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INVOLVEMENT OF VARIOUS ASSOCIATED RISK IN THE PROGRESSION OF DIABETIC RETINOPATHY: A PROSPECTIVE COHORT STUDY

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Abstract:

Objective: *The aim of this research was to determine the role of various associated factors (hyperlipidemia, hypertension, positive diabetic family history, positive hypertensive family history, and smoking) in the development and progression of diabetic retinopathy.*

Methods: *We carried out this prospective cohort series at Jinnah Hospital, Lahore in the timeframe of October 2017 to June 2018 on a total of 100 diabetic patients who presented not even a single sign of diabetic retinopathy. The glycemic control of the registered patients was (HbA1c < 6.5%). Patients were included through non-probability sampling methods after receiving an informed and written consent of research participation. We evaluated the patients for smoking, hyperlipidemia, and hypertension. These patients went through two years follow up a program for the assessment of development and progression of diabetic retinopathy.*

Results: *In the total one hundred patients 43 were female and 57 were male with a dominance of male over female in terms of population. The mean age of the study participants was (50.72 ± 9.29) years. More patients were NIDDM (82%). Mean disease duration among research participants was (8.31 ± 6.83) years. The proportion distribution of patients was such as there were smokers (11%), hypertensive (37%), hyperlipidemia (6%), diabetic family history (62%) and hypertensive family history (30%). There were 9 patients diagnosed with diabetic retinopathy at the end of the follow up the program. There was an increase in the onset of diabetic retinopathy with age factor; however, the difference was insignificant statistically. IDDM cases posed comparatively high diabetic retinopathy frequency and patients with positive diabetic family history and hypertension once again with an insignificant variation. There was no significant difference among smokers & non-smokers and gender-wise distribution. Diabetic retinopathy increased with prolonged disease duration. Diabetic retinopathy incidence was high among hyperlipidemia and hypertensive cases.*

Conclusion: *Patient's age more than fifty years, disease duration more than twenty years, insulin dependent DM, hyperlipidemia, hypertension and positive family history of hypertension and diabetes were associated risks in the development and progression of diabetic retinopathy.*

Keywords: *Blood Glucose Fasting (BGF), Diabetes Mellitus, Diabetic Retinopathy (DR) and Glycosylated Hemoglobin (HbA1c).*

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INTRODUCTION:

Diabetes refers to a metabolic syndrome which results due to hyperglycemia as a result of decreased circulating insulin sensitivity or reduced indigenous insulin or both [1]. The estimates show that diabetes will affect more people around the world and about 552 million will be affected by 2030. Underdeveloped countries are under increased burden as 80% diabetes burden is found in these countries [2]. Pakistani diabetic onset will increase from 6.9 million to 11.5 million by 2025 (WHO) [3].

Diabetes is one of the major causes of preventable blindness in the age group of (20 – 75) years [4]. Diabetic retinopathy causes 12% new cases of blindness yearly [4, 5]. Among Type – I & II diabetes patients of above twenty years diabetic retinopathy is respectively 95% & 60% [6]. However, prevalence is different for different age group according to the size of the population [4 – 6].

Various factors are responsible for the progression of diabetic retinopathy which includes diabetes duration, systemic hypertension, glycemic control, obesity, hyperlipidemia and positive diabetic history of the family [7 – 12]. Treatment and prevention are important as better glycemic control can possibly avoid the onset of diabetic retinopathy [7, 9, 11, 12].

Various research series presented different clinical and epidemiological outcomes with varying consistency. There is a scarcity of locally available literature on the topic. This series will ultimately help such kind of future research works.

METHODS:

We carried out this prospective cohort series at Jinnah Hospital, Lahore in the timeframe of October 2017 to June 2018 on a total of 100 diabetic patients who presented not even a single sign of diabetic retinopathy. The glycemic control of the registered patients was (HbA1c < 6.5%). Patients were included through non-probability sampling methods after receiving an informed and written consent of research participation. We evaluated the patients for smoking, hyperlipidemia, and hypertension. These patients went through two years follow up a program for the assessment of development and progression of diabetic retinopathy. We did not include any patients of chronic liver disease, chronic kidney disease, and ischemic heart disease. In order to remove biases, same consultant ophthalmologist evaluated every patient.

RESULTS:

In the total one hundred patients, 43 were female and 57 were male with a dominance of male over female in terms of population. The mean age of the study participants was (50.72 ± 9.29) years. More patients were NIDDM (82%). Mean disease duration among research participants was (8.31 ± 6.83) years. The proportion distribution of patients was such as there were smokers (11%), hypertensive (37%), hyperlipidemia (6%), diabetic family history (62%) and hypertensive family history (30%). There were 9 patients diagnosed with diabetic retinopathy at the end of the follow up the program. There was an increase in the onset of diabetic retinopathy with age factor; however, the difference was insignificant statistically. IDDM cases posed comparatively high diabetic retinopathy frequency and patients with positive diabetic family history and hypertension once again with an insignificant variation. There was no significant difference among smokers & non-smokers and gender-wise distribution. Diabetic retinopathy increased with prolonged disease duration. Diabetic retinopathy incidence was high among hyperlipidemia and hypertensive cases. Detailed outcomes analysis is given in the tabular and graphical representation.

Table – I: Mean Values of Age and Disease Duration

Variables	Mean	±SD
Age (Years)	50.72	9.29
Duration of diabetes (Years)	8.31	6.83

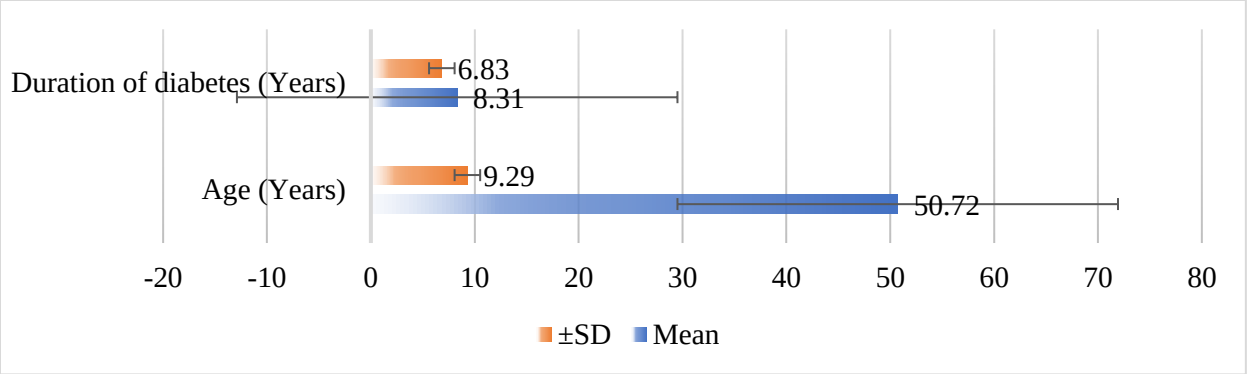


Table – II: Stratification of Characteristics

Characteristics		Participants (100)
Gender	Male	57
	Female	43
Type of Diabetes	IDDM	18
	NIDDM	82
Comorbid	Hypertension	37
	Hyperlipidemia	6
	Smoker	11
	Family history of diabetes	62
	Family history of hypertension	30

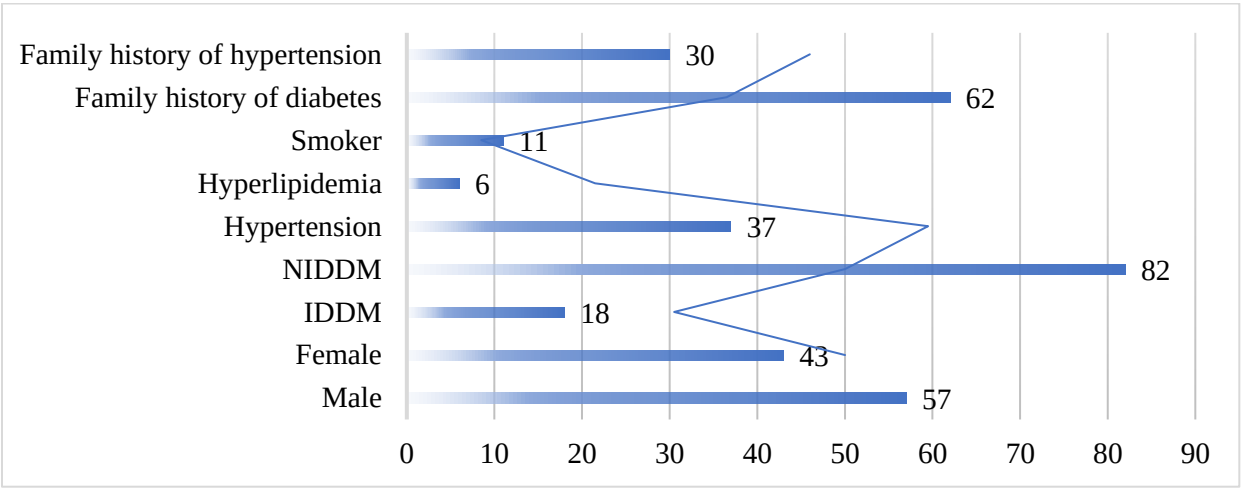
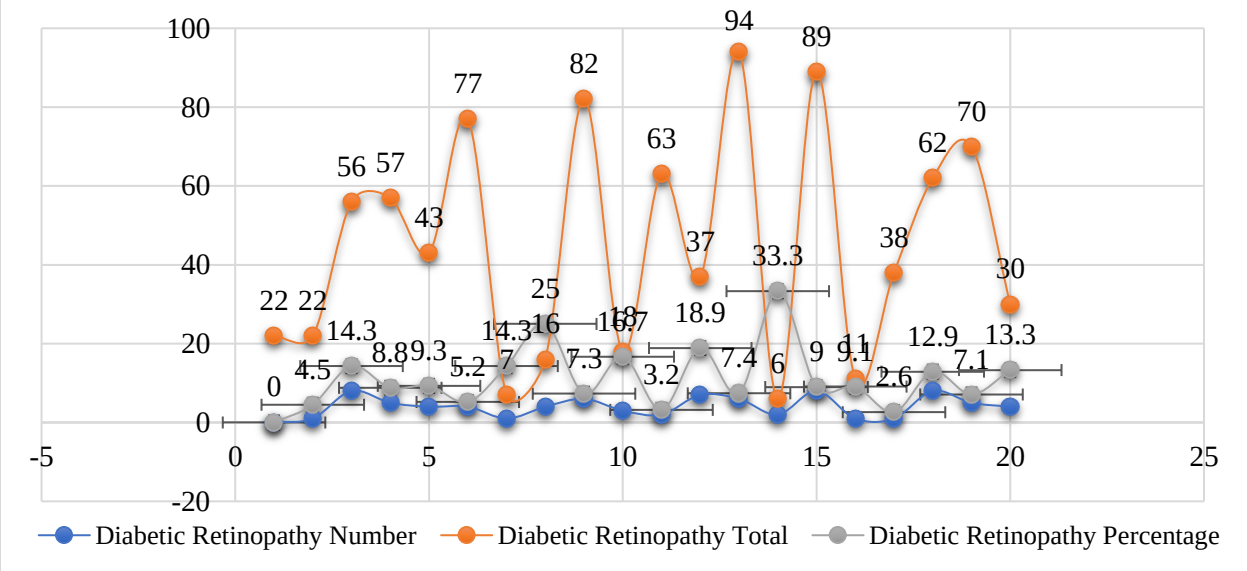


Table – III: Diabetic Retinopathy with Respect to Different Variables

Variable		Diabetic Retinopathy			P-value	OR	95% CI
		Number	Total	Percentage			
Overall		9	100	9	-	-	-
Age Group (Years)	30 - 40	0	22	0	0.099		
	41 - 50	1	22	4.5		0	0
	51 - 60	8	56	14.3		0.29	0.03 – 2.43
Gender	Male	5	57	8.8	0.927	0.94	0.24 – 3.72
	Female	4	43	9.3			
Diabetes Duration	0 - 10 Years	4	77	5.2	0.037*		
	11 - 20 Years	1	7	14.3		0.33	0.03 – 3.43
	21 - 30 Years	4	16	25		2	0.18 – 22.06
Diabetes Type	NIDDM	6	82	7.3	0.209	0.4	0.09 – 1.76
	IDDM	3	18	16.7			
Hypertension	No	2	63	3.2	0.008*	7.12	1.39 – 36.36
	Yes	7	37	18.9			
Hyperlipidemia	No	6	94	7.4	0.032*	6.21	0.96 – 40.07
	Yes	2	6	33.3			
Smoking	No	8	89	9	0.991	1.01	0.11 – 8.96
	Yes	1	11	9.1			
Diabetes Family History	No	1	38	2.6	0.081	5.48	0.66 – 45.69
	Yes	8	62	12.9			
Hypertension Family History	No	5	70	7.1	0.322	2	0.50 – 8.04
	Yes	4	30	13.3			



DISCUSSION:

The mean age of the study participants was (50.72 ± 9.29) years; whereas, the age bracket was 30 to 60 years. Cheng and Memon reported mean age respectively in American and Pakistani population as (55.9 ± 0.61) years and (55.3 ± 8.9) years [13, 14]. Our research population included 57% males and 43% females; whereas, Chuhan reported 63.12% males and 36.88% females in a diabetic population of Kashmir [15]. There was a slight predominance of the female population over the male population in Abbottabad and Karachi [14, 16].

NIDDM patients were 82%; whereas, the remaining 18% of patients were IDDM which is almost the same as reported by Rahman back in 2011 in Abbottabad [17]. A lower frequency of 5.16% was reported by Ahmad in Abbottabad as well [16]. We reported a disease duration of (8.31 ± 6.83) years in the bracket of (0 – 30) years which is the same as reported by Ahmadani (8.88 ± 5.21) years [18]. The proportion distribution of patients was such as there were smokers (11%), hypertensive (37%), hyperlipidemia (6%), diabetic family history (62%) and hypertensive family history (30%). Rahman and Ahmadani reported a higher prevalence of hypertension among patients with the respective proportion of (53.5%) and (55.9%) [17, 18]. According to Ahmedani, the proportions of smoking, family diabetes history, and hypertension was 29.5%, 44.6% and 5% in diabetic patients [18].

During follow-up still, there were nine diabetic retinopathy patients without due consideration of the status of diabetes control in this research. Shaikh also reported similar diabetic retinopathy occurrence of 10% back in 2010 with a mean diabetic duration of eight years [19]. A relative higher diabetic retinopathy frequency was reported by Wahab and Mahar as (15%) and (27.43%) respectively [20, 21]. reported relatively higher frequency of DR in the local population. Various authors have reported different onsets of DR among different regions such as USA, Australia, India, and Iran with respective frequency of 11.5%, 12.6%, 11.7% and 13.8% [13, 22 – 25]. Khanzada reported a relatively higher frequency of DR as 19.94% in his series which was due to prolonged diabetes duration (13 ± 4.5) [26]. Variations can be attributed to educational differences, socioeconomic status and population [20].

Increasing age is found with an increased onset of DR which is also reported by Wong as he explained the association of age factor with DR as an increasing age poses increased DR risk [12]. There was no significant variation of DR occurrence among males and females. Our outcomes are similar to the outcomes of Hu and Raman; whereas Chatziralli reported male predominance in the onset of DR [10 – 12]. IDDM showed a higher DR frequency including family diabetic history patients and hypertension cases. Hu also reported similar outcomes in his series (OR = 1.52, CI 95%:1.20 – 1.92; P-Value = 0.001) among positive diabetic family history patients [11]. There was an increase in the DR frequency with prolonged diabetes duration, hypertension, and hyperlipidemia. Chatziralli et al. also reported similar increase in his series (OR = 4.49, CI 95%: 1.15 – 17.49; P-Value = 0.030) [10]. Wong reported an insignificant variation with respect to hyperlipidemia (OR = 0.88, CI 95%:0.65 – 1.19; P-Value = 0.39) [22]. Respective values of number, percentage, Odds Ratio, Confidence Interval and P-Value are given in Table – III. Minor variations can be attributed to the sample selection differences.

CONCLUSION:

Patient's age more than fifty years, disease duration more than twenty years, insulin dependent DM, hyperlipidemia, hypertension and positive family history of hypertension and diabetes were associated risks in the development and progression of diabetic retinopathy. Therefore, these factors are necessary for the risk reduction and glycemic control to counter the onset of diabetic retinopathy.

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