

Correlation Between Hypertension and Diabetic Retinopathy Among Patients with Type-II Diabetes Mellitus

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Abstract- Hypertension coexisted with diabetes, can worst the vascular complications. Very few of the studies have been done to establish the correlation between diabetes and hypertension in our population. So the aim of current project was to find out the association between development of diabetic retinopathy and hypertension in our population. A case control study was conducted in the department of internal medicine, Shahida Islam Medical College. Fasting blood sugar, random blood sugar and HbA1C were tested. The systolic and diastolic blood pressure were recorded. Patients were screened for diabetic retinopathy by dilating the pupils with homatropine drops then examination by ophthalmoscope. Data was analyzed by using Statistical Package for Social Science (SPSS) version-20. The mean age of participants in Group A (with diabetic retinopathy) was 55.4 ± 11.1 years while in Group B (without diabetic retinopathy) was 51.9 ± 9.3 years. An increased systolic and diastolic blood pressure was noted among patients with diabetic retinopathy, recorded as 160.5 ± 17.1 mmHg and 89.3 ± 8.4 mmHg respectively with a strong significant association. About 40% of diabetic patients were hypertensive as well. The combined effect of systolic blood pressure and HbA1C were more likely to develop diabetic retinopathy with significant p-values and odd ratios. Current study found a strong positive correlation between diabetic retinopathy and hypertension.

Index Terms- Diabetes mellitus, Hypertension, Retinopathy, Vascular complication

Introduction

Diabetes mellitus is a disease due to either insulin deficiency or resistance developed against insulin utilization resulting in producing symptoms like polydipsia, polyphagia and polyuria (1). There is a high prevalence of diabetes worldwide leading to increase in morbidity and mortality rates. Looking over the developing countries like Pakistan, out of total 160 million populations, about 7 million people are labelled as diabetic. As per WHO ranking, Pakistan stands on 8th position (2, 3) and it has been predicted that it will be on 4th position till the year of 2025 (4). National level studies reported prevalence of diabetes is about 19.25% (5).

The uncontrolled diabetes lead to various complications, mostly are due to vascular lesion, including microvascular complications like neuropathy, nephropathy and retinopathy and macro vascular complications like cardiomyopathy and cerebero-vascular accident (6). Among all complications, diabetic retinopathy is the most well-known condition. Literature found that duration of diabetes is the most important risk factor, it is

about 33.3% if the duration is between 10 to 12 years (7). It has been stated that if hypertension is coexisted with diabetes, can worst the complications. In Pakistan about 20% to 60% of population is facing the two comorbid conditions simultaneously which endanger the life of patient (8). Experimental studies have been done in which decreasing blood pressure in hypertensive patient slows down the process of developing diabetic retinopathy (9-13). Significant effect of blood pressure regulation have been found in development of microvascular complication (14).

Very few of the studies have been done in current region to establish the correlation between diabetes and hypertension in our population. So the aim of current study is to find out the association between development of diabetic retinopathy and hypertension in our population.

Methodology

A case control study was conducted in the department of internal medicine, Shahida Islam Medical College during July 2021 to December 2021. The sample size was calculated by using the OpenEpi calculator and was 140, out of which 60 were cases (Group A having diabetic retinopathy) and 80 were controls (Group B without diabetic retinopathy). The diagnosed patients of type-II diabetes with age range of 35-70 years were included in the study while those were excluded who were either having type-I diabetes or any other known cause of retinopathy or refused to give consent.

Patient's biodata was recorded on preformed proforma. Fasting blood sugar, random blood sugar and HbA1C were tested. The systolic and diastolic blood pressure were recorded by using Sphygmomanometer. Patients were screened for diabetic retinopathy by dilating the pupils with homatropine drops then examination by ophthalmoscope.

Data was analyzed by using Statistical Package for Social Science (SPSS) version-20. All the categorical variables were calculated as frequency and percentages while numerical variables as mean with standard deviation. Independent t-test was applied to find out the associations and odd ratios were calculated. P-value less than 0.05 was considered as significant.

Results

About 140 known case of diabetes mellitus were included in the study, among them 60 were diagnosed with diabetic retinopathy. The mean age of participants in Group A (with diabetic retinopathy) was 55.4 ± 11.1 years while in Group B (without diabetic retinopathy) was 51.9 ± 9.3 years. Longer duration of diabetes was noted in Group A as compare to Group B but association was not significant. Higher blood sugar was the likelihood cause of developing diabetic retinopathy in Group A, having fasting blood sugar 157.23 ± 13.53 mg/dl and random blood sugar 174.41 ± 11.23 mg/dl. An increased systolic and diastolic blood pressure was noted among patients with diabetic retinopathy, recorded as 160.5 ± 17.1 mmHg and 89.3 ± 8.4 mmHg respectively with a strong significant association as mentioned in Table 1.

Variables	Group A (with DR) (n=60)	Group B (without DR) (n=80)	p-value
Age (years)	55.4 ± 11.1	51.9 ± 9.3	0.452
Duration of Diabetes (years)	10.6 ± 3.3	7.4 ± 6.2	0.684
Fasting blood sugar (mg/dl)	157.23 ± 13.53	151.87 ± 17.45	0.085
Random blood sugar (mg/dl)	174.41 ± 11.23	169.51 ± 14.27	0.34
Hemoglobin A1c	7.82 ± 0.38	7.65 ± 0.21	0.154
Systolic blood pressure (mmHg)	160.5 ± 17.1	152.7 ± 13.9	0.023
Diastolic blood pressure (mmHg)	89.3 ± 8.4	78.1 ± 5.4	0.000

About 40% of diabetic patients were hypertensive as well. For further analysis, participants were further categorized into groups on the basis of systolic blood pressure (SBP) and HbA1C. Systolic hypertension reported a strong significant association with diabetic retinopathy as p-value was 0.02 while odd ratio was 1.46. The combined effect of systolic blood pressure and HbA1C were more likely to develop diabetic retinopathy with significant p-values and odd ratios as mentioned in Table 2.

Variables	Group A (with DR) (n=60)	Group B (without DR) (n=80)	OR (95% CI)	p-value
Systolic BP				
≥ 140 mmHg	36	48	1.46	0.02
< 140 mmHg	24	32		
HbA1C				
≥7.0	32	52	1.11	0.154
< 7.0	28	28		
SBP≥140 mmHg and HbA1C≥7%	19	28	1.55	0.000
SBP<140 mmHg or HbA1C<7%	27	35	1.04	0.06
SBP<140 mmHg and HbA1C<7%	14	17	0.99	0.045

Discussion

It has been found that blood pressure regulation reduces the 37% risk of developing microvascular complication among the patients of type-II diabetes mellitus in United Kingdom (15). It is evident the systolic blood pressure must be less than 130mmHg while diastolic blood pressure should be less than 80mmHg (16).

Very few of the studies have been done in Pakistan. One of the study conducted in Lahore reported that 33% of hypertensive patients were having non-proliferative diabetic retinopathy while 21.5% were having the proliferative type of diabetic retinopathy (17). Another study by Shera et.al. found 64.6% prevalence of hypertension among the patients of diabetic retinopathy. They also found a strong association between microvascular complication and hypertension, duration of diabetes and HbA1c >8% (18).

Hashim et.al done a study in Rawalpindi and reported that about 42.8% of patients with diabetes were having hypertension with a significant association with age and duration of diabetes (19) while Saqib et.al. reported prevalence of 31% in Faisalabad but no association with age or duration of diabetes (20). Current study favored this finding by reporting no significant association between diabetic retinopathy and age or duration of diabetes while 40% of diabetic patients were hypertensive. This insignificant association is doubtful because the age and duration of diabetes are the two important risk factors for progressing towards diabetic retinopathy, the variations might be due to small sample size.

Leiden et.al. studied different risk factors associated with diabetic retinopathy and they found a positive association with age, HbA1C and hypertension either systolic or diastolic while no association with fasting blood sugar (21). On the other hand, current study found no significant association of diabetic retinopathy with either fasting blood sugar or random blood sugar or HbA1C but a strong positive association with both systolic hypertension and diastolic hypertension which is supported by Saqib et.al. (20). Combined effect of Lowering blood pressure along with good glycemic control reduces 43% progression of retinopathy in Chinese population with type-II diabetes (13). One of the study found that each 5mmHg increase in systolic or diastolic blood pressure increases the risk of developing diabetic retinopathy up to 40% in normotensive type-II diabetic patients (22).

Conclusion

Current study found a strong positive correlation between diabetic retinopathy and hypertension. Along with all other risk factors of diabetic retinopathy, the hypertension should also be considered as a modifiable risk factor.

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