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Original Research Article

RELATION BETWEEN HYPERTENSION AND DIABETIC RETINOPATHY IN TYPE 2 DIABETES MELLITUS

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Abstract:

Background : Diabetes mellitus and Hypertension these two non-communicable diseases are very common among the population improved understanding of the role of hypertension and diabetic retinopathy both are challenge and opportunity for ophthalmologist and other diabetic healthcare in order to give best patients care.

Aim and objective : To know the relation between hypertension and diabetic retinopathy among type 2 diabetes patients.

Materials and Method : This observational prospective study was conducted in Department of Ophthalmology, Dr. Patnam Mahender Reddy Institute of Medical Sciences, Chevella, Hyderabad, for the period of one year. We have included 75 patients in the study after getting informed consent. Arterial HTN with BP of >140/90 on two consecutive clinic visits and fasting blood sugar concentration levels ≥ 126 mg/dL (7.0 mmol/L) or random blood sugar concentration levels ≥ 200 mg/dL (11.1 mmol/L) on two consecutive visits. Demographic information and clinical history were obtained by questionnaire. Data were collected on BP, BMI, blood sugar and Visual Analysis.

Results : A total of 75 people had their fundus images graded for hypertensive and diabetic retinopathy. The distribution of outpatient clinics varied, with 36 (48%) participants Hypertension, 10 (13%) had DM and 29 (39%) had both DM and HTN. Bivariate analysis was observed that systolic blood pressure was associated with Diabetic retinopathy(DR) (P-value<0.01), also duration of DM was impacted on severity of DR.

Conclusion : Study can conclude that the increase in the hypertension will increase the diabetic retinopathy, patients with diabetic retinopathy were maximum because some of them were hypertensive and patients with early treatment on hypertension can reduces the diabetic retinopathy.

Keywords: Diabetic Mellitus, Hypertension, Diabetic Retinopathy, Fasting Blood Sugar.

ISSN: 0975-3583, 0976-2833 VOL 13, ISSUE 05, 2022

Introduction:

Diabetes mellitus refers to a group of diseases that affect how your body uses blood sugar. Blood Sugar (Glucose) is vital to health because it's an important source of energy for the cells that make up muscles and tissues. It's also brain's main source of fuel. The underlying cause of diabetes varies by type. But, no matter what type of diabetes you have, it can lead to excess sugar in your blood. Too much sugar in your blood can lead to serious health problems.

It has many subclassifications, including type 1, type 2, maturity-onset diabetes of the young (MODY), gestational diabetes, neonatal diabetes, and steroid-induced diabetes. Type 1 and 2 DM are the main subtypes, each with different pathophysiology, presentation, and management, but both have a potential for hyperglycaemia. This activity outlines the pathophysiology, evaluation, and management of DM and highlights the role of the interprofessional team in managing patients with this condition.

T2DM involves a more insidious onset where an imbalance between insulin levels and insulin sensitivity causes a functional deficit of insulin. Insulin resistance is multifactorial but commonly develops from obesity and aging. It involves a more complex interplay between genetics and lifestyle. There is clear evidence suggesting that T2DM is has a stronger hereditary profile as compared to T1DM. The majority of patients with the disease have at least one parent with T2DM.[1] The onset of T2DM is usually later in life, though obesity in adolescents has led to an increase in T2DM in younger populations.

Non-communicable diseases, including HTN and DM, are emerging as leading causes of death and disability, It is predicted that the number of cases of T2D will rise from 415 million to 642 million by 2040.[2] Hypertension is even more common, rising in prevalence in the same countries, with a recent worldwide estimate of 1.39 billion cases.[3]

Hypertension is more common in type 2 diabetes, and in the UKPDS 38% of newly diagnosed patients with type 2 diabetes had hypertension defined as repeated blood pressure >160/90 (or >150/85 in those on antihypertensive medication).[4] In the years after diagnosis of type 2 diabetes the incidence of hypertension is higher than in the age matched general population. Diabetic retinopathy does not occur in the absence of diabetes, and glucose toxicity is the key initial trigger for diabetic retinopathy. Diabetic retinopathy is a microvascular disorder in which the endothelial cells malfunction owing to chronic exposure to high levels of glucose and other factors. The resulting lesions include thickened capillary basement membrane, defects in the blood-retinal barrier, and pericyte loss. The metabolic and haemodynamic factors tend to interact in the evolution of diabetic retinopathy. It is now established that hypertension is a risk factor both for the development of retinopathy and also for the progression of retinopathy.[5-7] If blood pressure is important in the aetiology of diabetic retinopathy levels below the hypertensive range must be considered. According the

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many studies conducted it was observed that, in type 1 diabetes, that retinopathy was more likely to progress in subjects whose blood pressure was higher but still within the normal range than in subjects with lower blood pressure.[8]

The epidemiological association between hypertension and retinopathy has been demonstrated, but studies were needed to show that hypertension is not just a risk marker for retinopathy and that treatment of hypertension is beneficial. The results of controlled prospective studies using antihypertensive agents to prevent the development of diabetic retinopathy have been awaited with interest. There are very few studies which showed that in type 2 DM tight blood pressure control reduces the risk of clinical complications from diabetic eye disease, Thus we have undertaken this study to support previous study and to know the relationship between hypertension and diabetes retinopathy among type 2 diabetic mellitus patients.

Material and Methods:

This observational prospective study was conducted in Department of Ophthalmology, Dr. Patnam Mahender Reddy Institute of Medical Sciences, Chevella, Hyderabad, for the period of one year. We have included 75 patients in the study after getting informed consent and institutional ethical approval from committee and after following conditions. Arterial HTN was defined as a BP of >140/90 on two consecutive clinic visits. DM was defined as fasting blood sugar concentration levels ≥ 126 mg/dL (7.0 mmol/L) or random blood sugar concentration levels ≥ 200 mg/dL (11.1 mmol/L) on two consecutive visits.

Demographic information and clinical history were obtained by questionnaire. Data were collected on BP, BMI, blood sugar and VA. Distance VA was measured with a multi-letter Snellen eye chart with subjects positioned 6 metres from the chart. Corrected VA was measured in each eye. For the purpose of analysis, the VA of the best eye was used. Visual impairment was defined as VA less than 6/18 in the better eye.

We have diagnosed the diabetic and hypertensive retinopathy on the basis of grading of retina photographs.

Collected data were entered in the Microsoft excel 2016 data sheet for further statistical analysis. Qualitative data were presented by frequency and percentages and quantitative data were expressed in mean and standard deviation. The eye having the more advanced diabetic or hypertensive retinopathy was used for the analysis. T-test, chi-squared test (with Yates correction), Fisher's exact test were used to investigate the relationship between retinopathy outcome and clinical data, demographic factors. A P value of 0.05 was considered statistically significant.

Results and Observation:

A total of 75 people had their fundus images graded for hypertensive and diabetic retinopathy. The distribution of outpatient clinics varied, with 36 (48%) participants

ISSN: 0975-3583, 0976-2833 VOL 13, ISSUE 05, 2022

Hypertension, 10 (13%) had DM and 29 (39%) had both DM and HTN. Participants were most frequently employed as farmers, and the highest educational level obtained among most participants was primary school (Table 1).

Table 1: Demographic distribution of study population

Parameters	Hypertension (n = 36)	Diabetes(n=10)	Both(n=29)
Age	53.24±9.87	61.23±10.55	58.26±8.48
Gender			
Female	16(44.6%)	4(40%)	22(75.9%)
Male	20(55.4%)	6(60%)	7(24.1%)
Education			
None	4(12.3%)	1(10%)	6(20.7%)
Primary	15(41.5%)	2(20%)	10(34.5%)
Intermediate	8(21.5%)	3(30.0%)	8(27.6%)
Graduate	5(13.9%)	3(30%)	2(6.9%)
Higher	4(10.8%)	1(10%)	2(6.9%)
Occupation			
Farmer	12(33.8%)	4(40%)	8(27.6%)
Private	6(16.9%)	1(10%)	4(13.8%)
Government	7(20.0%)	1(10%)	3(10.3%)
Labour	5(13.8%)	2(20.0%)	7(24.1%)
Student, others	6(15.4%)	2(20%)	7(24.1%)
Body Mass Index	28.12±10.2	27.85±9.7	26.30±8.9

Table 2 : Distribution of Visual Impairment and duration of disease among the cases.

Parameters	Hypertensive (n=65)	Diabetic (n=39)	Total (n=75)
Vision			
No Visual Impairment	42(64.6%)	27(68.1%)	50(67%)
Visual Impairment	23(35.4%)	12(31.9%)	25(33%)
Duration of Disease(Years)	7.83 ±3.69	8.57 ± 4.66	8.17 ± 4.21

Table 3 : Distribution of Hypertensive Retinopathy and factors associated with it among study population

Parameters	HTN Retinopathy (n =23)	No HTN Retinopathy (n =42)	P-overall*
Age	57.4 ±6.22	57.63 ± 5.10	0.87
Gender			
Female	13	25	0.81
Male	10	17	
Education			

ISSN: 0975-3583, 0976-2833 VOL 13, ISSUE 05, 2022

None	3	7	0.927
Primary	6	9	
Intermediate	8	18	
Graduate	4	5	
Higher	2	3	
Occupation			
Farmer	8	18	0.658
Private	3	5	
Government	2	6	
Labour	6	5	
Student, others	4	8	
Body Mass Index	26.3 ± 4.1	27.6 ± 5.3	0.311
Duration of Disease(Years)	9.4 ±6.24	8.89 ± 6.52	0.76
Systolic Blood Pressure	168 ±19.24	151 ± 22.12	<0.001**
Diastolic Blood Pressure	93.45 ±15.24	85.4 ± 13.64	<0.001**

In our study we have observed that among the hypertensive 23(35.4%) of the patients had visual impairment while among diabetic patients 12(31.9%) of the patients had visual impairment showed in Table no. 2.

Table 4 : Distribution of Diabetic Retinopathy and factors associated with it among study population.

Parameters	DM Retinopathy (n =12)	No DM Retinopathy (n =27)	P-overall*
Age	61.1 ±7.21	60.12 ± 6.54	0.67
Gender			
Female	7	20	0.325
Male	5	7	
Education			
None	6	10	0.82
Primary	3	7	
Intermediate	1	5	
Graduate	2	2	
Higher	0	3	
Occupation			
Farmer	5	11	0.98
Private	2	4	

ISSN: 0975-3583, 0976-2833 VOL 13, ISSUE 05, 2022

Government	1	2	
Labour	2	5	
Student, others	2	5	
Body Mass Index	27.42 ±5.6	27.91 ± 6.1	0.81
Duration of Disease(Years)	10.75 ±5.23	7.23 ± 4.12	0.02*
Blood Pressure			
Systolic Blood Pressure	152.3 ±21.42	145.69 ± 23.2	0.4
Diastolic Blood Pressure	84.29 ±9.44	81.23± 11.48	0.98

Discussion:

Present study we have conducted in Department of ophthalmology, Dr. Patnam Mahender Reddy Institute of Medical Sciences, Chevella, Hyderabad in which we have included 75 patients, of them 36 were hypertensive, 10 found with diabetes and 29 were with both diabetic and hypertensive. There are very few studies are there which showed the relation between the diabetic and hypertensive retinopathy among type 2 diabetes mellitus. In our study we observed that among all 25(33%) patients had visual impairment. Our study observed that there was female dominance compared to the male. Study observed prevalence of diabetic retinopathy was 30.76% . this prevalence of diabetic retinopathy was higher than other studies conducted by Malaysian study in Selangor (9.0%) [9] The higher prevalence reported in our study could be due to the difference in the selection of study sample. In the Selangor study, only patients aged 40 years old and above were included. On the other hand, we included patients below 40 years old as well. In other words, a bigger sample size would have captured a higher population of diabetic patients who have undergone DR screened, thus increasing the prevalence of DR. In our study we have not observed any age difference between having DR and those do not having DR, but mean age of the study population was in the age group of 50-60 years of age. Thus we can say that old age was one of the risk factor to observed diabetic retinopathy among the study population.

Apart from that, our study also showed that the duration of T2DM diagnosis was significantly associated with DR. An increase in the duration of T2DM diagnosis would also increase the probability of getting DR. This was consistent with similar published research but a higher OR was observed in the other studies [10-12].

Our results demonstrate a strong association between systolic BP as well as diastolic BP and any hypertensive retinopathy. Study showed that Duration of HTN was associated with hypertensive retinopathy. This may be due to the observation that patterns of retinal vascular changes were vary with both current and past BP levels [13] and makes it even more vital that people with HTN in the study population be promptly diagnosed and treated to prevent damage to the retina.

ISSN: 0975-3583, 0976-2833 VOL 13, ISSUE 05, 2022

Age was not associated with hypertensive retinopathy among individuals with both HTN and DM, with younger age being a risk factor for developing HTN retinopathy. A possible explanation is that early in the course of HTN, the vascular system has not developed compensatory mechanisms, leading to retina damage[14]. Elevated diastolic BP rather than systolic BP was a risk factor associated with hypertensive retinopathy in individuals with comorbid HTN and DM by bivariate analysis. This finding may be explained by the observation that among local factors affecting the retina, retinal diastolic arterial pressure rises before retinal changes appear and that retinal diastolic retinobrachial ratio is more significant than retinal systolic retinobrachial ratio for the development of hypertensive retinopathy [15].

Conclusion:

From overall observation, discussion and comparison with another studies, we can conclude in our study that referring adults with DM for 8 or more years to an ophthalmologist for a dilated eye examination can allow those with the highest likelihood of DR to be screened. Also we can conclude that the increase in the hypertension will increase the diabetic retinopathy, patients with diabetic retinopathy were maximum because of them, some patients were hypertensive and thus, tight control of blood pressure or initially treatment of hypertension control will be suggested to reduce the diabetic retinopathy.

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Conflict of Interest : None

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References :

1. Klein BE, Klein R, Moss SE, Cruickshanks KJ. Parental history of diabetes in a population-based study. Diabetes Care. 1996 Aug;19(8):827-30.
2. Ogurtsova K, da Rocha Fernandes JD, Huang Y, et al. IDF Diabetes Atlas: Global estimates for the prevalence of diabetes for 2015 and 2040. Diabetes Res Clin Pract 2017;128:40-50.
3. Mills KT, Bundy JD, Kelly TN, et al. Global disparities of hypertension prevalence and control: a systematic analysis of population-based studies from 90 countries. Circulation 2016;134:441-50.
4. Hypertension in Diabetes Study Group. HDS 1: Prevalence of hypertension in newly presenting type 2 diabetic patients. *J Hypertens* 1993; **11**:309–17.
5. UK Prospective Diabetes Study Group. Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes: UKPDS 38. BMJ 1998;317:703–13.
6. Klein R, Klein BEK, Moss SE, et al. Is blood pressure a predictor of the incidence or progression of diabetic retinopathy? Arch Intern Med 1989;149:2427–32.
7. Norgarard K, Feldt-Rasmussen B, Deckert T. Is hypertension a major independent risk factor for retinopathy in type 1 diabetes? Diabet Med 1991;8: 334–7.

8. Testa MA, Puklin JE, Sherwin RS, *et al.* Clinical predictors of retinopathy and its progression in patients with type 1 diabetes during CSII and conventional insulin treatment. *Diabetes* 1985;**34**(suppl 3):61–8.
9. Ngah NF, Muhamad NA, Asnir ZZ, Aziz RAA, Kassim ZM, Sahar SA, et al. Descriptive assessment on diabetic retinopathy screening in an awareness programme in Malaysia. Int J Ophthalmol. 2020; 13 (11):1808–13. https://doi.org/10.18240/ijo.2020.11.19 PMID: 33215014
10. Yau JWY, Rogers SL, Kawasaki R, Lamoureux EL, Kowalski JW, Bek T, et al. Global prevalence and major risk factors of diabetic retinopathy. Diabetes Care. 2012; 35(3):556–64. https://doi.org/10.2337/dc11-1909 PMID: 22301125
11. Abougalambou SSI, Abougalambou AS. Risk factors associated with diabetic retinopathy among type 2 diabetes patients at teaching hospital in Malaysia. Diabetes Metab Syndr Clin Res Rev. 2015; 9(2):98–103. https://doi.org/10.1016/j.dsx.2014.04.019 PMID: 25470640
12. Raman R, Ganesan S, Pal SS, Kulothungan V, Sharma T. Prevalence and risk factors for diabetic retinopathy in rural India. Sankara Nethralaya Diabetic Retinopathy Epidemiology and Molecular Genetic Study III (SN-DREAMS III), report no 2. BMJ Open Diabetes Res Care. 2014; 2(1):e000005. **https://doi**. org/10.1136/bmjdrc-2013-000005 PMID: 25452856
13. Bhargava M, Wong T. Current concepts in hypertensive retinopathy. Retinal Physician 2013: 10: 43–45.
14. Henderson AD, Biousse V, Newman NJ, Lamirel C, Wright DW, Bruce BB. Grade III or grade IV hypertensive retinopathy with severely elevated blood pressure. West J Emerg Med 2012: 13: 529–534.
15. Lal SK, Jain IS, Gupta SD, Wahi PL.Role of local factors in hypertensive retinopathy. Indian J Ophthalmol 1974: 221–225.