**

a. Complete blood count
b. Erythrocytes sedimentation rate
c. Blood sugar (Fasting and Post prandial)
d. lipid profile
e. Cardiac evaluation
f. Coagulation profile

3. **Skin test** -Mantoux test

4. **Serological tests**

a) Venereal Disease Research Laboratory test / Rapid Plasma Reagin test (if required)
b) Enzyme linked immunoassay for Human immunodeficiency virus 1 and 2 (If required)
c) Enzyme linked immunoassay for TORCH (IgG and IgM) (If required)
d) Serum Homocysteine (If required)

5. **Others**

a. Chest X ray
b. Kidney function test (If required).
c. Liver function test (if required)
d. Human leukocyte antigen B_5 and B_{51} (If required)

Statistical methods

The results were analysed using descriptive statistics and making comparisons between the groups Mg and NS. Discrete (categorical) data were summarized as in proportions and percentages (%) and quantitative data were summarized as mean ± SD. Statistical comparison was carried out using the Chi-square or Fisher's exact tests and independent t-test which were according to need. ANOVA test was used to analysed more than two group. The $P < 0.05$ will be considered statistically significant

The following statistical methods were used for calculation and analysis in present study in the present analysis

Statistical tools employed

The statistical analysis was done using SPSS (Statistical Package for Social Sciences) Version

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15.0 statistical Analysis Software. The values were represented in Number (%) and Mean±SD.

The following Statistical formulas were used:

1. **Mean**: To obtain the mean, the individual observations were first added together and then divided by the number of observations. The operation of adding together or summation is denoted by the sign Σ.

The individual observation is denoted by the sign X, number of observations denoted by n, and the mean by $\overline{X}$.

$$\overline{X} = \frac{\Sigma X}{\text{No. of observations (n)}}$$

2. **Standard Deviation**: It is denoted by the Greek letter σ. If a sample is more than 30 then.

$$\sigma = \sqrt{\frac{\Sigma (X - \overline{X})^2}{n}}$$

When sample in less than 30 then.

$$\sigma = \sqrt{\frac{\Sigma (X - \overline{X})^2}{n-1}}$$

3. **Median:** To determine the median value in a sequence of numbers, the numbers must first be arranged in value order from lowest to highest. If there is an odd number of numbers, the median value is the number that is in the middle, with the same number of numbers below and above. If there is an even number of numbers in the list, the middle pair must be determined, added together, and divided by two to find the median value. The median can be used to determine an approximate average.

4. **Chi square test:**

$$\chi^2 = \sum \frac{(O-E)^2}{E}$$

Where O = Observed frequency, E = Expected frequency

5. **Analysis of Variance:Analysis of Variance** (ANOVA): The ANOVA test was used to compare the within group and between group variances amongst the study groups i.e., the three different sealers. Analysis of variance of these three sealers at a particular time interval revealed the differences amongst them. ANOVA provided "F" ratio, where a higher "F" value depicted a higher inter-group difference.

$$F = \frac{\text{Mean of Sum of Between Group Differences}}{\text{Mean of Sum of within Group Differences}}$$

Differences	Sum of Squares	df	Mean Square	F
Between Groups	A	N_1	$X=A/N_1$	X/Y
Within Groups	B	N_2	$Y=B/N_2$	

6.

Post-Hoc Tests (Tukey-HSD)

$$\frac{M_1 - M_2}{\sqrt{MS_w\left(\frac{1}{n}\right)}}$$

M = treatment/group mean
n = number per treatment/group

1. Calculate an analysis of variance (e.g., One-way between-subjects ANOVA).
2. Select two means and note the relevant variables (Means, Mean Square Within, and number per condition/group)
3. Calculate Tukey's test for each mean comparison
4. Check to see if Tukey's score is statistically significant with Tukey's probability/critical value table considering appropriate df_{within} and number of treatments.
7. **Paired "t" test**: To compare the change in a parameter at two different time intervals paired "t" test was used.

$$t = \frac{d_{av}}{SD/\sqrt{N}}$$

where:
d_{av} is the mean difference, i.e., the sum of the differences of all the datapoints (set 1 point 1 - set 2 point 2, ...) divided by the number of pairs
SD is the standard deviation of the differences between all the pairs
N is the number of pairs.

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8. Level of significance: "p" is level of significance

p > 0.05 Not significant
p <0.05 Significant
p <0.01 Highly significant
p <0.001Very highly significant

III. RESULTS:

Distributions of participants in cases and controls group are shown in Table 1 and Figure 1. Total 200 individuals are enrolled in this study. In which, 100 (50%) patients had Retinal Vein Occlusion (case group) and 100 (50%) patients were healthy (control group).

Table 1: Details of cases and controls

Groups	Details	n	%
Cases	Retinal Vein Occlusion (RVO)	100	50%
Controls	Healthy Individuals	100	50%

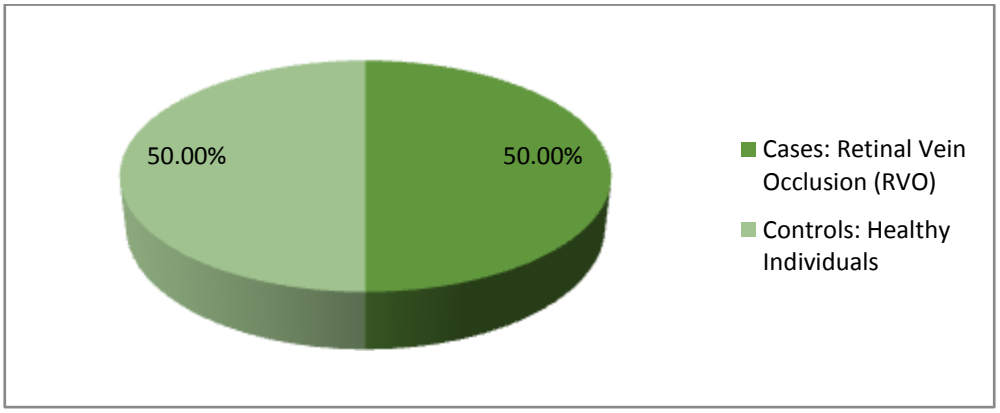

Figure 1: Pie chart shows the distribution of participants in cases and controls group.

Table 2 and Figure 2 show the distribution of Retinal Vein Occlusion (RVO) according to different age group. Age of patients who presented with retinal vein occlusion varied from 21 to >80. The percentage of 21-30, 31-40, 41-50, 51-60, 61-70 and >70 years age group were 3.00 %, 12.00%, 30.00%, 25.00%, 20.00%, and 10.00% in cases and 0.00%, 4.00%, 25.00%, 38.00%, 22.00%, and 10.00% in controls, respectively. Maximum incidence of RVO cases and controls were in 40–70 years age groups. The percentage of different age group was not significantly different.

Table 2: The distribution of Retinal Vein Occlusion (RVO) patients according to different age group in cases and controls

	Cases (n=100)		Controls (n=100)		Chi Sq.	p-Value
Age group	**n**	**%**	**n**	**%**		
21-30 years	3	3.00	0	0.00	10.23	0.069
31-40 years	12	12.00	4	4.00		
41-50 years	30	30.00	25	25.00		
51-60 years	25	25.00	38	38.00		
61-70 years	20	20.00	22	22.00		
>70 years	10	10.00	10	10.00		

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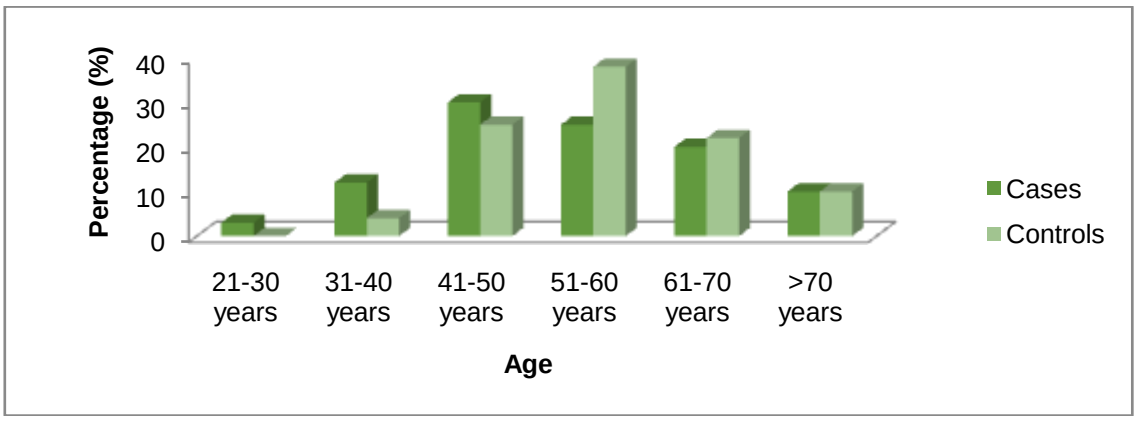

Figure 2: Bar chart shows the distribution of Retinal Vein Occlusion (RVO) patients according to different age group in cases and controls.

Table 3 and Figure 3 show the distribution of Retinal Vein Occlusion (RVO) according to gender. The percentage of male and female was 62% and 38% in cases and 54% and 46% in controls, respectively. The percentage of male and female was not significantly different in between groups.

Table 3: The distribution of Retinal Vein Occlusion (RVO) patients according to genderin cases and controls.

Gender	Cases (n=100)		Controls (n=100)		Chi Sq.	p-Value
	n	%	n	%		
Male	62	62.0	54	54.0	1.01	0.316
Female	38	38.0	46	46.0		

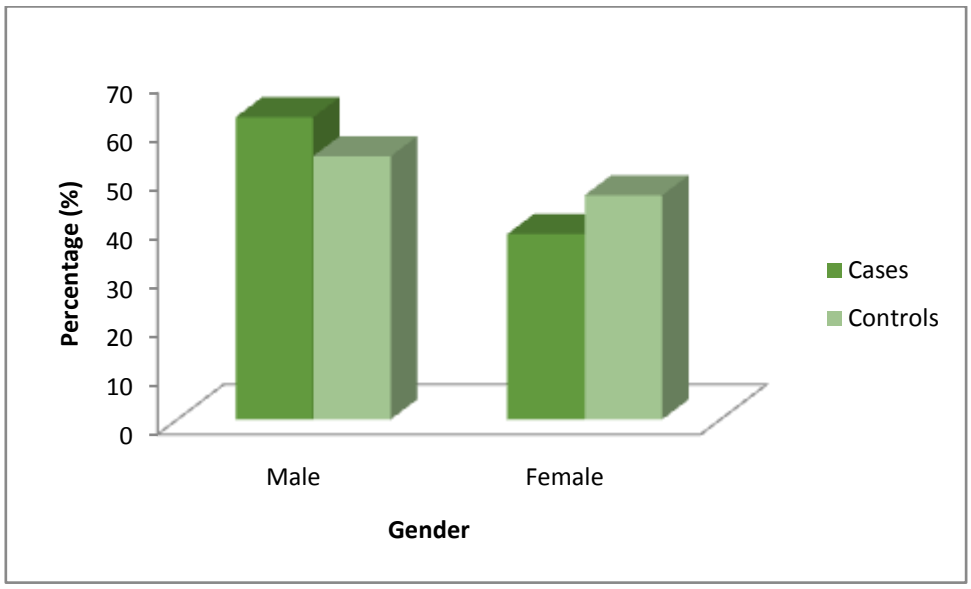

Figure 3: Bar chart shows the distribution of Retinal Vein Occlusion (RVO) patients according to gender in cases and controls.

Table 4 and Figure 4 show the details of vision status on the basis of Best Corrected Visual Acuity (BCVA)in cases. The percentage of good vision, moderate vision, severe vision and very severe vision were 45.00%, 18.00%, 16.00%, and 21.00% in OD and 50.00%, 26.00%, 14.00%, and 10.00% in OS in cases and 29.0%, 25.0%, 46.0%, and 0.0% in OD and 39.0%, 25.0%, 35.0%, and 1.0% in OS in control group.

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Table 4: Details of vision status on the basis of Best Corrected Visual Acuity (BCVA)in cases.

	Cases				Controls			
	OD		OS		OD		OS	
	n	%	n	%	n	%	n	%
Good vision (6/6-6/18)	45	45.00	50	50.00	29	29.0	39	39.0
Moderate vision (6/18-6/60)	18	18.00	26	26.00	25	25.0	25	25.0
Severe vision (<6/60)	16	16.00	14	14.00	46	46.0	35	35.0
Very severe vision (<1/60)	21	21.00	10	10.00	0	0.0	1	1.0

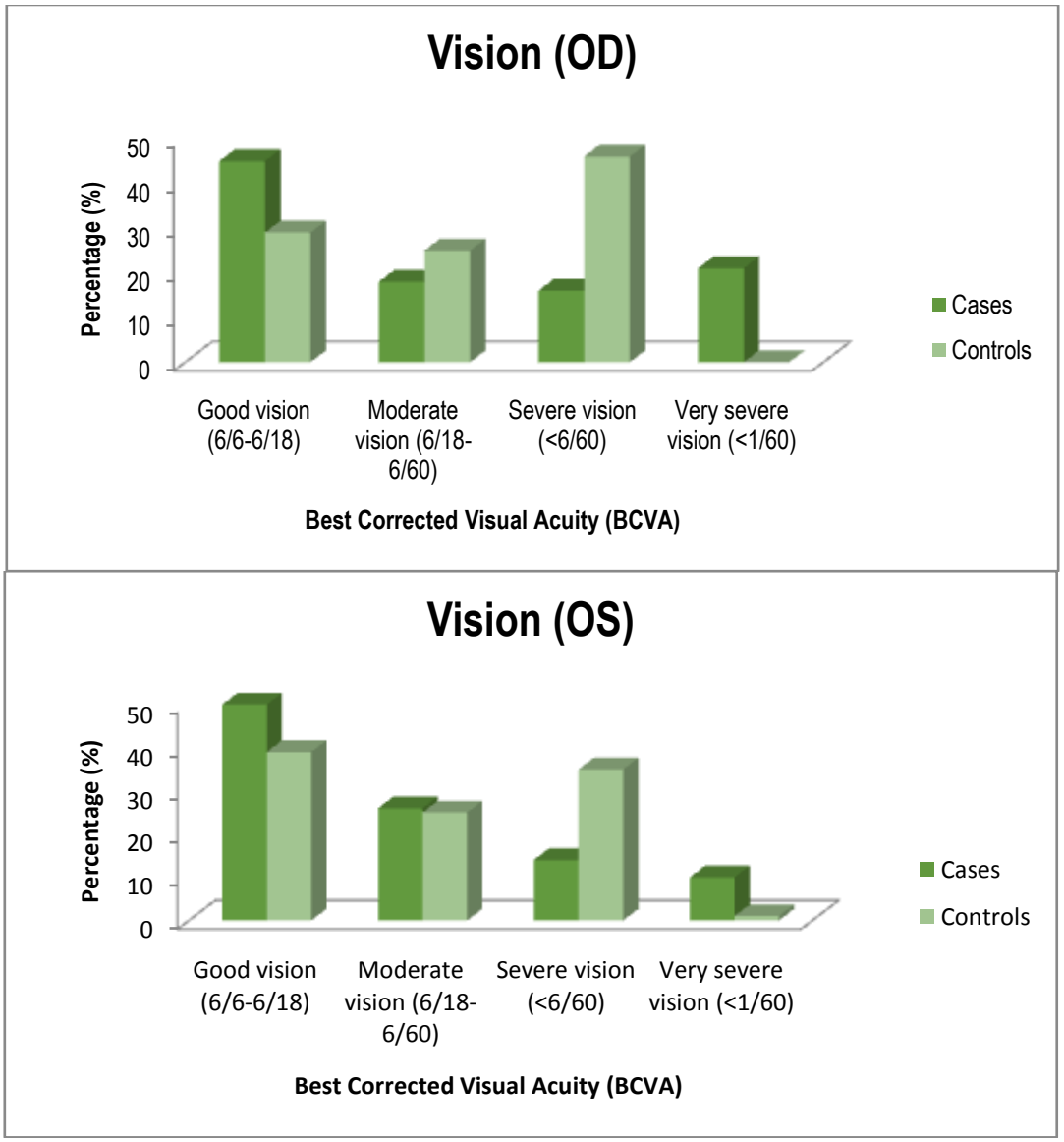

Figure 4. Details of vision status on the basis of Best Corrected Visual Acuity (BCVA) in cases.

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The comparisons of mean blood pressure (BP) in between cases and controls group are shown in Tables 5 and Figure 5. The mean Systolic and Diastolic BP were 149.57±22.98 and 92.12±11.66 in cases and 137.64±13.41 and 83.21±7.60 in controls group. The mean Systolic and Diastolic BP were significantly more in cases as compared to controls.

Table 5: Comparisons of in Blood Pressure (BP) in between cases and controls.

Blood Pressure (BP)	Cases (n=100)		Controls (n=100)		t	p-Value
	Mean	±SD	Mean	±SD		
Systolic	149.57	22.98	137.64	13.41	4.48	<0.001*
Diastolic	92.12	11.66	83.21	7.60	6.40	<0.001*

*=Significant (p<0.05)

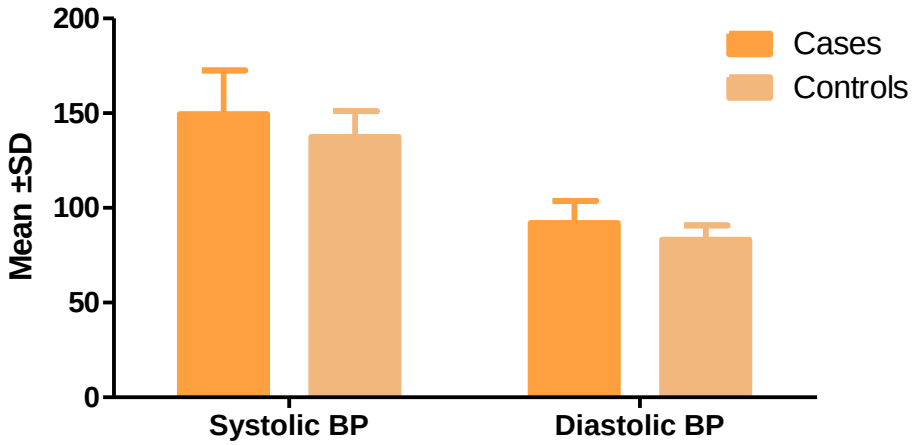

Figure 5: Bar Chart shows the comparison of mean Systolic BP and Diastolic BP in between cases and controls group.

The comparisons of mean blood sugar in between cases and controls group are shown in Tables 6 and Figure 6. The mean Fasting, PP and RBS blood sugarwere 110.40±20.82, 147.85±30.54 and 179.50±34.88 in cases and 96.69±21.23, 130.71±28.17 and 121.37±37.42 in controls group. The mean RBS, Fasting and PP blood sugar were significantly higher in cases as compared to controls.

Table 6: Comparisons of mean blood sugar in cases and controls

Blood Sugar	Cases (n=100)		Controls (n=100)		t	p-Value
	Mean	±SD	Mean	±SD		
Fasting	110.40	20.82	91.70	20.80	6.35	<0.001*
PP	147.85	30.54	134.96	21.61	3.45	0.001*
RBS	179.50	34.88	153.95	16.80	6.60	<0.001*

*=Significant (p<0.05)

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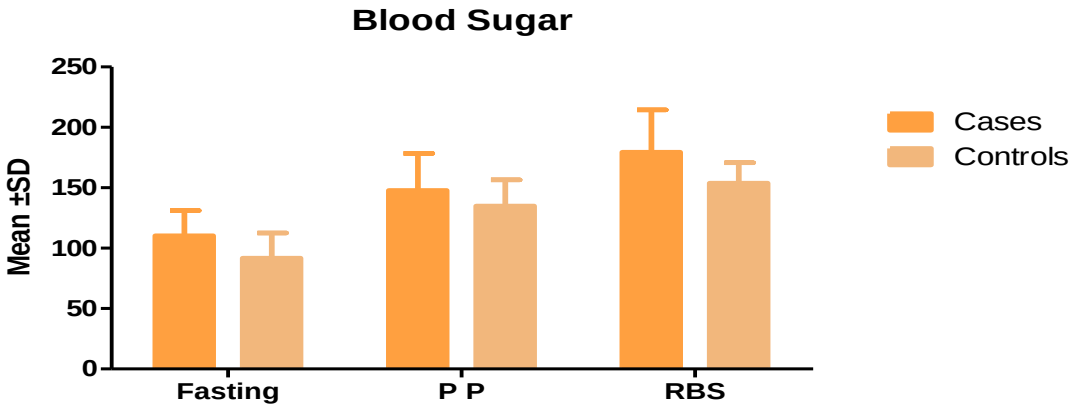

Figure 6: Bar Chart shows the comparison of RBS, Fasting and P P Blood Sugar in between cases and controls group.

Table 7 and Figure 7 show the mean Total Cholesterol, TGS, HDL, LDL and VLDL Lipid Profile in cases and controls. The mean Total Cholesterol, TGS, HDL, LDL and VLDL were 178.54±19.87, 159.82±22.27, 50.79±8.61, 97.27±20.90 and 34.35±14.60 in cases and 155.92±8.72, 172.36±12.18, 50.97±4.53, 94.11±7.90 and 25.21±3.69 in controls. The mean Total cholesterol and VLDL were significantly more and mean TGS was significantly lower in cases as compared to control.

Table 7: Comparisons of mean Lipid Profile in cases and controls

Lipid Profile	Cases (n=100)		Controls (n=100)		Chi Sq.	p-Value
	Mean	±SD	Mean	±SD		
Total Cholesterol	178.54	19.87	155.92	8.72	10.42	<0.001*
TGS	159.82	22.27	172.36	12.18	-4.94	<0.001*
HDL	50.79	8.61	50.97	4.53	-0.19	0.853
LDL	97.27	20.90	94.11	7.90	1.41	0.159
VLDL	34.35	14.60	25.21	3.69	6.07	<0.001*

*=Significant (p<0.05)

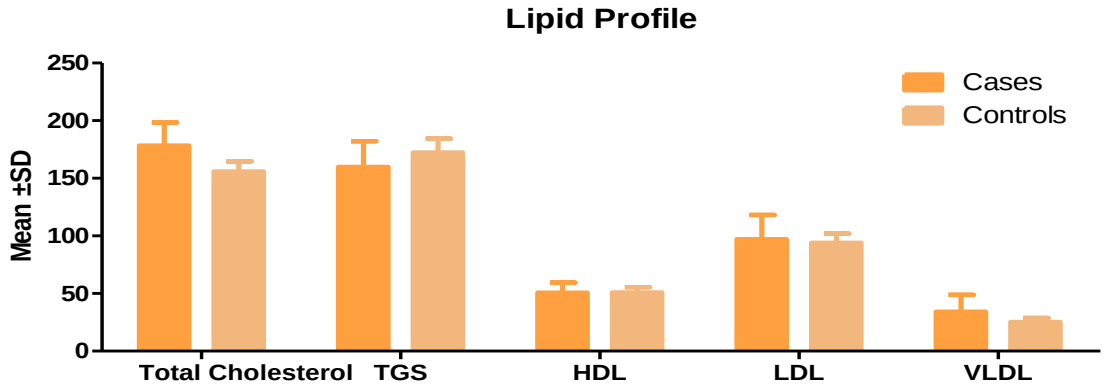

Figure 7: Bar Chart shows the mean total cholesterol, TGS, HDL, LDL and VLDL in between cases and controls group.

Table 8 and Figure 8 show the details of Maculopathy in cases and controls. The percentage of macular edema, macular edema+haemorrhage, macular edema+haemorrhage+exudates, macular exudates+macular edema+exudates, macular haemorrhage, R.D. and no maculopathy were 39.00%, 52.00%, 3.00%, 1.00%, 4.00%, 1.00%, 0.00% and 0.00% in cases and 6.0%, 1.0%, 9.0%,

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0.00%, 1.0%, 0.00%, 0.00% and 83.0%, respectively. The distribution of different maculopathy was significantly different in between cases and controls.

Table 8: Details of Maculopathy in cases and controls.

	Cases (n=100)		Controls (n=100)		Ch. Sq.	p-Value
	n	%	n	%		
Macular edema	39	39.00	6	6.0	163.08	<0.001*
Macular edema and hemorrhage	52	52.00	1	1.0		
Macular edema, hemorrhage, exudates	3	3.00	9	9.0		
Macular exudates	1	1.00	0	0.00		
Macular edema and exudates	4	4.00	1	1.0		
Macular hemorrhage	1	1.00	0	0.00		
R .D.	0	0.00	0	0.00		
No maculopathy	0	0.00	83	83.0		

*=Significant (p<0.05)

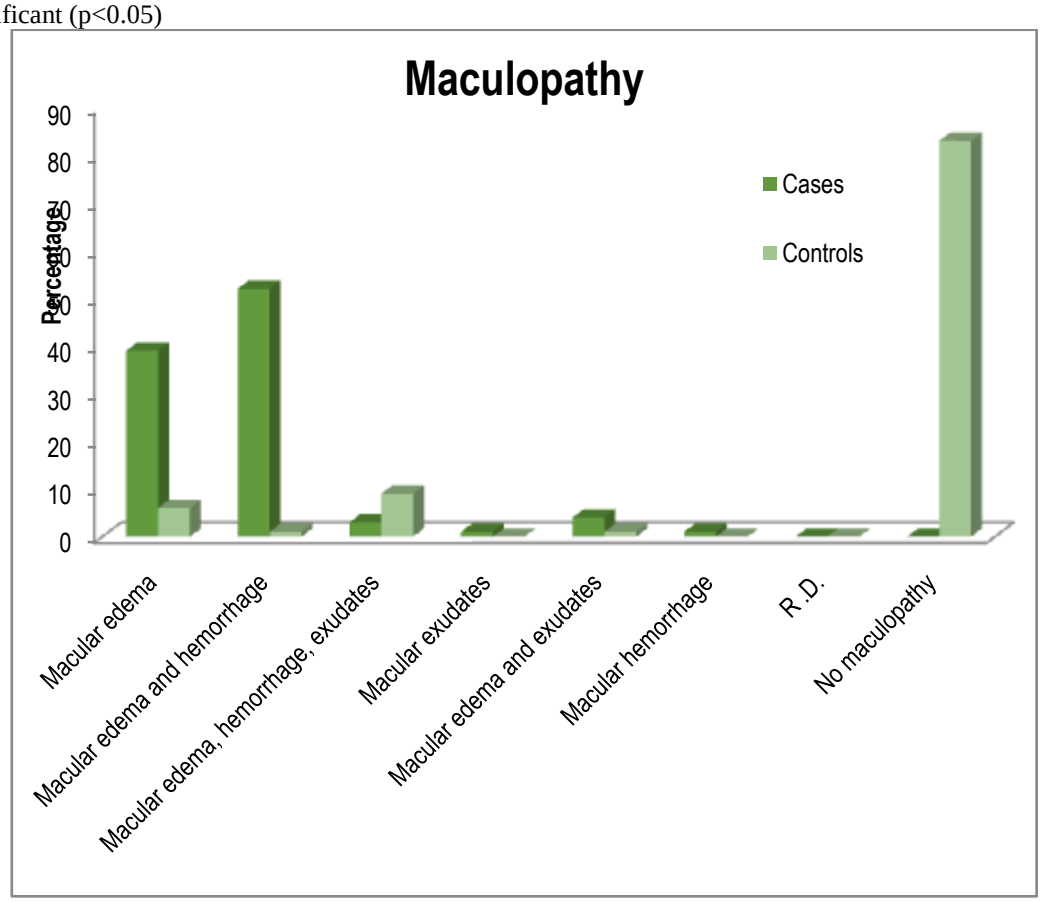

Figure 8: Bar chart shows the details of Maculopathy in cases and controls.

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Comparisons of Intraocular pressure (IOP) in cases and controls are shown in Table 9 and Figure 9. The mean OD and OS Intraocular pressure (IOP) was 16.08±7.55 and 16.15±4.83 in cases and 14.46±3.29 and 14.99±7.24 in controls. The mean OD and OS Intraocular pressure (IOP) was not significantly different in between groups.

Table 9: Comparisons of Intraocular pressure (IOP)in cases and controls.

IOP (mmhg)	Cases (n=100)		Controls (n=100)		t	p-Value
	Mean	±SD	Mean	±SD		
OD	16.08	7.55	14.46	3.29	1.97	0.051
OS	16.15	4.83	14.99	7.24	1.33	0.184

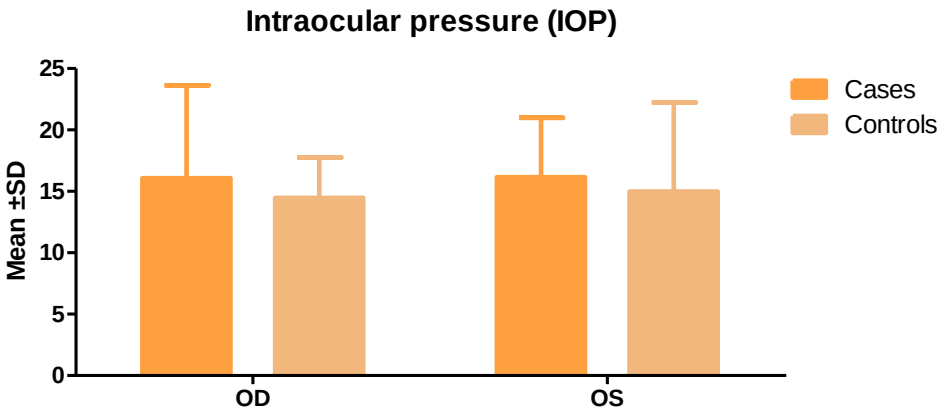

Figure 9: Bar chart shows the comparisons of Intraocular pressure (IOP) in cases and controls.

Table 10 and Figure 10 show the details of Cardiac disease, Serum homocysteine, Systemic inflammatory disease, Hypercoagulation disease, Smoking, Oral contraceptive pills and Neoplasia in in cases and controls. The cardiac disease, systemic inflammatory disease, hypercoagulation disease, smoking, oral contraceptive pills and neoplasia were only found in Branch RVO. The mean serum homocysteine was significantly more in Branch RVO (5.48±11.10) as compared to Central RVO (2.01±0.09).

Table 10: Details of Cardiac disease, Serum homocysteine, Systemic inflammatory disease, Hypercoagulation disease, Smoking, Oral contraceptive pills and Neoplasia in in between Branch RVO and Central RVO in cases.

	Branch RVO (n=43)		Central RVO (n=54)		Ch. Sq.	p-Value
	n	%	n	%		
Cardiac disease	1	1.00	0	0.00	-	-
Systemic inflammatory disease	2	2.00	0	0.00	-	-
Hypercoagulation disease	4	4.00	0	0.00	-	-
Smoking	40	40.00	0	0.00	-	-
Oral contraceptive pills	0	0.00	0	0.00	-	-
Neoplasia	0	0.00	0	0.00	-	-
Serum homocysteine (mean±SD)	5.48	11.10	2.01	0.09	3.13	0.002*

*=Significant (p<0.05)

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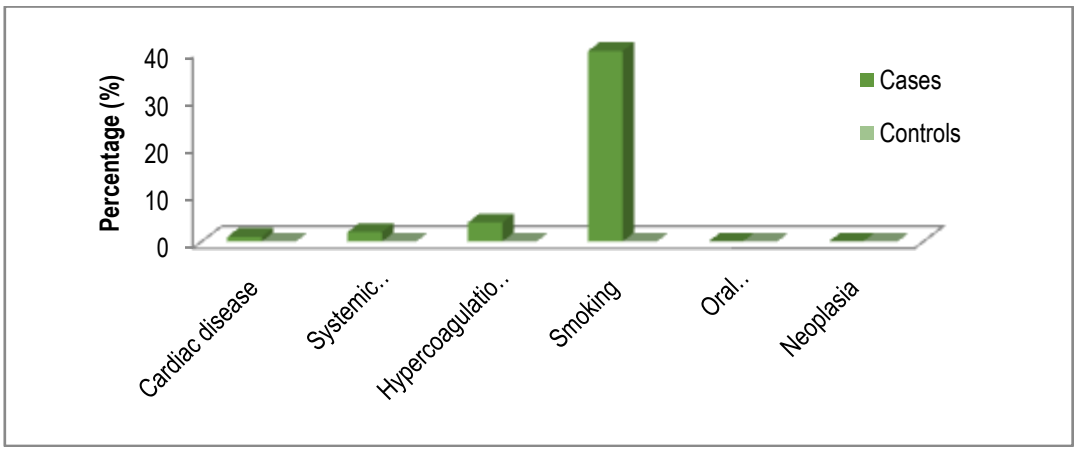

Figure 10:Bar chart shows the Cardiac disease, Serum homocysteine, Systemic inflammatory disease, Hypercoagulation disease, Smoking, Oral contraceptive pills and Neoplasia in between Branch RVO and Central RVO in cases.

Table 11 and Figure 11 show the distribution of retinal vein occlusion (RVO) on the basis of occurring at different sites in cases. Out of 100, total 43% patients were branch RVO, 54% patients were Central RVO and 3% patients were hemi RVO.

Table 11: Distribution of retinal vein occlusion (RVO) on the basis of occurring at different sites in cases

	n	%
Branch RVO	43	43.00
Central RVO	54	54.00
Hemi RVO	3	3.00

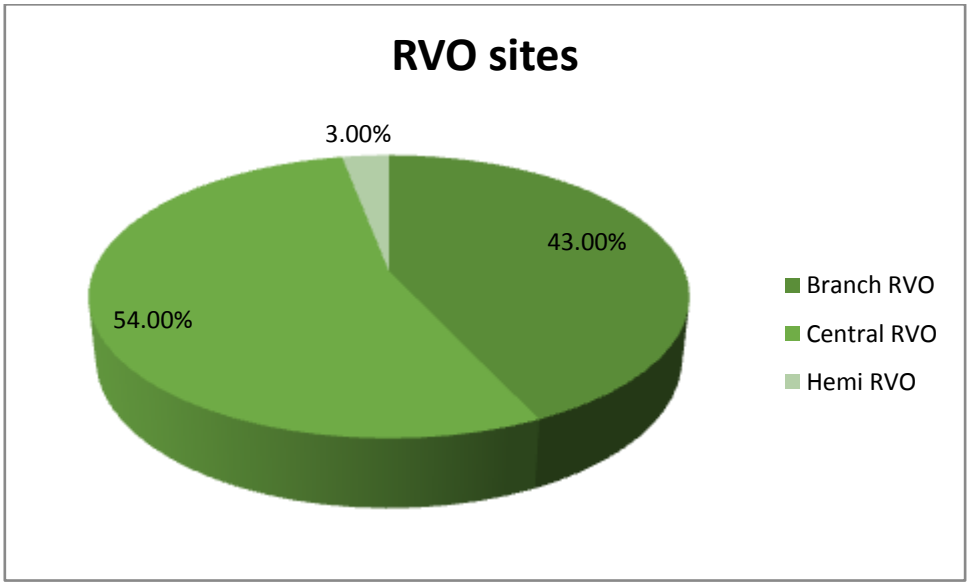

Figure 11: Pie Chart shows the distribution of retinal vein occlusion (RVO) on the basis of occurring at different sites in cases.

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Table 12 and Figure 12 show the distribution of Retinal Vein Occlusion (RVO) according to different age group. The percentage of 21-30, 31-40, 41-50, 51-60, 61-70 and >70 years age group were 6.98%, 13.95%, 27.91%, 20.93%, 23.26% and 6.98% in Branch RVO, 0.00%, 9.26%, 33.33%, 25.93%, 18.52% and 12.96% in Central RVO, and 0.00%,33.33%, 0.00%, 66.67%, 0.00% and 0.00% Hemi RVO respectively. The percentage of different age group was not significantly different in between different RVO.

Table 12: Comparisons of different age group with Branch, Central and Hemi RVO.

Age group	Branch RVO (n=43)		Central RVO (n=54)		Hemi RVO (n=3)		Ch. Sq.	p-Value
	n	%	n	%	n	%		
21-30 years	3	6.98	0	0.00	0	0.00	11.19	0.343
31-40 years	6	13.95	5	9.26	1	33.33		
41-50 years	12	27.91	18	33.33	0	0.00		
51-60 years	9	20.93	14	25.93	2	66.67		
61-70 years	10	23.26	10	18.52	0	0.00		
>70 years	3	6.98	7	12.96	0	0.00		

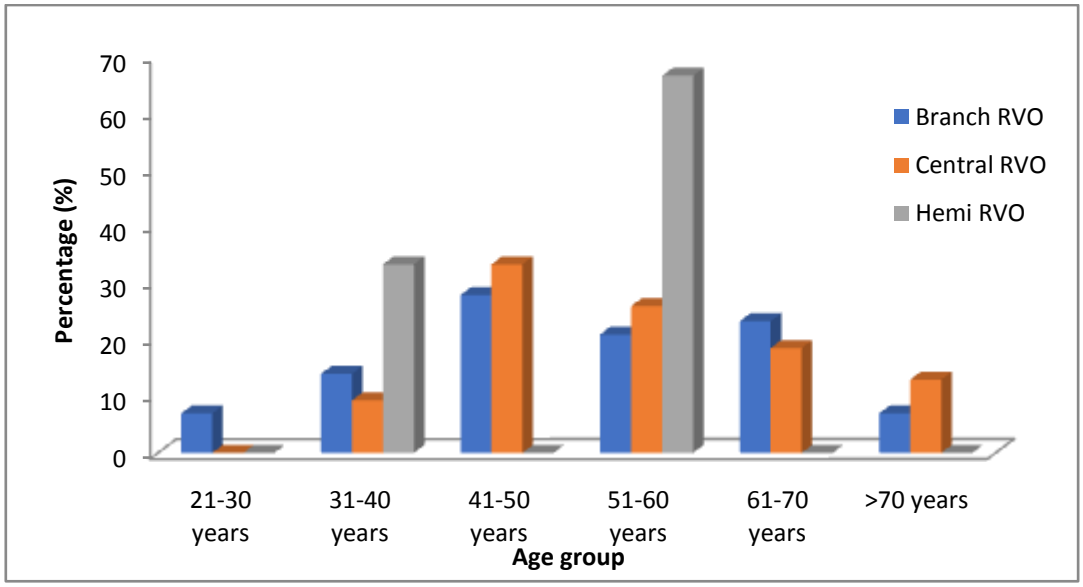

Figure 12: Bar chart shows the comparisons of different age group with Branch, Central and Hemi RVO.

Table 13 and Figure 13 show the distribution of Retinal Vein Occlusion (RVO) cases according to gender. The percentage of male and female was 55.81% and 44.19% in Branch RVO, 64.81% and 35.19% in Central RVO, and 100% and 0.0% in hemi RVO, respectively. The percentage of male and female was not significantly different in between different RVO.

Table 13:Comparisons of gender with Branch, Central and Hemi RVO

Gender	Branch RVO (n=43)		Central RVO (n=54)		Hemi RVO (n=3)		Ch. Sq.	p-Value
	n	%	n			%		
Male	24	55.81	35	64.81	3	100.00	2.72	0.257
Female	19	44.19	19	35.19	0	0.00		

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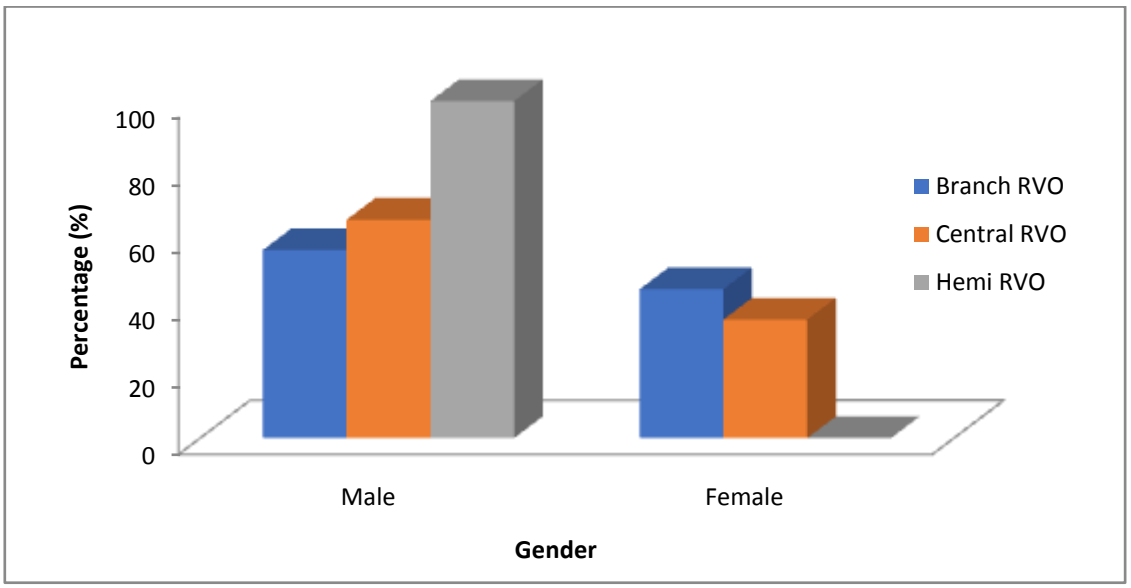

Figure 13:Bar chart shows the comparisons of gender with Branch, Central and Hemi RVO.

Table 14 and Figure 14 show the details of vision status on the basis of Best Corrected Visual Acuity (BCVA)in Branch, Central and Hemi RVO cases. The percentage of good vision, moderate vision, severe vision and very severe vision were 51.16%, 23.26%, 23.26% and 2.33% in OD and 53.49%, 25.58%, 16.28%, and 4.65% in OS in Branch RVO, 40.74%, 12.96%, 11.11%, and 35.19% in OD and 46.30%, 25.93%, 12.96%, and 14.81% in OS in Central RVO and 33.33%, 33.33%, 0.00% and 33.33% in OD and 66.67%, 33.33%, 0.00%, and 0.00% in OS in Hemi RVO, respectively. The frequencies of different vision status on the basis of BCVA was significantly different in between Branch, Central and Hemi RVO in OD, whereas it was not significantly different in between Branch, Central and Hemi RVO in OS.

Table 14: Comparisons of vision status on the basis of Best Corrected Visual Acuity (BCVA) with Branch, Central and Hemi RVO.

	Branch RVO (n=43)		**Central RVO (n=54)**		**Hemi RVO (n=3)**		**Ch. Sq.**	**p-Value**
	n	%	n	%	n	%		
OD								
Good vision	22	51.16	22	40.74	1	33.33	17.72	0.007*
Moderate vision	10	23.26	7	12.96	1	33.33		
severe vision	10	23.26	6	11.11	0	0.00		
Very severe vision	1	2.33	19	35.19	1	33.33		
OS								
Good vision	23	53.49	25	46.30	2	66.67	3.89	0.692
Moderate vision	11	25.58	14	25.93	1	33.33		
severe vision	7	16.28	7	12.96	0	0.00		
Very severe vision	2	4.65	8	14.81	0	0.00		

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*=Significant (p<0.05)

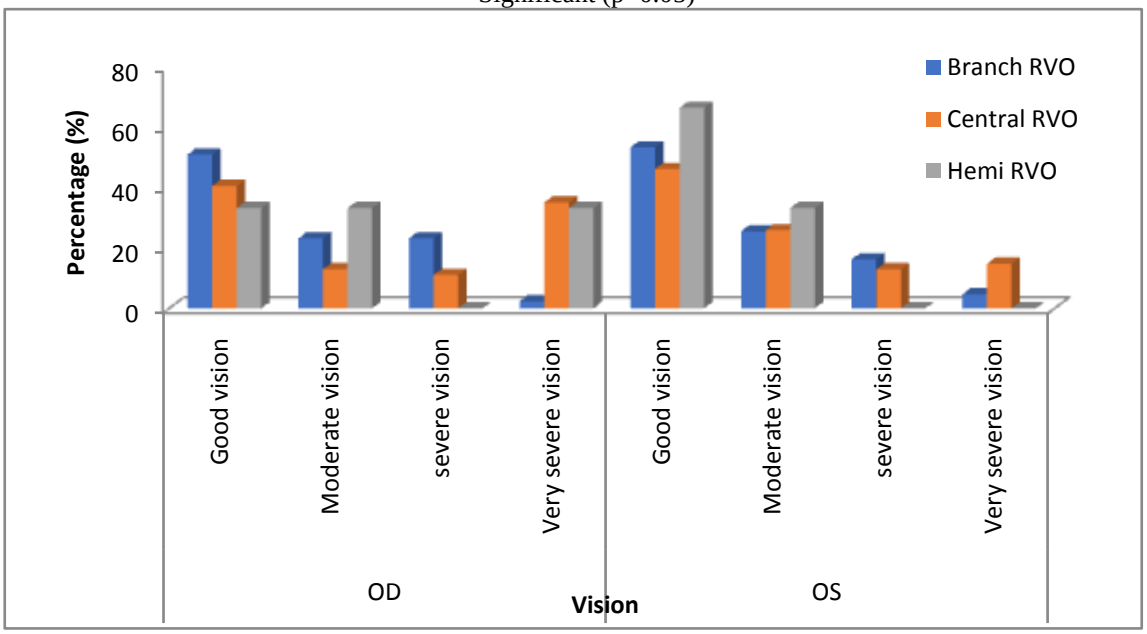

Figure 14: Bar chart shows the comparisons of vision status on the basis of Best Corrected Visual Acuity (BCVA) with Branch, Central and Hemi RVO.

The comparisons of mean blood pressure (BP) in between Branch, Central and Hemi RVO group are shown in Tables 15 and Figure 15. The mean Systolic and Diastolic BP were 142.09±18.43 and 86.66±11.33 in Branch RVO, 147.74±21.45 and 90.53±8.93 in Central RVO and 143.33±41.63 and 85.33±5.03 in Hemi RVO group. The mean Systolic and Diastolic BP were not significantly different in between Branch, Central and Hemi RVO.

Table 15: Comparisons of Blood Pressure (mmHg) in between Branch, Central and Hemi RVO

	Branch RVO (n=43)		Central RVO (n=54)		Hemi RVO (n=3)		p-Value
	Mean	±SD	Mean	±SD	Mean	±SD	
Systolic Blood Pressure	142.09	18.43	147.74	21.45	143.33	41.63	0.204
Diastolic Blood Pressure	86.66	11.33	90.53	8.93	85.33	5.03	0.076

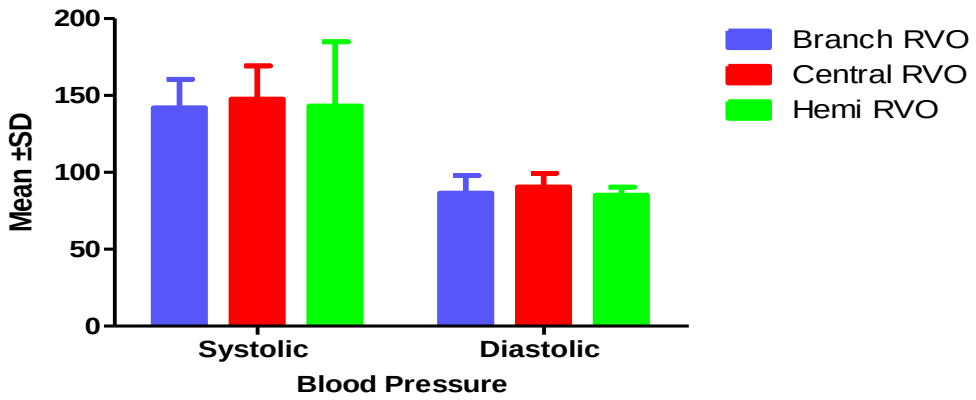

Figure 15: Bar chart shows the comparisons of Blood Pressure (mmHg) in between Branch, Central and Hemi RVO.

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The comparisons of mean blood sugar in between Branch, Central and Hemi RVO group are shown in Tables 16 and Figure 16. The mean Fasting, P P and RBS, blood sugarwere 99.23±23.92, 140.85±29.81 and 163.65±30.12 in Branch RVO, 105.34±16.33, 142.42±18.07 and 174.81±29.65 in Central RVO and 112.67±12.70, 150.00±17.32 and 171.33±18.58 in Hemi RVO group. The mean Fasting, P P and random blood sugar were not significantly different in between Branch, Central and Hemi RVO group.

Table 16: Comparisons of Deranged Blood Glucose (mg/dl) in between Branch, Central and Hemi RVO.

Blood Glucose (mg/dl)	Branch RVO (n=43)		Central RVO (n=54)		Hemi RVO (n=3)		p-Value
	Mean	±SD	Mean	±SD	Mean	±SD	
Fasting	99.23	23.92	105.34	16.33	112.67	12.70	0.151
P P	140.85	29.81	142.42	18.07	150.00	17.32	0.805
RBS	163.65	30.12	174.81	29.65	171.33	18.58	0.067

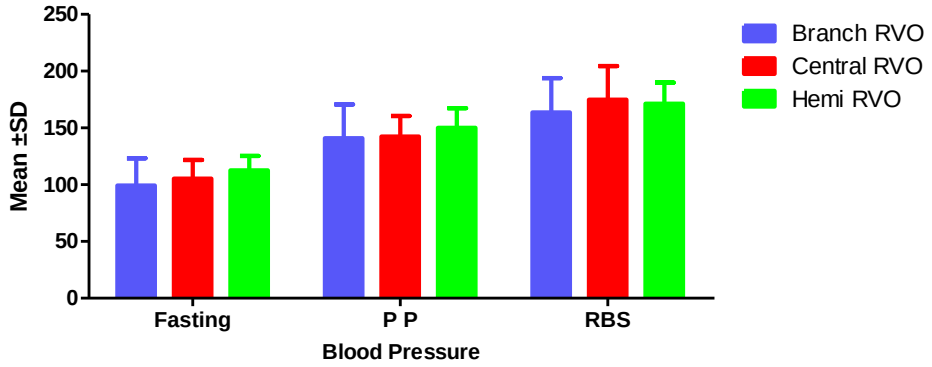

Figure 16: Bar chart shows the comparisons of Deranged Blood Glucose (mg/dl) in between Branch, Central and Hemi RVO.

Table 17 and Figure 17 show the mean Total Cholesterol, TGS, HDL, LDL and VLDL Lipid Profile in Branch, Central and Hemi RVO. The mean Total Cholesterol, TGS, HDL, LDL and VLDL were 178.35±22.58, 163.49±24.94, 50.72±6.20, 98.58±19.90 and 33.51±13.73in Branch RVO, 178.57±18.14, 157.00±20.34, 50.70±10.36, 95.89±22.14 and 34.87±15.66 in Central RVO and 180.67±10.07, 158.00±2.00, 53.33±2.31, 103.33±13.32 and 37.00±7.55 in Hemi RVO. The mean Total Cholesterol, TGS, HDL, LDL and VLDL Lipid Profile were not significantly was not significantly different in between Branch, Central and Hemi RVO.

Table 17: Comparisons of Lipid Profile in between Branch, Central and Hemi RVO

Lipid Profile	Branch RVO (n=43)		Central RVO (n=54)		Hemi RVO (n=3)		p-Value
	Mean	±SD	Mean	±SD	Mean	±SD	
Total Cholesterol	178.35	22.58	178.57	18.14	180.67	10.07	0.981
TGS	163.49	24.94	157.00	20.34	158.00	2.00	0.362
HDL	50.72	6.20	50.70	10.36	53.33	2.31	0.876
LDL	98.58	19.90	95.89	22.14	103.33	13.32	0.724
VLDL	33.51	13.73	34.87	15.66	37.00	7.55	0.859

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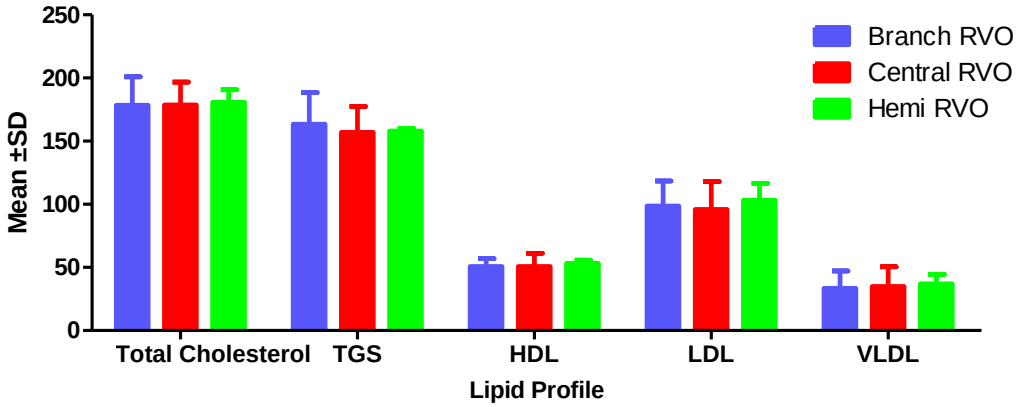

Figure 17: Bar chart shows the comparisons of Lipid Profile in between Branch, Central and Hemi RVO.

Table 18 and Figure 18 show that the Maculopathy in Branch, Central and Hemi RVO. The different Maculopathy were not significantly different in between Branch, Central and Hemi RVO.

Table 18: Maculopathy in Branch, Central and Hemi RVO

	Branch RVO (n=43)		Central RVO (n=54)		Hemi RVO (n=3)		Ch. Sq.	p-Value
	n	%	n	%	n	%		
Macular edema	15	34.88	23	42.59	1	33.33	4.69	0.911
Macular edema and hemorrhage	23	53.49	27	50.00	2	66.67		
Macular edema, hemorrhage, exudates	2	4.65	1	1.85	0	0.00		
Macular exudates	0	0.00	1	1.85	0	0.00		
Macular edema and exudates	3	6.98	1	1.85	0	0.00		
Macular hemorrhage	0	0.00	1	1.85	0	0.00		

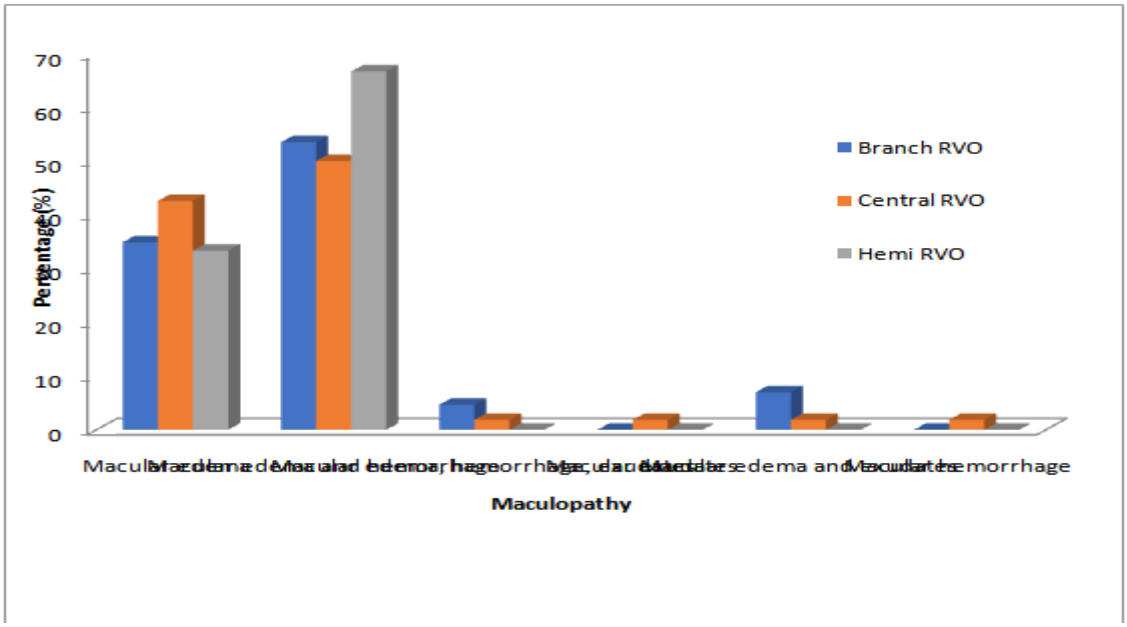

Table 18: Bar chart shows the distribution of Maculopathy in Branch, Central and Hemi RVO.

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Comparisons of Intraocular pressure (IOP) in Branch, Central and Hemi RVO are shown in Table 19 and Figure 19. The mean OD and OS Intraocular pressure (IOP) was 14.70±4.09 and 15.26±3.47 in Branch RVO, 17.13±9.51 and 16.74±5.71 in Central RVO and 17.00±1.00 and 18.33±2.08 in Hemi RVO. The mean OD and OS Intraocular pressure (IOP) was not significantly different in between groups.

Table 19: Intraocular pressure (IOP)in Branch, Central and Hemi RVO.

IOP (mmHg)	Branch RVO (n=43)		Central RVO (n=54)		Hemi RVO (n=3)		p-Value
	Mean	±SD	Mean	±SD	Mean	±SD	
OD	14.70	4.09	17.13	9.51	17.00	1.00	0.285
OS	15.26	3.47	16.74	5.71	18.33	2.08	0.237

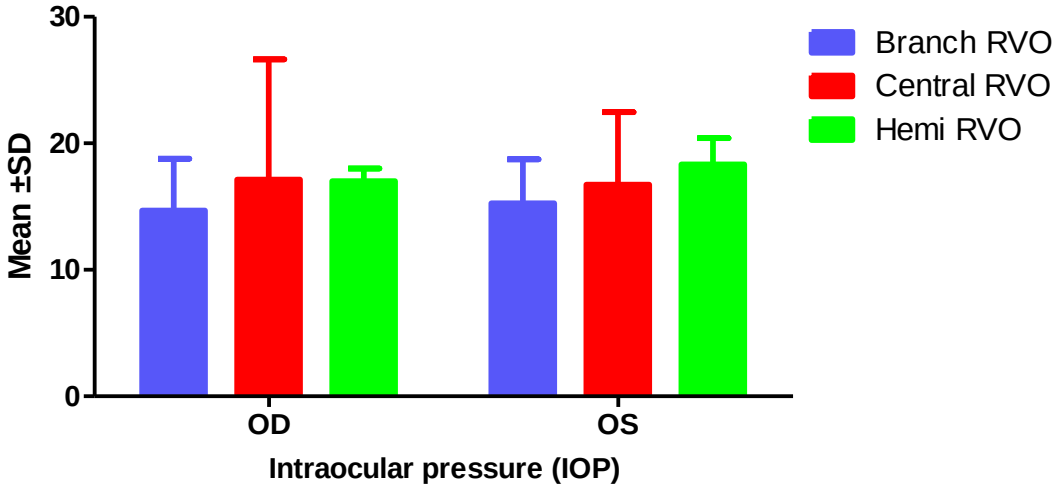

Figure 19: Bar chart shows the mean Intraocular pressure (IOP) in Branch, Central and Hemi RVO.

The presence of Cardiac disease, Serum homocysteine, Systemic inflammatory disease, Hypercoagulation disease, Smoking, Oral contraceptive pills and Neoplasia were comparable in between in Branch, Central and Hemi RVO as shown in Table 20 and Figure 20.

Table 20: Details of Cardiac disease, Serum homocysteine, Systemic inflammatory disease, Hypercoagulation disease, Smoking, Oral contraceptive pills and Neoplasia in Branch, Central and Hemi RVO.

	Branch RVO (n=43)		Central RVO (n=54)		Hemi RVO (n=3)		Ch. Sq.	p-Value
	n	%	n	%	n	%		
Cardiac disease	0	0.00	1	1.85	0	0.00	-	-
Serum homocysteine	16	37.21	17	31.48	1	33.33	0.86	0.650
Systemic inflammatory disease	1	2.33	1	1.85	0	0.00	0.35	0.839
Hypercoagulation disease	2	4.65	2	3.70	0	0.00	0.09	0.956
Smoking	20	46.51	20	37.04	0	0.00	0.18	0.912
Oral contraceptive pills	0	0.00	0	0.00	0	0.00	-	-
Neoplasia	0	0.00	0	0.00	0	0.00	-	-

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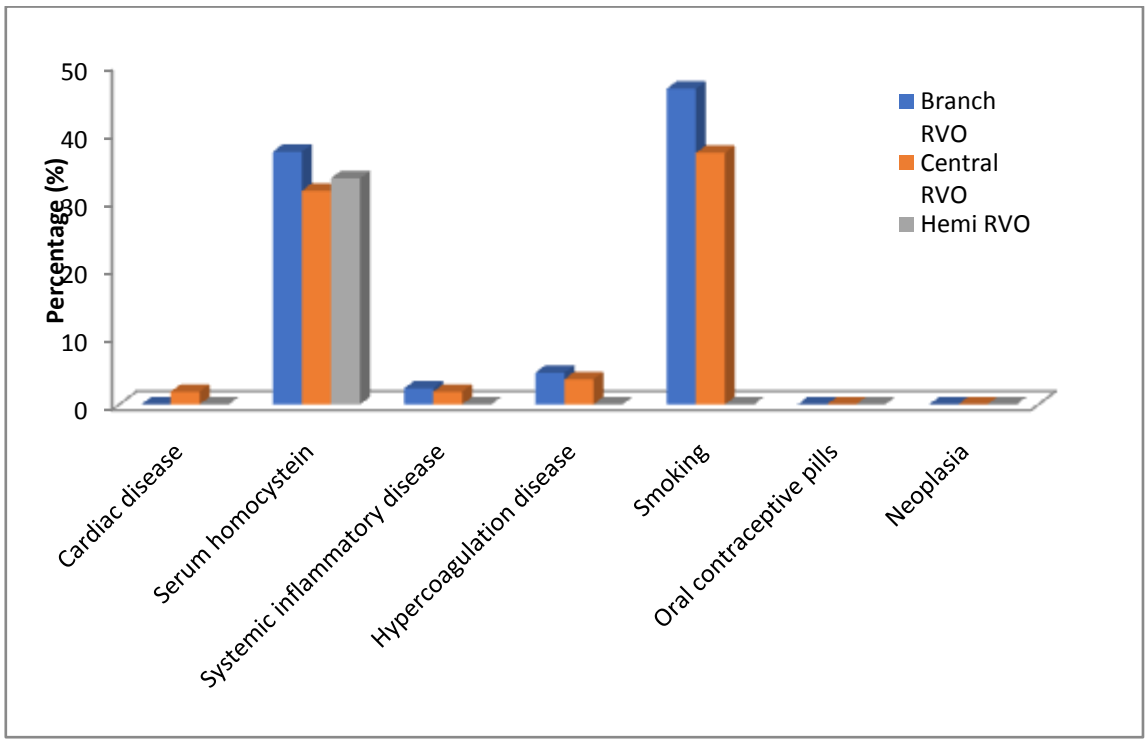

Figure 20:Bar chart shows the details of Cardiac disease, Serum homocysteine, Systemic inflammatory disease, Hypercoagulation disease, Smoking, Oral contraceptive pills and Neoplasia in Branch, Central and Hemi RVO.

Table 21: Significant findings.

		Cases (n=100)		Controls (n=100)		t/chi sq.	p-Value
		Mean/n	**±SD/%**	**Mean/n**	**±SD/%**		
Blood Pressure (BP) (mean±SD)	Systolic	149.57	22.98	137.64	13.41	4.48	<0.001*
	Diastolic	92.12	11.66	83.21	7.60	6.40	<0.001*
Hypertension (n, %)	Yes	61	61.0	32	32.0	22.02	<0.001*
	No	39	39.0	68	68.0		
Blood Sugar (n, %)	Fasting	110.40	20.82	91.70	20.80	6.35	<0.001*
	P P	147.85	30.54	134.96	21.61	3.45	0.001*
	RBS	179.50	34.88	153.95	16.80	6.60	<0.001*
Diabetes (n, %)	Yes	32	32.0	13	13.0	9.29	0.002*
	No	68	68.0	87	87.0		
Lipid Profile (mean±SD)	Total Cholesterol	178.54	19.87	155.92	8.72	10.42	<0.001*
	TGS	159.82	22.27	172.36	12.18	-4.94	<0.001*
	VLDL	34.35	14.60	25.21	3.69	6.07	<0.001*
Maculopathy (n, %)	Macular edema	39	39.00	6	6.0	163.08	<0.001*
	Macular edema and hemorrhage	52	52.00	1	1.0		
	Macular edema, hemorrhage, exudates	3	3.00	9	9.0		

	Macular exudates	1	1.00	0	0.00		
	Macular edema and exudates	4	4.00	1	1.0		
	Macular hemorrhage	1	1.00	0	0.00		
	R.D.	0	0.00	0	0.00		
	No maculopathy	0	0.00	83	83.0		
Serum homocysteine's	(mean±SD)	5.48	11.10	2.01	0.09	3.13	0.002*

IV. DISCUSSION:

The obstruction of veins that take blood away from the retina is known as retinal vein occlusion (RVO). As a result of macular edema and retinal ischemia, RVO—the second most prevalent retinal vascular disorder—is a reasonably frequent and common cause of vision loss, particularly in elderly people. Although it has been known about for more than a century, the precise pathophysiology is still unknown. Additionally, systemic diseases such as HTN, arteriosclerosis, diabetes, hyperlipidemia (HLD), vascular cerebral stroke, blood hyperviscosity, thrombophilia, inflammatory pathologies, neoplasia's, smoking, and oral contraceptives are linked to the risk of RVO.[25] In this study, we aim to evaluate the various risk factors and clinical presentation of retinal vein occlusion in patients visiting a tertiary eye care facility in UttarPradesh.

A total of 200 people has signed up for this study.in which 100 patients (50%) had retinal vein occlusion (case group) and 100 patients (50%) were healthy (control group).in the study of 100 patients, 43% had branch RVO, 54% had central RVO, and 3% had hemi RVO.Bhattacharjee et al. (2020) [74] observed that 67.6% of the total patients had branch retinal vein occlusion (BRVO) and the remaining 32.4% had central retinal vein occlusion (CRVO). Laouri et al. [27] compared the data from one pooled analysis and seven population-based studies to assess the prevalence of RVO. According to this systematic review, the prevalence of rvo is relatively constant across all countries: in populations older than 40 years, it ranges from 0.3% to 2.1%, with highest values in Japan and Australia and lowest values in the United States, Europe, and Singapore. In all studies, the prevalence of BRVO was higher than that of CRVO, ranging from three (Singapore, 26) to 10 (China, 24) times higher. Data from Europeand the Rotterdam eye study were included in the pooled analysis.[75] In this pooled analysis, the prevalence of any RVO was 0.8% in Europe and 0.6% in the Rotterdam eye study. In these two studies, the prevalence of BRVO and CRVO was 0.6% vs. 0.5% and 0.2% vs. 0.1%, respectively. According to Kolar's et al [25] research, BRVO is four times more common than CRVO.

In our study, the age of patients who presented with retinal vein occlusion varied from 21 to >80. The percentages of the 21–30, 31–40, 41–50, 51–60, 61–70, and >70 years age groups in the RVO group were 3.00%, 12.00%, 30.00%, 25.00%, 20.00%, and 10.00%, respectively. The incidence of RVO was more common in the 40–70 age group. Moreover, the percentages of the 21–30, 31–40, 41–50, 51–60, 61–70, and >70 years age groups were 6.98%, 13.95%, 27.91%, 20.93%, 23.26%, and 6.98% in the branch RVO, 0.00%, 9.26%, 33.33%, 25.93%, 18.52%, and 12.96% in the central RVO, and 0.00%, 33.33%, 0.00%, 66.67%, 0.00%, 0.00%, and 0.00% in the hemi The percentage of different age groups was not significantly different between different RVOs (branch, central, and hemi RVO). RVO risk factors are independent of age. Ponto et al. (2015) [53] discovered that the prevalence of BRVO increased with age, and CRVO was most prevalent in older age decades. The average age of people with RVO was 62.5 9.5 years, compared to 55.0 11.1 years for people without RVO. There was no statistically significant age difference between those with CRVO (66.2 9.4 years) and those with BRVO (61.6 9.5 years). Overall, 22 (37.3%) of 59 persons with RVO, 18 (38.3%) of 47 with BRVO, and four (33.3%) of 12 persons with CRVO were women. There is broad consensus that the prevalence of RVO is strongly associated with increasing age (23–28). This has to be kept in mind when comparing the results of the present younger cohort with those from other population-based studies looking at populations older than 40 years. Rogers et al. (2010),[9] Klein et al. (2000),[41] Mitchell et al. (1996),[5] Wong et al. (2005),[76] Liu et al.

(2007),[77] Cheung et al. (2008),[57] Lim et al. (2008),[64] and Verougstraete (1999) [78] reported that age is an important risk factor for RVO. This likely reflects an increase in arteriosclerosis and in age-related vascular (e.g., systemic hypertension) and ocular (e.g., glaucoma or increased intraocular pressure) risk factors. [35,76] Barnett et al. (2010) [79] reported that the mean baseline age of participants who later developed RVO was 65.1 8.5 SD years, compared to 55.3 9.5 SD years among participants who did not develop RVO (p 0.001). The pathogenic impact of various risk factors on both young and old people varies (Bucciarelli et al., 2017).[62]Ages 50–59 and 60–69 were found to have a greater risk of stroke in a meta-analysis by examining subgroups of various ages (Li et al., 2016).[77] Younger patients (50 years old) had superior baseline and final acuities, a reduced incidence of cystoid macular edema, and needed fewer intravitreal injections, according to a study (Thomas et al., 2019).[80] Less blood stasis and a more active lifestyle might probably contribute to the better patient outcomes seen in younger patients. On the other hand, natural ageing and organ wear would also have a negative impact on senior patients' prognoses. A greater risk of RVO may also be caused by other cardiovascular risk factors, such as increased lamina cribrosa thickness and hardness (where the retinal vein and artery vein are very close to one another) (Bucciarelli et al., 2017).[62] It is evident that CRVO is positively connected with age; hence, young patients with BRVO must be screened for thrombus causes (Ali et al., 2011).

In our study, men were more frequently affected by RVO (62%). Male and female RVO percentages were 55.81% and 44.19%, respectively, in branch RVO, 64.81% and 35.19% in central RVO, and 100% and 0.0% in hemi RVO. The proportion of males and females did not differ significantly across RVOs. Moreover, the male was also more common in branch RVO (55.81%), central RVO (64.81%), and hemi RVO (100%). Similarly, Ponto et al. (2019) [53] reported that males were 1.7 times more frequently affected by RVO (prevalence of RVO in men: 0.52%) than females (0.29%). Rogers et al. (2010) [9] of these participants, 43.7% were male, 48.4% were white, 27.1% were Asian, 17.2% were Hispanic, and 7.2% were black. Sinawat et al. (2017) [81] showed that young CRVO occurrence was also found in women more than men, and young BRVO was noted in men more than women. However, these differences were not statistically significant. Another study, however, reported more cases in men than women and indicated that being male was one of the risk factors in the development of RVO (Fong et al., 1993).[82] Roger et al. (2004) [9] state that females were 25% less likely to have RVO than males. Ponto et al. (2014) found that males were 1.7 times more frequently affected by RVO (prevalence of RVO in men: 0.52%) than females (0.29%). RVO is more common in older adults and in males than in females (over 65 years of age). RVO prevalence data for the USA, Europe, Asia, and Australia were reported in a study by the International Eye Disease Consortium in 2010.[9] RVO prevalence for women increases from 55 to 84 years of age (Park et al., 2014).[47] This discovery could be connected to menopause and unhealthy lipid profiles (Pappa et al., 2012; Ko et al., 2021; Taddei et al., 2009).[83] RVO, on the other hand, affects men more frequently in people over 85 and between the ages of 30 and 54 (Park et al., 2014).[47]

In our study, there was no significance noted in the laterality of the affected eye, as 37% had right eye involvement and 24% had left eye involvement. In our study, the best corrected visual acuity (BCVA) for good vision, moderate vision, severe vision, and very severe vision in OD patients was 45.00%, 18.00%, 16.00%, and 21.00%, and in RVO patients it was 50.00%, 26.00%, 14.00%, and 10.00%. In our study, there was no significance noted in the laterality of the affected eye, as 37% had right eye involvement and 24% had left eye involvement. Furthermore, the percentages of good vision, moderate vision, severe vision, and very severe vision in OD were 51.16%, 23.26%, 23.26%, and 2.33%, respectively, and 53.49%, 25.58%, 16.28%, and 4.65% in OS in Branch RVO; 40.74%, 12.96%, 11.11%, and 35.19% in OD and 46.30%, 25.93%, 12.96%, and 14.81% in OS in Central RVO; and 33.33%The frequencies of different vision statuses on the basis of BCVA were significantly different between branch, central, and hemi RVO in OD, whereas they were not significantly different between branch, central, and hemi RVO in OS. According to a previous study, the branch retinal vein blockage normally has a positive prognosis, with a final visual acuity (VA) of 20/40 or greater in 50% to 60% of eyes, even in the absence of treatment. Initial VA appears to be a significant predictor of final VA. The prognosis of acute BRVO is significantly influenced by the degree of macular or foveal involvement. There is a 36% likelihood that patients with retinal ischemia of at least five-disc diameters may experience neovascularization of the retina or optic disc. If laser photocoagulation is not carried out, patients with retinal ischemia measuring at least five-disc diameters have a 60%

to 90% probability of experiencing vitreous haemorrhage. [84]

In our study, the presence of hypertension was significantly higher in cases (61.0%) as compared to controls (32.0%). Moreover, the mean systolic and diastolic BP were 149.57±22.98 and 92.12±11.66 in cases, and 137.64±13.41 and 83.21±7.60 in the control group. Cases had significantly higher mean systolic and diastolic blood pressures than controls. The mean systolic and diastolic BP were 142.09±18.43 and 86.66±11.33 in Branch RVO, 147.74±21.45 and 90.53±8.93 in Central RVO, and 143.33±41.63 and 85.33±5.03 in the Hemi RVO group. The mean systolic and diastolic BP were not significantly different between the branch, central, and hemi RVOs. Mohamed et al. (1996) [85] stated that 48 percent of RVO is connected to hypertension. Sankaranarayanan et al. (2017) [86] reported that the associations of BRVO with uncontrolled hypertension were significantly higher (58%). Various previous studies reported that the BRVO was commonly associated with systemic hypertension. [86] Systemic hypertension occurs more frequently in the elderly population, which could be the reason for a higher prevalence of BRVO in our elderly population. Because our sample did not include CRVO estimates in the younger age group (60 years), where it is more common, we could have also underestimated the prevalence of CRVO. The population prevalence of CRVO was 0.21%. The finding was consistent with other studies where prevalence ranged from 0.1–0.4%. [41,68] The ARIC and CHS studies identified hypertension as one of the main risk factors for RVO, along with concomitant hypertensive retinal arteriolar alterations (such as the arteriovenous notch). BRVO is more affected by hypertension than CRVO is, and this difference is due to higher pressure at the point where the arteries and veins meet. Through pro-inflammatory processes of the renin-angiotensin-aldosterone system, hypertension results in RVO. Small arteries are also harmed, resulting in arteriolosclerosis and venule compression. This promotes turbulence, which slows the flow of venous blood. Additionally, the hematocrit is altered by hypertension, which damages the blood vessel walls, increasing blood viscosity and the likelihood of RVO. RVO and non-dipping hypertension were investigated by Rao et al. They discovered that the prevalence of non-dipping patterns was almost two times greater in RVO patients.[49] To strengthen the relationship even further, more research is required. Ninety-two percent of RVO patients who have hypertension have stable blood pressure. These hypertension studies indicate that dynamic blood pressure control and monitoring may reduce the risk of RVO.

The percentage of cases with diabetes in this study was significantly higher (32.0%) than in controls (13.0%). Moreover, the mean fasting, PP, and RBS blood sugars were 110.40±20.82, 147.85±30.54 and 179.50±34.88 in cases, and 96.69±21.23, 130.71±28.17 and 121.37±37.42 in the control group. The mean RBS, fasting, and PP blood sugars were significantly higher in cases as compared to controls. The mean fasting, PP, and RBS blood sugars were 99.23±23.92, 140.85±29.81 and 163.65±30.12 in the branch RVO group, 105.34±16.33, 142.42±18.07 and 174.81±29.65 in the central RVO and 112.67±12.70, 150.00±17.32 and 112.6712.70, 150.0017.32, and 171.3318.58 in the hemi RVO group. Moreover, the mean fasting, PP, and random blood sugar were not significantly different between the Branch, Central, and Hemi RVO groups. Diabetes mellitus (DM) is the main cause of RVO and a significant factor in visual loss. Wang et al. conducted a meta-analysis involving 148,654 cases with RVO and 23,768,820 controls, which supported the finding that individuals with DM were positively related to an increased risk of RVO.[87] Furthermore, they discovered no link between diabetes and the risk of BRVO, but diabetes was a risk factor for the CRVO and mix groups. Previously, Pinna et al. [88] found that the prevalence rate of DM was lower in the BRVO group (12.2%) than in the control group (15%). However, Demir et al. [89] and Christodoulou et al. [90] indicated that the prevalence rate of DM was higher in the BRVO group (24% and 16.7%, respectively) than in the control group (14% and 2.4%, respectively). Santiago et al. (2014) [91] reported that the prevalence of CRVO in diabetic patients (N = 72 27) were 0.5 and 0.4%, respectively. Disc neovascularization (21.3 vs. 0.0%, P = 0.05) was more common in diabetic patients compared with nondiabetic patients. Compared with type 2 diabetic patients, retinal neovascularization (28.6 vs. 3.7%, P = 0.004) and subsequent PRP (78.6 vs. 41.9%, P = 0.01) were more likely in type 1 diabetic patients. Optic nerve head collateral vessels (CVs) were observed less than half as often (21.4 vs. 56.5%, P = 0.04) in patients with type 1 diabetes. End products of advanced glycosylation can accumulate excessively in response to persistently high glucose levels, altering the function of the extracellular matrix, basement membrane, and vascular wall structure. End-stage diabetes mellitus changes could be crucial for BRVO. According to a recent study, sodium-

glucose cotransporter 2 (SGLT2) inhibitors increased the incidence of RVO because they changed the blood's composition. Adipo, which modifies obesity and diabetes, raises CRVO. According to a study, the severity of DM affects the link between body mass index (BMI) and RVO. The link between BMI and RVO may be explained by the hormone adipo.

In this study the mean total Cholesterol, TGS, HDL, LDL and VLDL were 178.54±19.87, 159.82±22.27, 50.79±8.61, 97.27±20.90 and 34.35±14.60 in cases and 155.92±8.72, 172.36±12.18, 50.97±4.53, 94.11±7.90 and 25.21±3.69 in controls. The mean Total cholesterol and VLDL were significantly more and mean TGS was significantly lower in cases as compared to control. The mean Total Cholesterol, TGS, HDL, LDL and VLDL were 178.35±22.58, 163.49±24.94, 50.72±6.20, 98.58±19.90 and 33.51±13.73in Branch RVO, 178.57±18.14, 157.00±20.34, 50.70±10.36, 95.89±22.14 and 34.87±15.66 in Central RVO and 180.67±10.07, 158.00±2.00, 53.33±2.31, 103.33±13.32 and 37.00±7.55 in hemi RVO. Moreover, the mean Total Cholesterol, TGS, HDL, LDL and VLDL Lipid Profile were not significantly was not significantly different in between Branch, Central and Hemi RVO. Lecumberri et al. reported that the non-HDL cholesterol and homocysteine levels were greater in patients with RVO than in controls (148.9 37.3 mg/dL vs. 142.9 34.5 mg/dL; p = 0.03 and 13.4 [11.2-18.2] mol/L vs. 11.1 [9.0-14.4] mol/L; p 0.001, respectively). The HDL cholesterol was considerably lower in patients (52 mg/dL) RVO patients had increased levels of triglycerides, LDL-C, and total cholesterol, although these changes did not achieve statistical significance. Buehl et al. (2010) reported that the patients with RVO had significantly lower levels of HDL phospholipid (1.24 +/- 0.19 g/L versus 1.44 +/- 0.25 g/L) than those in the control group. The patient group had lower concentrations of many lipids and apolipoproteins linked to LDL while having higher concentrations of lipids and apolipoproteins linked to VLDL; however, these changes were not statistically significant. Stojakovic et al. (2007) [92] reported that the comparison to controls, patients with RVO and RAO exhibited significantly higher LDL cholesterol levels (3.82+/-1.06, 3.59+/-0.90, and 3.07+/-0.83 mmol/L), LDL triglyceride levels (0.39+/-0.14, 0.40+/-0.12 and 0.35+/-0.14 mmol/L), and apolipoprotein B levels (1.06+/-0.27, 1.05+/-0.26 LDL-triglycerides and retinal vascular occlusion in RAO were independently correlated. According to the current investigation, Dodson and colleagues found a tendency toward higher HDL-C levels in retinal vein occlusion.[93] HDL may not defend against the obstruction of retinal veins for unknown reasons, although it may be due to unique qualities of the retina's vascular bead that set it apart from other bodily vessels. It was also surprise that our patient groups had a tendency toward reduced VLDL concentrations, which was especially significant in the case of RVO. This conclusion is feasible, though. The concentration of VLDL and HDL have a strong inverse biochemical and statistical relationship, thus the low VLDL found in the current study may only be a reflection of the high HDL (or vice versa).

An antiatherogenic lipoprotein called HDL inhibits the transfer of cholesterol in the reverse direction, which has positive vascular and antithrombotic benefits. 18 Additionally, the total cholesterol, HDL, or LDL/HDL atherogenic indexes, as well as other non-HDL cholesterol levels, were significantly higher in our RVO patients. These ratios combine two potent components of vascular risk, and subjects with elevated ratios have a higher cardiovascular risk due to a greater imbalance between the cholesterol transported by the most atherogenic lipoproteins and that of the lipoproteins with a protective effect. These indices represent risk markers with a higher predictive value than that of isolated data. The majority of our patients with RVO are categorized into the moderate-risk lipid intervals (LDL 40/50 (men and women)). A triglyceride study of a national cohort stated there was an association between low HDL levels and the risk of developing an RVO. However, as reported by Oriole et al., when analyzing the anterior lipid profile of a vascular event, the parameters are not overly high. According to Newman-Casey et al., elevated serum triglyceride levels and a decline in HDL levels were both risk factors for the development of peripheral RVO. A frequent risk factor, particularly in people under 50, is hyperlipidemia. Hyperlipidemia affects roughly 20.1% of people (Park et al., 2015).[47] Hyperlipidemia and RVO may be related to alterations in platelet function, clotting improvement, and plasma viscosity. The activity of plasminogen activator inhibitor type 1 (PAI-1) is increased in people with hyperlipidemia. Another independent risk factor for RVO is PAI-1. Further investigation reveals a connection between RVO and the genotype of PAI-1 4G. This offers a fresh approach to treating thrombotic RVO.

RVO has also been connected to cigarette smoking. HTN, HLD, arteriosclerosis, and DM are risk factors for RVO, according to research from the Diabetes Control and Complications Study

(DCCT) and Blue Mountains Study. Schmidt documented a number of systemic risk factors in a small sample of patients who had RVO and retinal artery occlusion (RAO). 11 out of 14 participants (mostly HTN 8x, HLD 3x, and chronic smoking 3x) had systemic risk factors.

In our study, cardiac disease, systemic inflammatory disease, hypercoagulation disease, smoking, oral contraceptive pills, and neoplasia were only found in Branch RVO. The mean serum homocysteine was significantly higher in branch RVO (5.48±11.10) as compared to central RVO (2.01±0.09). Moreover, the presence of cardiac disease, serum homocysteine, systemic inflammatory disease, hypercoagulation disease, smoking, oral contraceptive pills, and neoplasia were comparable between the Branch, Central, and Hemi RVOs. Alcoholism and smoking are both regarded as risk factors for the development of emboli that block the retinal arteries. In research by Hayreh and associates, a high frequency of RAO was seen in individuals who smoked. RAO has been linked to cardiac issues in the past. In our investigation, six (18.7%) patients had cardiac problems. Five (15.6%) of these individuals had mitral regurgitation, and three (9.4%) had mitral valve prolapse. These have been suggested as vascular occlusion etiological variables. The vascular occlusion occurs as a result of a calcific, platelet-rich, or fibrinous embolus. However, none of the individuals we treated for cardiac abnormalities had any obvious emboli. It has also been suggested that rheumatic heart disease (RHD) plays a role in the development of retinal vascular occlusions. Numerous ocular problems, including retinal vascular occlusion, are correlated with the use of hormone therapy and oral contraceptive pills (OCP). Studies by Brown et al. and Greven et al. demonstrate a higher number of female patients with RAO with a history of OCP use (11.1% and 19%, respectively) in comparison to our study (3.1%), as OCP use is more common in the Western community. The pathophysiology of vascular occlusions is also influenced by coagulation problems. In contrast to the Greven et al. study, which found 9% of patients to have coagulation problems, Brown and associates' study found 29.6% of patients to have coagulation disorders. RVO development is extremely closely related to systemic disorders such as HTN, HLD, and DM. [8] According to statistics from published studies, 48% of RVO is related to NTH, 20% to HLD, and 5% to DM [9].

According to Kolar et al. (2014),[25] people with HTN have a 36% higher risk of having CRVO. In addition, individuals with advanced HTN had a 92% elevated risk of CRVO. Participants without end-organ damage from DM did not have an elevated risk of developing CRVO (HR, 0.87; 95% CI, 0.73–1.04), but those who had end-organ damage from DM did. The risk of developing CRVO was increased by 53% (HR, 1.53; 95% CI, 1.28–1.84) in those participants. Patients with hypertension, diabetes mellitus, dyslipidaemia, a high body mass index, and smoking have all been proven to have an elevated risk of RVO. Other risk factors include drug use, neoplasia, and various types of vasculitis. Younger people can also develop the syndrome, but there is less of a correlation with systemic cardiovascular disease in these circumstances. Younger patients' exact aetiology is unclear, and some investigators have speculated that thrombophilia may play a larger role than previously thought. A meta-analysis of 21 studies on the relationship between RVO and systemic cardiovascular risk factors was carried out by O'Mahoney et al. [35] 63.6% of RVO patients had systemic hypertension, compared to 36.2% of controls for this condition. Cheung et al. [57] studied the prevalence of RVO and its relationship to inflammatory, hematologic, and cardiovascular risk factors.

In our study, the mean OD and OS intraocular pressure (IOP) were 16.08±7.55 and 16.15±4.83 in cases, and 14.46±3.29 and 14.99±7.24 in controls. The mean intraocular pressure (IOP) was not significantly different between groups. The mean OD and OS intraocular pressure (IOP) were 14.70±4.09 and 15.26±3.47 in Branch RVO, 17.13±9.51 and 16.74±5.71 in Central RVO, and 17.00±1.00 and 18.33±2.08 in Hemi RVO, respectively. The mean OD and OS intraocular pressure (IOP) were not significantly different between groups. According to Barnett et al. (2010), CRVO/HRVO had a cumulative incidence of 1.3%, which was more than four times higher than BRVO's incidence of 0.3%. This is in stark contrast to the Beaver Dam Eye Study's 5-year data, which showed the ratio to be 0.6% for BRVO and 0.2% for CRVO (HRVO was not identified separately). Similar to the Blue Mountains Eye Study, 1.2% BRVO and 0.4% CRVO were the incidence rates of BRVO over a 10-year period (including HRVO). The reversal of the ratio of BRVO to CRVO/HRVO in the OHTS versus previous population-based studies may be connected to the necessity for elevated IOP for inclusion in the OHTS, given the stronger association between elevated IOP and CRVO/HRVO documented in the literature.

The percentages of macular edema, macular edoema + hemorrhage, macular exudates +

macular edoema + exudates, macular exudates + macular edoema + exudates, macular haemorrhage, R.D., and no maculopathy in this study were 39.00%, 52.00%, 3.00%, 1.00%, 4.00%, 1.00%, 0.00%, The distribution of different maculopathies was significantly different between cases and controls. Moreover, the different maculopathies were not significantly different between the branch, central, and hemi RVOs. Strokes are a frequent risk factor for CRVO (51), and they are 45% more likely to occur in people with RVO. Furthermore, the risk of hemorrhagic stroke rose 30 days after the start of RVO. Chen and co. (2018) RVO patients are much more likely to experience hemorrhagic, ischemic, and stroke events. The probability of having an ischemic or hemorrhagic stroke was considerably higher in RVO patients than in non-RVO individuals. It makes more sense to assess ischemic stroke and hemorrhagic stroke separately since thrombosis in RVO may be more closely linked to the development of thrombosis or emboli in ischemic stroke. Hemorrhagic and ischemic strokes were separately assessed in only one prior study. In that study, RVO considerably raised the risk of ischemic stroke, according to Rim et al.'s analysis of the Korean National Health Research Database. The RVOs and their comparisons did not, however, show a statistically significant difference in hemorrhagic stroke. In most cases of central retinal vein occlusion (CRVO) and in 5–15% of eyes with branch retinal vein occlusion (BRVO), macular edoema is observed. According to Adelman et al. (2015), out of the 2,603 cases of macular edoema that were presented, 2,159 individuals from four different etiologies could be studied. 870 cases of diabetic macular edoema, 358 cases of CRVO, 380 cases of BRVO, and 551 cases of epiretinal membranes Following CRVO or BRVO, the obstruction in venous outflow increases intraluminal venous pressure and leads to the transudation of plasma and blood, resulting in edoema and haemorrhages across all or most of the retina for CRVO and across the drainage area for BRVO. Severe emphysema seems to increase interstitial pressure, impair arterial perfusion, and cause cotton wool patches and varying degrees of capillary blockage. RVO has also been connected to cigarette smoking. HTN, HLD, arteriosclerosis, and DM are risk factors for RVO, according to research from the Diabetes Control and Complications Study (DCCT) and Blue Mountains Study. Schmidt documented a number of systemic risk factors in a small sample of patients who had RVO and retinal artery occlusion (RAO). 11 out of 14 participants (mostly HTN 8x, HLD 3x, and chronic smoking 3x) had systemic risk factors.

V. CONCLUSION:

The present study was carried out to evaluate the various risk factors and clinical presentation in retinal vein occlusion patients visiting a tertiary care eye hospital in Uttar Pradesh. For this purpose, a case-control study was carried out that included a total of 200 individuals.

In this study, 100 patients (50%) had retinal vein occlusion (case group) and 100 patients (50%) were healthy (age-matched control group).

In the general adult population aged 40 and up, we found that 43% of patients had BRVO, 54% had CRVO, and 3% had hemi-RVO. The males were more frequently affected by RVO. Diabetes and hypertension were significantly more common in RVO patients. Our findings imply that dyslipidaemia plays a major role in the aetiology of disorders of the retinal vascular system. Disorders in lipoprotein metabolism, such as increased LDL-TGS and raised VLDL and LDL, result in the emergence of vascular compromise and subsequent occlusions. Hence, dyslipidaemia is an important modifiable etiological factor while treating patients with RVO. The following conclusions were drawn from the study:

This study enumerates the etiological factors contributing to visual loss in patients with RVO. A scientific approach is warranted to treat these factors to achieve better therapeutic results in patients with retinal vascular occlusion.

In our population, retinal vein occlusion is a common retinal vascular disorder in the elderly. The BRVO is more common than the CRVO. The main risk factors for RVO were increasing age, male gender, diabetes, and hypertension. Moreover, diabetes was also significantly more common in RVO patients as compared to controls. The lipid profile was also one of the significant risk factors for RVO. Regular eye examinations in the high-risk group coupled with timely detection and treatment of retinal vascular occlusions could help prevent blindness in this elderly population. While eyes with poor beginning acuity show a poor visual outcome, eyes with good initial vision have a better chance of sustaining exceptional vision. RVO can be prevented from recurring with early recognition and effective control of relationships. For the prevention and treatment of sequelae, patients with RVO require routine follow-up.

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