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Evaluation of Risk Factors in the Severity of Diabetic Retinopathy

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ABSTRACT:
INTRODUCTION: *Diabetes mellitus is one of the world's fastest-growing chronic diseases. According to WHO, it is estimated that 123.5 million are likely to have diabetes by the year 2040 in India (1). It is a heterogeneous group of metabolic diseases characterized by hyperglycemia due to insulin resistance or insulin secretion defects(2). Ophthalmic complications of diabetes include corneal abnormalities, pupillary abnormalities, iris neovascularization, glaucoma, cataracts, and retinopathy. Diabetic retinopathy, a vision-threatening disorder, remains the commonest complication(4). The prevalence of DR is expected to increase along with the increasing rate of diabetes.The risk factors for diabetic retinopathy are modifiable (blood glucose, blood pressure, serum lipids, obesity, anaemia, alcohol, and smoking), non-modifiable (duration, age, sex), and other independent factors like the type of Diabetes mellitus, family history of DR (5).The present aim of the study is to evaluate the multiple risk factors associated with the development and severity ofDiabetic retinopathy.*
AIM: *To evaluate the multiple risk factors associated with the development and severity ofDiabetic retinopathy*
STUDY DESIGN: *a hospital-based cross-sectional study.*
METHODS:*139 patients included in the study were subjected to a detailed ocular examination which included Detailed ocular and medical history, Best-corrected visual acuity, Anterior segment examination, Posterior segment evaluation using a direct ophthalmoscope and 90D lens and Fundus photography. Systemic investigations included Blood pressure,Fastingbloodsugar,postprandialbloodsugar,Hba1c, Hemoglobin, Calculation of BMI. The Results obtained were subjected to statistical analysis.*
RESULTS: *The results showed that the progression of diabetic retinopathy is dependent on various risk factors like duration of diabetes, glycemic control, hypertension were having significant associations with diabetic retinopathy.*
CONCLUSION: *The present study showed that the progression of diabetic retinopathy is dependent on various risk factors like duration of diabetes , glycemic control, hypertension.*
KEYWORDS: *Diabetic retinopathy, Duration of Diabetes, HbA1C, Blood pressure.*

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I. INTRODUCTION

Diabetes mellitus is one of the world's fastest-growing chronic diseases. According to WHO, it is estimated that 123.5 million are likely to have diabetes by the year 2040 in India(1). It is a heterogeneous group of metabolic diseases characterized by hyperglycemia due to insulin resistance or insulin secretion defects(2). Ophthalmic complications of diabetes include corneal abnormalities, pupillary abnormalities, iris neovascularization, glaucoma, cataracts, and retinopathy. Diabetic retinopathy, a vision-threatening disorder, remains the commonest complication(3). The risk factors for diabetic retinopathy are modifiable (blood glucose, blood pressure, serum lipids, obesity, anaemia, alcohol, and smoking), non-modifiable (duration, age, sex), and other independent factors like the type of Diabetes mellitus, family history of DR (4). Duration of Diabetes is one of the most important determining factors for the occurrence and progression of diabetic retinopathy (5). Hyperglycaemia is considered to play an important role in the pathogenesis of retinal microvascular damage. Retinal ischemia caused by diabetic retinopathy is aggravated by hypertension. Clinical evaluation of these determinants helps in awareness of what variables are significant to be controlled to prevent DR and its progression to blindness. Identifying risk factors and their control is as important as timely detection of diabetic retinopathy. This article evaluates the role of major risk factors in Diabetic retinopathy.

II. MATERIAL AND METHODS

STUDYDESIGN:ahospital-basedcross-sectionalstudy.

STUDYDURATION:

Oneyearfromthedateofinstitutionalscientificandethicscommitteeapproval(Dec2019toNov2020)

STUDYSOURCE: TheoutpatientdepartmentofOphthalmology,SriVenkateshwaraMedicalCollegeandSVRR GovernmentGeneral Hospital,Tirupati.

SAMPLESIZE:

139patientsfulfillingtheinclusionandexclusioncriteriaattendingtheoutpatientdepartmentofophthalmology,SVRRGGH,TirupatI.

INCLUSION CRITERIA: Allpatientsofdiabeticretinopathywhohavegivenwrittenandinformed consent

EXCLUSION CRITERIA:

1) Patientswithhazymediawhichcaninterferewithadetailedexaminationofthe fundus.
2) Type 1 Diabetes Mellitus
3) Gestational Diabetes Mellitus

METHODS: Ethical and scientific committee approval was obtained for conducting the study. Total 139 patients were included in this study as per the inclusion criteria. An informed, written consent was taken from all the
patients.

Allthesubjectsunderwentacompleteophthalmicevaluationwhichincluded Detailedocularandmedicalhistory, Best-correctedvisualacuity, Anterior segment examination using slit-lamp biomicroscopy (CARL ZEISSMEDITECHAG 07740Jena,Germany), Posterior segment evaluation using a direct ophthalmoscope and 90D lens.(Diabeticretinopathywasgraded asperETDRSclassification)&Fundusphotography.
SystemicinvestigationsincludedBloodpressure, Fastingbloodsugar,Postprandialbloodsugar&Hba1c.

- The blood pressure of each subject was measured in the right arm, supineposition. Two readings were taken half an hour apart, and the average of twowas taken as a final reading. In our study, the patients were consideredhypertensiveasperJNCVIIcriteria;patientswereconsideredashypertensive if the systolic BP was ≥140mmHg or diastolic BP was ≥90mmHgorif thepatient wason anti-hypertensivetreatment.
- Glycaemic controlwas graded according to HbA1c levels. Values less than7%wereconsidered asgood controlofdiabetes.Levelsbetween7.1 to8.5 % - fair controlandlevelsbeyond8.5%wereconsideredpoor control.

STASTICAL ANALYSIS:

Results and data were analyzed using SPSS 22 Version, and statistical significance was expressed by p-value.

III. RESULTS

Atotalof139subjectswithdiabeticretinopathywereincludedinthepresent.

TABLE: 1 Age Distribution

Agegroup(inyears)	Frequency	Percentage
31-40	7	5.0
41-50	38	27.3
51-60	48	34.6
61-70	39	28.1
≥71	7	5.0
Total	139	100.0

Most ofthesubjectswereintheagegroupof51-60years(34.5%),followedby61-70(28.1%)yearsand41-50(27.3%)years.Themeanageofsubjectswas 55.3±year

TABLE: 2Gender Distribution

Gender	Frequency	Percentage
Male	76	54.7
Female	63	45.3
Total	139	100.0

Amongthe139subjects,maleswere76(54.7%),andtherestwerefemales(45.3%)andMale: Female ratiowas 1.2:1

TABLE: 3Severityof diabeticretinopathy

Diagnosis	Frequency	Percentage
Mild NPDR	28	20.1
ModerateNPDR	28	20.1
SevereNPDR	33	23.8
VerysevereNPDR	37	26.6
PDR	13	9.4
Total	139	100.0

Outof139subjects,28(20.1%)hadMildNPDR,28(20.1%)hadmoderateNPDR,33(23.8%) hadsevereNPDR,37(26.6%)hadverySevereNPDR,and13(9.4%)subject.

TABLE: 4Duration of diabetes mellitus

DurationofDM(inyears)	Frequency	Percentage
0-5	40	28.8
6-10	47	33.8
11-15	26	18.7
16-20	22	15.8
>21	4	2.9
Total	139	100.0

Out of 139 subjects, 47(33.8%) had a duration of diabetes for 6-10 years,followedby0-5yearsin40(28.8%)subjects,11-15yearsin26(18.7%)subjects,16-20 years in 22(15.8%) subjects. Four subjects (2.9%) had a duration of DM ≥ 21years.

TABLE: 5 HbA1C levels

HbA1cLevels	Frequency	Percentage
<7%(Goodcontrol)	53	38.1
7.1-8.5%(Faircontrol)	53	38.1
>8.5%(Poorcontrol)	33	23.8
Total	139	100.0

Outof139subjects,53(38.1%)hadHba1clevelslessthan7%,53(38.1%)hadHba1clevelsintherangeof7.1-8.5%and33(23.8%)hadHba1cgreaterthan8.5%.

TABLE: 6Frequency of Hypertension

Hypertension	Frequency	Percentage
Present	81	58.3
Absent	58	41.7
Total	139	100.0

Outof139subjects,81(58.3%)hadhypertension.

TABLE: 7Diabetic retinopathy vs duration of diabetes (in years)

The severity ofretinopathy vsDuration of DM(inyears)	0-5 N(%)	6-10 N(%)	11-15 N(%)	16-20 N(%)	≥21 N(%)	TotalN(%)	p-value*
Mild NPDR	23 (82.1)	4(14.3)	1(3.6)	0(0.0)	0(0.0)	28(100.0)	<0.001
Moderate NPDR	10 (35.7)	17(60.7)	1(3.6)	0(0.0)	0(0.0)	28(100.0)	
SevereNPDR	7 (21.2)	5(15.2)	15(45.5)	6(18.2)	0(0.0)	33(100.0)	
Very severeNPDR	0(0.0)	21(56.8)	7(18.9)	9(24.3)	0(0.0)	37(100.0)	
PDR	0(0.0)	0(0.0)	2(15.4)	7(53.8)	4(30.8)	13(100.0)	
Total	40 (28.8)	47(33.8)	26(18.7)	22(15.8)	4(2.9)	139(100.0)	

chi-squarevalue=146.79;df=16.;Significant*

In the present study, the majority 23(82.1%) of subjects with Mild NPDR had aduration of diabetes for less than five years.

The most common duration of diabetesinModerateNPDRwas6-10year (60.7%),SevereNPDR was11-15years(45.5%), and in Very Severe NPDR was 6-10 years (56.8%). 30.8% of patients withPDR had a duration of greater than 21 years. As the severity of diabetic retinopathyincreased, the duration of diabetes increased, and the difference in proportion wasfound tobestatisticallysignificant**.**

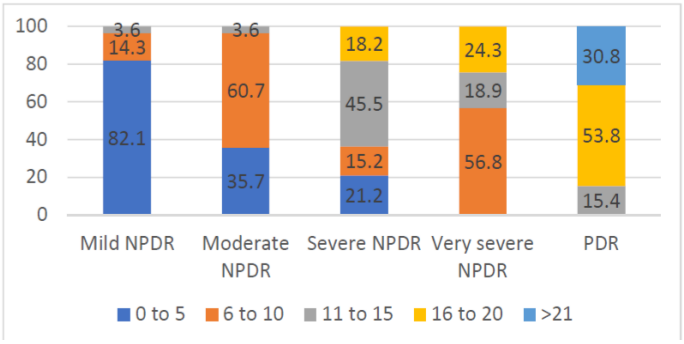

Chart1:DiabeticretinopathyvsdurationofDiabetes

TABLE: 8Diabetic retinopathy vs HbA1c levels

Diagnosis vs HbA1clevels	**<7%N(%)**	**7.1%-8.5%N(%)**	**>8.5%N(%)**	**TotalN(%)**	**p-value***
Mild NPDR	24(85.7)	4(14.3)	0(0.0)	28(100.0)	<0.001
ModerateNPDR	17(60.7)	8(28.6)	3(10.7)	28(100.0)	
SevereNPDR	4(12.1)	20(60.6)	9(27.3)	33(100.0)	
VerysevereNPDR	7(18.9)	19(51.4)	11(29.7)	37(100.0)	
PDR	1(7.7)	2(15.4)	10(76.9)	13(100.0)	
Total	53(38.1)	53(38.1)	33(23.8)	139(100.0)	

chi-squarevalue=70.514;df=8;Significant*

AmongmildNPDRcases,24(85.7%)hadgoodGlycemiccontroland4(14.3%) had fair control. In patients with moderate NPDR,17(60.7%) had goodGlycemiccontrol,8(28.6%)hadfaircontroland3(10.7%)hadpoorcontrolofglycemia. 4(12.1%) subjects in severe NPDR had good glycemic control,20(60.6%)had faircontrol and remaining 9(27.3%)had poorcontrol.InverysevereNPDRpatients,majority(51.4%)hadfaircontrolofglycaemia.ThemajorityofsubjectswithPDR10(76.9%)hadpoorglycemiccontrol.

As the severity of diabetic retinopathy increased, the proportion of patients with poorglycemiccontrolincreasedandthedifferenceinproportionwasfoundtobestatisticallysignificant.

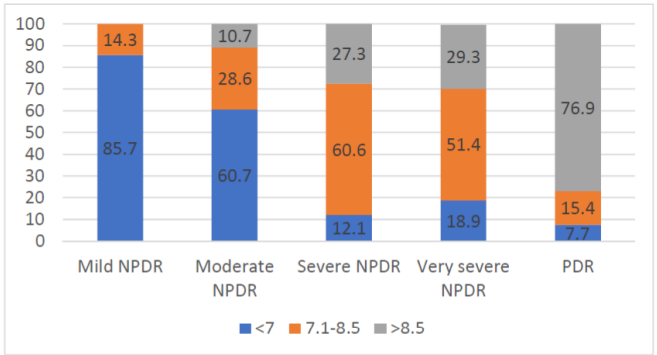

Chart2DiabeticretinopathyvsHbA1clevels

TABLE: 8 Diabetic retinopathy vs hypertension.

Severity of retinopathyvshypertension	**Present N(%)**	**Absent N(%)**	**Total N(%)**	**p-value***
Mild NPDR	12(42.9)	16(57.1)	28(100.0)	0.009
ModerateNPDR	15(53.6)	13(46.4)	28(100.0)	
SevereNPDR	15(45.5)	18(54.5)	33(100.0)	
VerysevereNPDR	28(75.7)	9(24.3)	37(100.0)	
PDR	11(84.6)	2(15.4)	13(100.0)	
Total	81(58.3)	58(41.7)	139(100.0)	

Chi-squarevalue=13.539;df=4;Significant*

Among the 139 subjects,81(58.3%) was found to have hypertension. Out of the mild NPDRcases,42.9% had hypertension.53.6% of moderate NPDR,45.5% of severe NPDR,75.5% ofverysevereNPDRand84.6% ofsubjectswithPDRhadhypertension.
Astheseverityofretinopathyincreased,theproportionofcaseswithhypertensionincreased, andthedifferenceinproportionwasstatistically significant

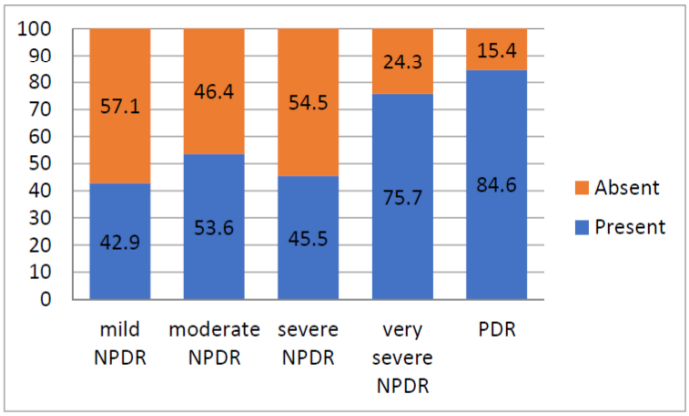

Chart3: Diabetic retinopathyvshypertension

IV. DISCUSSION

Diabetes mellitus (DM)is a globalepidemic. The ninth edition of diabetesAtlasbytheInternationalDiabetesFederationreleasedin2019estimatesthediabetic population will reach up to 700 million by the year 2045, the increase beingdisproportionately more in developing countries. This will result in a heavy burden onthe healthcare systembecause of severalDM-related complications.StudiesfromSouthernIndiareported the range of prevalence from 12.2% to 18.03% in the population with knownDM.TheprevalenceofDRamongpersonswithdiabetesrangedfrom10%to30.4%.Diabetic retinopathy is one of the potentially blinding conditions in middle ageand elderly patients. Among the various factors that can influence the progression ofdiabetic retinopathy, the impact of duration of diabetes Mellitus, glycemic control,blood pressure were discussedinthis study.

AGE DISTRIBUTION:

In the present study, the most common age group in the patients withdiabetic retinopathy was 50-60 years (34.5%). The least common age group amongthesubjectswas31to40years(5%)and>71years(5%).Themeanagegroupwas55.3yearswhichwassimilartoothe rstudiesintable 9.

TABLE: 9Mean age group of the study population

STUDY	MEANAGEGROUP
Presentstudy	55.3±
AnjaliP.Shroteet.al(6)	56.4±11.2years
AnulekhaMaryJohnet.al(7)	59.9±12.18years.
BalasubramanianNadarajanet.al(8)	56.69years

PraveenaKKet.al(9)	56.7±11.2years

IntheAravindComprehensiveEyeStudy(ACES)conductedinaruralpopulation in three districts of Tamil Nadu, the most common age group in patientswith diabetic retinopathy was in the range of 60-69 years(10).The Singapore IndiaEye Study (SINDI), which was conducted on 2200 subjects ethnic Indians living inSingapore, also reported a mean age of 57.8 years(11).The Andhra Pradesh EyeDisease Study, which was carried out in 21 districts of India, reported a mean rangeof the urban residents as 46.7 ± 12.9 years; and for rural residents was 30 to 95years47.8±12.9years(12).

GENDER DISTRIBUTION:

Outof139patientswhoparticipatedinthestudy,63werefemales(45.3%),and76weremales(54.7%).

TABLE: 10Gender distribution among the study population.

STUDY	MALES	FEMALES
Presentstudy	54.7%	45.3%
AnjaliPShorteetal.(6)	68%	32%
AbhishekPadhaetal.(13)	74.5%	25.5%
AnulekhaMaryJohnetal(7)	62%	38%
Balasubramanian Nadarajanet.al.(8)	43.8%	56.2%

There was male preponderance in the present study which was similar to astudy done by Anjali P Shorteet al.(6) and Abhishek Padha et al.(13) also foundsimilar results of a higher rate of diabetic retinopathy among the males. The studywas done by AnulekhaMary John et al.(7)also found more prevalence of diabeticretinopathyamongmales.Femalepreponderancewasobservedinthestudyconductedby Balasubramanian Nadarajanet.al.(8)

The Chennai Urban Rural Epidemiology Study in India and a hospital-basedstudy inOmanfoundthatDR wassignificantly higherinmalesthaninfemalepatients(14).

In contrary, a study which was conducted by MK Shrestha et al.(15) in Nepalshoweda slightlyhigherprevalenceinfemales(46.3%)thanin males(42.6%).

INCIDENCE OF VARIOUS STAGES OF DIABETIC RETINOPATHY:

Inthepresentstudy,28subjects(20.1%)presentedwithMildNPDR,28subjects (20.1%) with moderate NPDR,70 subjects (23.7%) with severe NPDR,37subjects(26.6%)withverysevereNPDRand13subjects(9.4%)presentedwithPDR.

TABLE: 11Incidence of various stages of diabetic retinopathy

STUDY	MildNPDR	ModerateNPDR	Severe to VerySevereNPDR	PDR
Presentstudy	20.1%	20.1%	50.3%	9.4%
Rishi Mehta(16)	51.31%	22.36%	17.1%	9.2%
Karma LodayBhutiaetal.(17)	51.7%	35.6%	4.6%	8%
BalasubramanianNadarajanet.al.(8)	44.4%	51.9%	3.7%	-

The present study had a more incidence of severe and very severe NPDRchanges among the subjects. The studies conducted by Rishi Mehta et al., KarmaLodayetal.,(18)andBalasubramanianNadarajanetal.(19) hadmoreincidenceofmildandmoderateNPDRchangesamongpatients.

DURATION OF DIABETICS:

Thedurationofdiabetesisoneofthestrongestpredictorsforthedevelopmentandprogressionofretinopathy.Inthepresent study,40subjects(28.8%)haddiabetesforaperiodof0-5years,47subjects(33.8%)in6–10-year duration,26 subjects (18.7%) in 11-15 years duration and 22 subjects (15.8%) in 16-20yearsduration.Onlyfour subjects(2.9%) hadadurationofmorethan21years.

About 80%of the patients with mild NPDR had diabetes for a period of lessthan five years. The most common duration of diabetes in patients with moderateNPDR (60.7%) was 6-10 years, and in severe NPDR was 11-15 years. Patients withvery severe NPDR had diabetes for 6-10 years, followed by 16-20 years. 53.8% ofpatients in PDR had diabetes for 16-20 years, and 30.8% had diabetes for more than21 years. As the severity of diabetic

retinopathy increased, the duration of diabetesincreased,andthedifferenceinproportionwasfoundtobestatisticallysignificant.(p<0.001)

TABLE: 12 Mean duration of diabetes(in years) with the severity of diabetic retinopathy.

STUDY	MILDNPDR	MODERATENPDR	SEVERE-VERYSEVERENPDR	PDR
PRESENTSTUDY	4.00±2.47	6.89±2.28	11.42±4.58	19.2±4.00
Abhishek Padhaetal. (10)	14.95±4.29	17.76±3.89	18.66±3.69	24.53±5.92
KaurPet.al(20)	11.62±4.41	14.50±7.17	14.76±6.45	23.45±10.13
ShanthaSruthi.(21)Met.al	2.9±1	6.5±1.8	8.5±3.3	15.8±1.4

The results of the present study were comparable with Shantha Sruthi. Met.al.(21) study where the severity of diabetic retinopathy was significantly associatedwithdurationofdiabetes.AbhishekPadhaetal.(68)withp<0.00001andKaurPet al.(20) with p<0.001 reported a similar significant association of severity of diabeticretinopathywiththeduration ofdiabetesmellitus.
TheWisconsinEpidemiologicStudyofDiabeticRetinopathy(WESDR)reported a higher prevalence of DR associated with a longer duration of diabetes(22).Inpersonswithtype1diabeteswithlessthan5yearsofduration,theprevalence of retinopathy was about 10%, whereas it ranged from 25 to 40% inindividuals with type 2 diabetes. In the CURES Eye study, 41.8 % had DR after 15yearsofdiabetes,andtheseverityofDRproportionallyincreasedwiththedurationof diabetes. The study also demonstrated that for every five-year increase in thedurationof diabetes,theriskforDRincreasedby1.89times.(23)
Indian studies have shown an increased prevalence of DR as the duration ofdiabetesincreased(14,22,23)
In a study conducted by Dandona et al. (24) in type 2 diabetes, 87.5% ofpatients with >15 years duration of diabetes had DR and only 18.9%showed DRchangeswith<15yearsdurationofdiabetes.

GLYCAEMIC CONTROL:
There is strong evidence to suggest that the development and progression ofDRisinfluencedbythelevel of hyper glycaemia.

TABLE: 12GLYCAEMICCONTROL

STUDY	Glycaemiccontrol(Hba1c%)	MildNPDR	ModerateNPDR	SevereNPDR	VerysevereNPDR	PDR
Presentstudy	<7	85.7%	60.7%	12.1%	18.9%	7.7%
	7.1-8.5	14.3%	28.6%	60.6%	51.4%	15.4%
	>8.5	0%	10.7%	27.3%	29.7%	76.9%
Dr SrinivasPhaniNakkellaet.al(25)	6.5-8.5	93%	55%	13%	-	15%
	8.6-10.5	7%	32%	55%	-	54%
	10.6-12.5	0%	9%	27%	-	31%
	12.6-14.5	0%	4%	5%	-	0%

In the present study, as the severity of diabetic retinopathy increased, theproportion of patients with poor glycaemic control increased and the difference inproportion was found to be statistically significant. (p<0.001). This was similar to thestudy done by Dr Srinivas PhaniNakkellaet al.,(25) which showed that the Hba1clevels increased with the severity of diabetic retinopathy. Poor glycaemic control ledto theworseningof retinopathy.

Similar results were found in a study done by **Pragati Garg et al.** (26), inwhich the majority of patients with mild and moderate NPDR (34%) showed fairglycemic control, whereas the majority of patients (28%) with severe and verysevere NPDR had poor glycemic control. PDR was found in a higher proportion ofpatients with poor control (36%) as compared to fair control (3.4%) and good control(0.4%)ofHba1cvalues.Asignificantassociationbetweenseverityofretinopathyand Hba1c values wasfound(p<0.001)
Kahlon,Pathak,2011(27)StudyshowedintensiveglycemiccontrolwithHbA1Cvalue<6.5%hassignificantly(p<0.003)reducedtheprogressionofretinopathy.
In a meta-analysis study, intensive glycemic control reduced the risks ofretinalphotocoagulationorvitrectomy,macularoedemaandprogressionofretinopathy (Zhang G *et al.*, 2015)(28).

Thus, good glycemic control has proven toretardtheprogressionofdiabeticretinopathyin DMpatients.
In the CURES Eye Study (16), a linear trend in the prevalence of retinopathywith an increase in HbA1c levels was observed. For every 2 per cent elevation ofHbA1c,therisk forDRincreasedbya factorof 1.710.
In the UKPDS(29), the risk reduction in eye complications for every 1 per centdecrease in HbA1c was 19 per cent. Thus, it was observed that long term glycemiccontrolplaysanimportantroleindelayingtheonsetandslowingdowntheprogression of DR.

HYPERTENSION:
Ithasbeenhypothesizedthatincreasedbloodpressurecausesdamagetotheretinalcapillary endothelialcellsthroughtheeffectsofincreased bloodflow.
In this study, hypertension was the most common systemic comorbidity foundin 58.3% of the patients. The prevalence of hypertension in Diabetic retinopathycompared withotherstudiesis giveninthe table.

TABLE: 13Prevalence of hypertension in patients with diabetic retinopathy

STUDY	Percentageofpatientswithhypertension
Presentstudy	58.3%
P.Kauretal.(25)	46.5%
Kamranet.al(30)	43%
AshokKumar etal.(31)	72%
AbhishekPadha(20)	68.54%
Anjali Pshorteet.al(10)	50%

ThepresentstudywascomparablewithP.Kauretal.(25)andAnjaliPshorteet.al.(10)

TABLE: 14Severity of diabetic retinopathy with hypertension

	Presentstudy	Rizkiet.al(82)
Mild	42.9%	0%
Moderate	53.6%	22.2%
Severe	45.5%	48.1%
Verysevere	75.7%	-
PDR	84.6%	67.7%

As the severity of DR increased, the proportion of cases with hypertensionalsoincreased,andthedifferenceinproportionwasfoundtobestatisticallysignificant(p=0.009). This was comparable with the study conducted by Rizkietal.,(27)
A study by MK Shrestha et al. (15) showed that hypertension and DR had astrong association (p=0.00). The development of diabetic retinopathy was twice morelikelyinhypertensive thannon-hypertensivecases.
The UKPDS(29) showed that the incidence of retinopathy was associated withsystolic blood pressure. In 1919 patients with type 2 diabetes retinal photographstaken at diagnosis and six years later showed a significant association of systolichypertensionwith retinopathy incidence. Thosewithsystolic blood pressure≥140mm Hgwere 2.8 times (95% confidence interval) as likely to develop retinopathythan peoplewith systolic blood pressure<125 mmHg.
Inthe WisconsinEpidemiologicStudyofDiabeticRetinopathy(WESDR),diastolicbloodpressurewasasignificantpredictor ofprogressionofdiabeticretinopathytoproliferativediabeticretinopathyover14yearsoffollowupinpatients withyounger-onset(type1)diabetesmellitus,independentofglycosylatedhemoglobin andthe presenceofgross proteinuria.(22)
TheAppropriateBloodPressureControlinDiabetes(ABCD)Trial(28)compared the effects of intensive (diastolic blood pressure goal of 75 mm Hg) andmoderate (diastolic blood pressure of 80–89 mm Hg) blood pressure control in 470hypertensive subjects (baseline diastolic blood pressure of ≥90 mm Hg) with type 2diabetes mellitus. Over a 5 year follow up period, intensive and moderate groups didnotshowanydifferenceregardingtheprogressionofdiabeticretinopathy.Thelackof efficacy of the trialcompared to the UKPDSmight be due to the shorter timeperiod of the ABCD trial (5 years versus 9 years on average for

the UKPDS), loweraverage blood pressure control in the ABCD trial (144/82 mm Hg versus 154/87 mmHgintheUKPDS),andpoorerglycemiccontrolintheABCDtrialthantheUKPDS.
In the Indian context, hypertension was not a significant confounding factor intheCURESEyestudy,however,uncontrolledhypertensiondidinfluencetheprogression of DR.(14)

V. CONCLUSION

The progression of diabetic retinopathy is dependent on variousrisk factors, and this study showed that duration of diabetes, glycemic control,hypertension werehaving significantassociationswithdiabeticretinopathy.

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