Frequency of Peripheral Arterial Disease in Type-II Diabetic Patients presenting with Diabetic Retinopathy

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ABSTRACT

Background: Type-II Diabetes Mellitus (T2DM) often leads to Diabetic Retinopathy (DR), but the prevalence of coexisting Peripheral Arterial Disease (PAD) in these patients is unclear, creating controversy in existing literature. This study aims to fill this gap by investigating the frequency of PAD in T2DM patients with DR, enhancing our understanding of diabetes-related complications. **Objective:** To determine frequency of peripheral arterial disease in T2DM patients presenting with diabetic retinopathy. **Study Design:** It was a cross sectional study. **Settings:** This study was conducted at the Department of Medicine, DHQ Teaching Hospital, KMU Institute of Medical Sciences, Kohat Pakistan. **Duration:** Six months from 05-01-2022 to 04-07-2022. **Methods:** A total 165 T2DM patients presenting with diabetic retinopathy and meeting inclusion criteria were enrolled in this study after taking informed written consent. Ankle brachial pressure index was measured. Two blood pressure readings were taken 5 minutes apart and average was calculated for analysis. Peripheral arterial disease was labeled. SPSS version 26.0 was used for data analysis. **Results:** The mean age of the participants was 51.1±14.69. There were 63 (38.2%) females and 102 (61.8%) males. Mean BMI was 26.87±3.73 kg/m2. The mean duration of diabetes in the participants was 6.43±2.36 years. As regards type of retinopathy, 62 (37.6%) had Proliferative Diabetic Retinopathy (PDR), and 103 (62.4%) had Non-Proliferative Diabetic Retinopathy (NPDR). Mean Ankle Brachial Pressure Index (ABPI) among the participants was 1.01±0.25. Peripheral arterial disease was noticed in 28.5% of the T2DM patients presenting with diabetic retinopathy. Stratification of frequency of PAD for various sub groups of age, gender, BMI, duration of disease and type of retinopathy produced insignificant difference between sub groups (p-value>0.05). **Conclusion:** In conclusion, our investigation of Type 2 diabetic patients with diabetic retinopathy uncovers a significant 28.5% prevalence of peripheral arterial disease (PAD). Stratification across age, gender, BMI, disease duration, and retinopathy type reveals no substantial differences. These results underscore the systemic nature of vascular complications, emphasizing the importance of comprehensive care strategies.

Keywords: Diabetic Retinopathy, Peripheral Artery Disease, Type II Diabetes Mellitus.

INTRODUCTION

Type 2 Diabetes Mellitus (T2DM), a pervasive metabolic disorder characterized by defective insulin secretion and tissue insensitivity to insulin, has witnessed an alarming surge in global prevalence.[1] From 2000 to 2019, the estimated number of individuals affected tripled from 151 million to a staggering 463 million.[2] In Pakistan, the prevalence of diabetes mirrored this trend, escalating from 11.77% in 2016 to 17.1% in 2019.[3] This surge emphasizes the urgency of understanding and managing T2DM complications, among which diabetic retinopathy (DR) and peripheral arterial disease (PAD) hold particular significance.[4]

Diabetic retinopathy, a formidable global challenge in ophthalmology, affects millions worldwide, posing a substantial public health concern.[5] The intricate interplay of chronic hyperglycemia and vascular alterations in diabetes leads to retinal microvascular abnormalities, potentially causing vision impairment or blindness. Consequently, addressing the complications arising from T2DM, with a focus on conditions like PAD, becomes crucial for healthcare providers.[5,6]

Diabetic retinopathy has been associated with an increased prevalence of PAD, characterized by the narrowing or blockage of arteries outside the heart and brain, primarily impacting the lower extremities.[7,8] Reports on the frequency of PAD in T2DM patients with diabetic retinopathy vary; Chen *et al*. (2015)[8] reported a prevalence of 28.1%, while Chandrana *et al*. (2018)[9] found it higher at 38.41%. In contrast, Chutervedi *et al*. (2019)[10] reported a slightly lower prevalence of 19.0%. This disparity underscores the need for a comprehensive local study to unveil the true burden of PAD in T2DM patients with diabetic retinopathy.

Recognizing the controversy in existing literature and the lack of localized insights, a meticulously planned study is set to assess the actual prevalence of peripheral arterial disease in T2DM patients presenting with DR. This research endeavor aims to provide a nuanced and context-specific perspective, unraveling the intricate relationship between T2DM, diabetic retinopathy, and peripheral arterial disease within the local population.

The significance of this study extends beyond the identification of prevalence; it anticipates future challenges and aims to formulate effective management strategies. Understanding the burden of peripheral arterial disease in T2DM patients with diabetic retinopathy is pivotal for healthcare professionals to tailor anticipative assessments and implement targeted management plans. Such insights will not only facilitate early detection and intervention but also contribute to the overall improvement of patient outcomes and the mitigation of associated complications.

METHODS

This cross sectional study was conducted at Department of Medicine, DHQ Teaching Hospital, KMU Institute of Medical Sciences, Kohat for a period of 06 months after approval from ethical review committee of the hospital. One hundred and sixty five cases sample size was calculated at 95% confidence level and 6% margin of error by considering expected frequency of PAD in patients with DR to be 19.0%.[10] Inclusion criteria was patients with T2DM from both the genders with age between 18-70 years and diagnosed with diabetic retinopathy and informed written consent. However, patients with coronary artery bypass graft, stroke, myocardial infarction, percutaneous transluminal coronary angioplasty and patients on anti-coagulant therapy were excluded. Ankle brachial pressure index was measured. Two blood pressure readings were taken 5 minutes apart and average was calculated for analysis. Peripheral arterial disease was labeled with ABI score <0.9. All the labs were acquired from the same (hospital) lab, all the ophthalmoscopic evaluations and ABI measurements were done by the researchers under supervision of in

charge of the unit to minimize bias. Confounding variables were controlled by exclusion. SPSS version 26.0 was used for data analysis.

RESULTS

Mean age of the participants was 51.1±14.69. Among them, 46 (27.9%) were in the 18-40 years age group, while 119 (72.1%) were in the 41-70 years age group. There were 63 (38.2%) females and 102 (61.8%) males. Mean BMI was 26.87±3.73 kg/m². The participants were categorized into three groups: 39 (23.6%) had normal weight, 81 (49.1%) were overweight and 45 (27.3%) were obese. Mean duration of diabetes in the participants was 6.43±2.36 years. Among them, 66 (40.0%) had a disease duration of ≤5 years, while 99 (60.0%) had a disease duration of >5 years. As regards type of retinopathy, 62 (37.6%) had Proliferative Diabetic Retinopathy (PDR), and 103 (62.4%) had Non-Proliferative Diabetic Retinopathy (NPDR). Mean Ankle Brachial Pressure Index (ABPI) among the participants was 1.01±0.25. Data is given in Table 1. Peripheral arterial disease was noticed in 28.5% of the T2DM patients presenting with diabetic retinopathy, as given in Table 2. Stratification of frequency of PAD for various sub groups of age, gender, BMI, duration of disease and type of retinopathy produced insignificant difference between sub groups (p-value>0.05), as given in Table 3.

Table 1: Baseline Characteristics of the Study Sample

Characteristics	Participants n=165
Age (years)	51.1±14.69
• 18-40 years	46 (27.9%)
• 41-70 years	119 (72.1%)
Gender	
• Male	102 (61.8%)
• Female	63 (38.2%)
BMI (kg/m2)	
• Normal Weight	39 (23.6%)
• Overweigh	81 (49.1%)
• Obese	45 (27.3%)
Duration of Disease (years)	6.43±2.36
• ≤5 years	66 (40.0%)
• >5 years	99 (60.0%)
Type of Retinopathy	
• PDR	62 (37.6%)
• NPDR	103 (62.4%)
Ankle Brachial Pressure Index	1.01±0.25

Table 2: Frequency of Peripheral Arterial Disease in Patients with Diabetic Retinopathy

Peripheral Arterial Disease	Frequency (n)	Percent (%)
Yes	47	28.5%
No	118	71.5%
Total	165	100.0%

Table 3: Frequency of PAD Stratified for Subgroups

Subgroups	n	Peripheral Arterial Disease n (%)	P-value
Age (years)			
• 18-40 years	46	15 (32.6%)	0.466
• 41-70 years	119	32 (26.9%)	
Gender			
• Male	102	31 (30.4%)	0.490
• Female	63	16 (25.4%)	
BMI (kg/m2)			
• Normal Weight	39	13 (33.3%)	
• Overweigh	81	24 (29.6%)	0.504
• Obese	45	10 (22.2%)	
Duration of Disease (years)			
• ≤5 years	66	21 (31.8%)	0.439
• >5 years	99	26 (26.3%)	
Type of Retinopathy			
• PDR	62	18 (29.0%)	0.904
• NPDR	103	29 (28.2%)	

Chi-square test, a p-value>0.05 was considered as insignificant.

DISCUSSION

Type-II diabetes (T2MD) is a chronic condition often accompanied by complications such as peripheral arterial disease.[1] Diabetic retinopathy is a common complication of T2MD, affecting the eyes. Emerging research suggests a notable association between diabetic retinopathy and peripheral arterial disease in T2MD patients.[2,3] Understanding the frequency of PAD in T2MD individuals with diabetic retinopathy becomes crucial for comprehensive care, emphasizing the interconnected nature of complications arising from diabetes and the necessity for holistic management strategies in diabetic patients.

The participants in our study exhibited a mean age of 51.1±14.69. Notably, comparative studies in T2DM patients with diabetic retinopathy reported varied mean ages globally: Zabdi *et al*. (2022)[11] in Palestine noted 56.48±12.33 years, Chen *et al*. (2015)[8] in China reported 56.6±9.7 years, Chaturvedi *et al*. (2018)[10] in India observed 59.5±10.1 years, Lee *et al*. (2018)[12] in Taiwan recorded 61.0±9.3 years, and Molina *et al*. (2014)[13] in the Philippines documented 61.5±9.7 years. Inter-study variations in mean age underscore the need for region-specific considerations in diabetic retinopathy research and tailored patient care.

In our study, the gender distribution comprised 63 (38.2%) females and 102 (61.8%) males. This aligns with Chaturvedi *et al*. (2018),[10] reporting 61.0% male participants, and Lee *et al*. (2018),[12] with 54.2%. Conversely, Chen *et al*. (2015)[8] and Zabadi *et al*. (2022)[11] presented divergent findings, indicating male participants as 49.0% and 48.0% of the study sample, respectively. Discrepancies in gender distribution across studies emphasize the importance of considering demographic variations in interpreting diabetic retinopathy outcomes and tailoring interventions accordingly.

In our study, the mean BMI was recorded at 26.87±3.73 kg/m². Comparative studies by Lee *et al*. (2018),[12] Molina *et al*. (2014),[13] and Chen *et al*. (2015)[8] reported slightly lower mean BMIs of 25.6±3.9 kg/m², 25.6±4.3 kg/m², and 25.6±4.3 kg/m², respectively. In contrast, Zabadi *et al*. (2022)[11] documented a notably higher mean BMI of 30.3±5.6 among patients with diabetic retinopathy.

The mean duration of diabetes in our study participants was 6.43±2.36 years. Among them, 66 (40.0%) individuals had a disease duration of ≤5 years, while 99 (60.0%) had a disease duration of >5 years. In comparative studies, Chaturvedi *et al*. (2018),[10] Lee *et al*. (2018), and Zabadi *et al*. (2022)[11] reported longer mean durations of Type 2 Diabetes Mellitus (T2DM) at 7.75±1.50 years, 9.0±6.7 years, and 9.6±7.8 years, respectively. However, Chen *et al*. (2015)[8] reported a notably higher mean duration of T2DM as 13 years (range 10-20 years), possibly associated with differing inclusion criteria. Regarding the type of retinopathy, 62 (37.6%) participants exhibited Proliferative Diabetic Retinopathy (PDR), while 103 (62.4%) had Non-Proliferative Diabetic Retinopathy (NPDR). The mean Ankle Brachial Pressure Index (ABPI) among the participants was 1.01±0.25.

In our study, peripheral arterial disease (PAD) was observed in 28.5% of Type 2 Diabetes Mellitus (T2DM) patients presenting with diabetic retinopathy. This aligns with findings from Chen *et al*. (2015),[8] who reported a similar frequency of PAD in patients with diabetic retinopathy at 28.1%. However, divergent results were reported by Chaturvedi *et al*. (2019),[10] noting a lower frequency of PAD at 19.0%, while Chandrana *et al*. (2018)[9] documented a higher frequency of 38.41% in a similar patient population.

The stratification of peripheral arterial disease (PAD) frequency across various subgroups, including age, gender, BMI, duration of disease, and type of retinopathy, yielded insignificant differences between subgroups (p-value > 0.05). This suggests that the prevalence of PAD did not significantly vary based on these demographic and clinical characteristics within the studied population. These findings underscore the need for comprehensive assessment and consideration of various factors when

evaluating the frequency of PAD in Type 2 diabetic patients presenting with diabetic retinopathy.

CONCLUSION

In conclusion, our investigation of Type 2 diabetic patients with diabetic retinopathy uncovers a significant 28.5% prevalence of peripheral arterial disease (PAD). Stratification across age, gender, BMI, disease duration, and retinopathy type reveals no substantial differences. These results underscore the systemic nature of vascular complications, emphasizing the importance of comprehensive care strategies.

LIMITATIONS

The study has limitations, such as its single-center design, potentially limiting the generalizability of findings to a broader population. The cross-sectional nature precludes establishing causal relationships, and while efforts were made to control confounders, some may not have been fully addressed.

SUGGESTIONS / RECOMMENDATIONS

To achieve a more comprehensive understanding, future research should consider longitudinal approaches with diverse participant cohorts.

CONFLICT OF INTEREST / DISCLOSURE

Respondents are well-informed, with assured confidentiality. No conflicts of interest exist among the authors conducting the study.

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