Rate of carotid stenosis in diabetic patients with lower limb chronic ischemia

Walid M. Gamal[a], Ahmed Abdelmoneim Abdelrasheed[b], Yomna Bahaa El-Den Mohammed Hussein[a*], Abdelrahiem Fathy Mohammed[a]

[a]Vascular Surgery Department, Faculty of Medicine, South Valley University, Qena, Egypt.
[b]General Surgery Department, Faculty of Medicine, South Valley University, Qena, Egypt.

Abstract

Background: The existence of a high-grade stenosis in the carotid arteries is thought to increase the risk of stroke in people with asymptomatic carotid illness. Atherosclerotic events like endothelial damage or inflammation leads to stenosis.

Objectives: to assess the rate of carotid artery stenosis in diabetic patients with chronic ischemia of lower limb.

Patients and methods: This cross-sectional investigation was carried out at the Qena University Hospital's Vascular Surgery department. From those visiting the vascular surgery department's outpatient clinic at Qena University Hospital, 100 patients in all were chosen. The trial lasted between six and twelve months.

Results: Relation between carotid artery stenosis and grade of chronic ischemia and it show highly statistically significant differences between them. Relation between HbA1C level and carotid artery stenosis and it show highly statistically significant differences between them.

Conclusion: Patients with persistent lower limb ischemia had a significant frequency of carotid artery stenosis.

Keywords: Carotid stenosis; Diabetic patients; Lower limb ischemia

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*__Correspondence__: yomnabahaaelden@gmail.com

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Introduction

The existence of a high-grade stenosis in the carotid arteries is thought to increase the risk of stroke in those with asymptomatic carotid illness **(Joakimsen et al., 2000)**. Atherosclerotic events like endothelial damage or inflammation lead to stenosis. **(Sacco et al.,** 2001) Due to changes in carotid artery diameter that affect brain perfusion or the formation of thrombi originating from plaques produced at the site of stenosis, these lesions may eventually cause a stroke **(Orlandi et al., 1997)**

The need for carotid stenosis screening is constantly growing due to recent reports of successful carotid endarterectomy or stenting **(Yadav et al., 2004).** Additionally, early detection of carotid stenosis is helpful in managing risk factors with the necessary medication or surgical treatments.

Carotid stenosis may be diagnosed via duplex ultrasonography, which has a higher diagnostic value in those at risk for developing the condition or in high-risk groups. When the carotid artery stenosis surpasses a 40% decrease in diameter, changes in flow velocities may be seen on ultrasonography (**Hoke et al., 2019)**

Despite the fact that Type 2 diabetes is a known contributor to ischemic stroke, (**Yang et al., 2021)** The aim of this study was to assess the rate of carotid artery stenosis in diabetic patients with chronic ischemia of lower limb.

Patients and methods

This was a Cross sectional researchIn order to fulfill the objectives of this study, the following techniques was followed: A total of 100 patients were selected from those attending the outpatient clinic of vascular surgery Department of Qena University Hospital in the period between May2021 to June 2022.

Inclusion criteria: Patients presented by Diabetes mellitus over 50y old with chronic limb ischaemia.

Exclusion criteria: Patients presented by previous Stroke, hyperlipidemia or history of exposure to Radiotherapy in head and neck malignancy.

Methods: All patients included in the research were subjected to the following:

Detailed history taking including: Personal data: Name, age, sex, occupation, address.

Careful clinical examination: General: **Vital signs** (Temperature, heart rate, blood pressure, and respiration rate), **Vascular clinical examination** supplemented by using (1) continuous wave handheld Doppler:

Investigations: HGB A1C, Lipid profile (Total lipids, Total cholesterol/HDL cholesterol ratio, Serum Total Cholesterol, Serum HDL Cholesterol LDL, VLDL, HDL, serum triglycerides, and serum phospholipids) and Arterial duplex on neck

Accordingly, each patient was put into one of the following groups: Absence of stenosis, mild stenosis (<50 percent diameter stenosis, peak systolic velocity [PSV] >100 to ≤150 cm/s), moderate stenosis (≥50 percent to 69 percent diameter stenosis, PSV >150 to ≤210 cm/s), 4- extreme stenosis (≥70 percent to 99 percent diameter stenosis, PSV >210 cm/s) and preocclusion PSV >210 cm/s and distal PSV <40 cm/s or subtotal PSV <50 cm/s and severe plaque); and occlusion (100 percent diameter stenosis, no flow).

According to HbA1C patients were classified to**:** Group 1(5-7), Group 2(7.1-8) ,Group 3(8.1-9),Group 4 (9.1-10).Group 5(10.1-11). According to chronic ischemia patients were classified to: Grade 1 ABI (0.9-1.3), Grade 2: ABI (0.4-0.8), Grade 3: ABI (0.2-0.4), Grade 4: ABI (>0.2). According to ABI patients were classified to**:** with no detected signals by Doppler and present signals by Doppler.

Research outcome measures: Primary (main): Prevalence of carotid artery stenosis in diabetic patients over 50 years with chronic limb ischaemia. Secondary (subsidiary): Determination of relation between HB A1C level and Prevalence of carotid artery stenosis.

Ethical consideration: Informed permission was acquired from each subject after receiving ethical clearance from the Qena Faculty of Medicine at South Valley University, with

ethical approval code : SVU-MED-VAS015-1-21-2-135 .

Statistical analysis

The acquired data were examined, and manual coding was performed. These numerical codes were entered into the Statistic Package for Social Science Version 26 (SPSS 26) for Windows computer, which performed the statistical analysis. Chi square-test (X2) was employed to compare groups while comparing qualitative data. Student's "t "- test is used to compare quantitative data from two independent samples. For comparing quantitative data from more than two independent samples, use the ANOVA test. Post hoc analysis was used to compare the analyzed subgroups further. Utilizing the "Pearson correlation" correlation coefficient, the link between the variables was studied.

Results

A total of 100 patients was selected from those attending the outpatient clinic of vascular surgery Department of Qena University Hospital their age was ranged between 50-84 years with a mean value of 67.68±9.008 years. HbA1C distribution of the studied group and it was ranged between 5.4-10.9 with a mean value of 7.93±1.344.Carotid Artery Stenosis distribution of the studied group and it was present in 72(72.0%) with a ranged between 25-80 % with a mean value of 50.44±15.443. **(Table .1)**

Relation between CAS and chronic limb ischaemia (according to level of occlusion and ABI) **(Fig.1)**

Relation between HbA1C level and carotid artery stenosis and it show highly statistically significant differences between them (**Table .2)**

Table 1. Distribution of studied sample according to demographic data, incidience of CAS and HBA1C

Variables	Number	Percent
Age		
50 – 60	30	30.0
60 – 70	34	34.0
70 - 80	30	30.0
<80	6	6.0
Range	50-84	
Mean±S.D.	67.68±9.008	
Sex		
Male	36	36.0
Female	64	64.0
HbA1C		
5 – 7	42	42.0
7.1 – 8	14	14.0
8.1 – 9	28	28.0
9.1 – 10	8	8.0
10.1 – 11	8	8.0
Range	5.4-10.9	
Mean±S.D.	7.93±1.344	
Carotid Artery Stenosis		
Absent	28	28.0
Present	72	72.0
<50%	38	38.0
50 – 69 %	22	22.0
70 – 99 %	12	12.0
Range	25-80	
Mean±S.D.	50.44±15.443	

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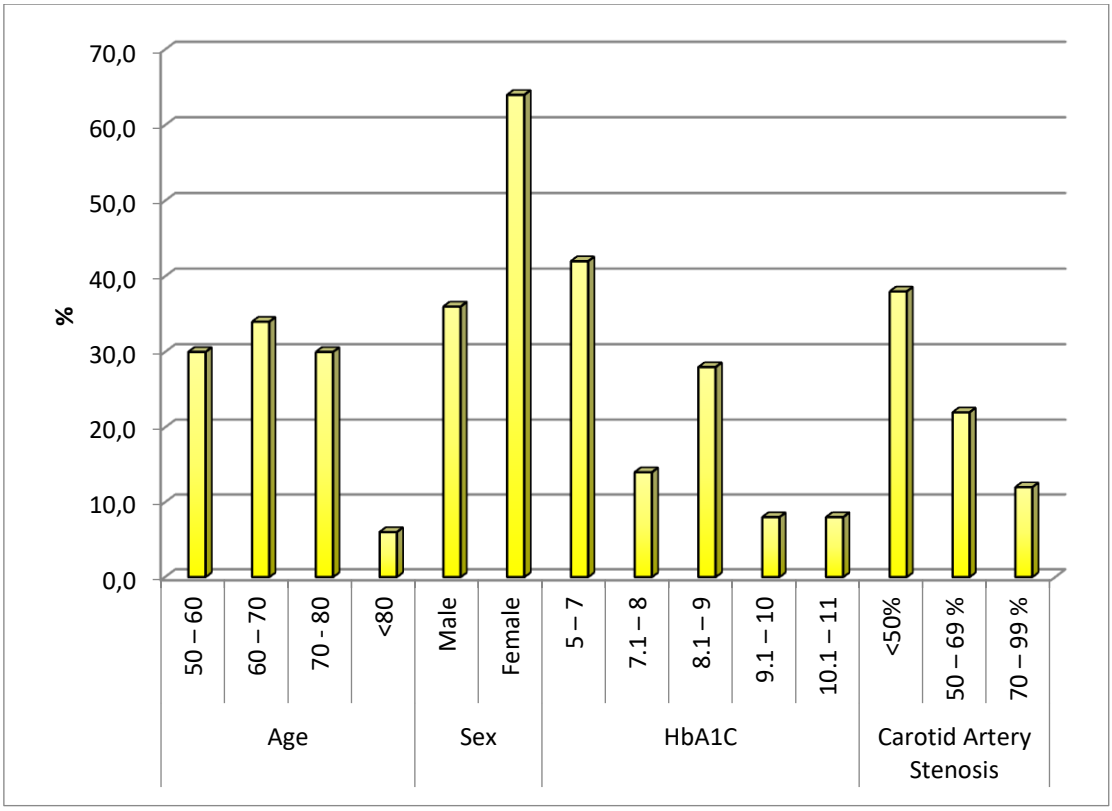

Fig.1. Distribution of studied sample according to demographic data.

Table 2. Relation between HbA1C level and carotid artery stenosis

Carotid Artery Stenosis	HbA1C										P value
	5 – 7		7.1 – 8		8.1 – 9		9.1 – 10		10.1 – 11		
	No.	%	No.	%	No.	%	No.	%	No.	%	
Absent	20	47.6	4	28.6	2	7.1	0	0	2	25.0	0.001*
Present	22	52.4	10	71.4	26	92.9	8	100	6	75.0	
<50%	14	33.3	8	57.1	12	42.9	2	25.0	2	25.0	
50 – 69 %	2	4.8	2	14.3	12	42.9	4	50.0	2	25.0	
70 – 99 %	6	14.3	0	0	2	7.1	2	25.0	2	25.0	
Range	29-74		25-53		25-80		48-80		50-75		<0.001*
Mean±S.D.	49.64±15.948		40.60±10.189		49.54±15.804		61.25±13.382		59.33±12.209		

Discussion

A total of 100 patients WITH age ranged between 50-84 years with a mean of AGE 67.68±9.008 years. 36(36.0%) were male and 64(64.0%) were female, while in the study of **Hoke et al., (2019)** the final analysis comprised 1065 patients in total. At the time of inclusion, the average age was 69 years (IQR 61-76 years), and 668 (62.7%) of the population were men. Whereas **Yang et al., (2021)** revealed that 124 patients who were eligible and gave their agreement to participate in the trial, comprising 64 men and 60 women, ranged in age from 25 to 85, with an average age of 53.2± 6.2 years. Carotid artery stenosis states that issues in all main arterial beds, such as the coronary arteries, carotid vessels, and lower limb arteries, may be brought on by DM-associated atherosclerosis.

Regarding to our study, Carotid Artery Stenosis was present in 72(72.0%). pre occlusion PSV >220 cm/s 2 (2.0%) had Pre occlusion.

According to our results about grade show that 20(20.0%) had G1, 24(24.0%) had G2, 34(34.0%) had G3 and 22(22.0%) had G4. Our findings were corroborated by **Zhang et al., (2019)** investigation which showed that Patients with peripheral artery disease (PAD) had a substantially larger percentage of patients with a CIMT ≥0.71 mm (90/113, 79.65%) than patients without PAD (21/54, 38.89%; P< 0.001). Furthermore, individuals with PAD had a substantially greater prevalence of internal carotid artery plaques (75/113, 66.37%) compared to patients without PAD (6/54, 11.11%; P<0.001).

In the study of **Yang et al. (2021)** 72 occurrences of type I carotid stenosis (58.06%), 30 cases of type II carotid stenosis (24.19%), and 15 cases of type III carotid stenosis (12.10%) were among the 117 patients with type 2 diabetes mellitus who (94.35%) had some degree of damage. There were 84 instances of type 0 carotid stenosis (77.78%), 19 cases of type I carotid stenosis (17.59%), 5 cases of type II carotid stenosis (4.63%), and 0 cases of type III carotid stenosis (0.00%) among the 108 participants in the control group. Compared to the control group, the type 2 diabetes mellitus group had higher occurrences of carotid stenosis.

Also, **De Angelis et al., (2003)** revealed that 17/143 patients (12%) had extensive carotid stenosis; 12 of them had diabetes (70%) and 5 did not (30%) An odds ratio of 3.152, (95% CI, 2.032-4.889), indicating that diabetics were three times more likely to developing carotid stenosis than non-diabetics, was found.
According to HBA1C level, the present study showed that as regard HbA1C distribution of the studied group and it was ranged between 5.4-10.9 with a mean value of 7.93±1.344.

Our findings were validated by the research conducted by Zhang et al., who found that the HbA1c levels varied anywhere, from 5.7% to 19.9% (median: 8.7±2.4%).

According to ABI distribution, the present study showed that as regard ABI distribution of the studied group and it was ranged between 0.2-0.9 with a mean value of 0.61±0.217.

Moreover, **Marso and Hiatt (2006)**stated that Twenty percent to thirty percent of patients diagnosed with PAD also have diabetes mellitus, although this percentage is probably underestimated due to the asymptomatic nature of PAD that is less severe and the altered pain perception that occurs in diabetic patients as a result of peripheral neuropathy. Regarding relation between Carotid Artery Stenosis and ABI, It shows no statistically significant differences between them.

Zhang et al., (2019) According to a single logistic regression study, PAD was strongly linked with internal carotid artery plaques and CIMT≥ 0.71 mm (P <0.05). The only characteristics substantially linked with PAD, according to multivariate logistic regression analysis, were the presence of internal carotid artery plaques (OR: 13.452; 95%CI: 4.450-40.662; P<0.001) and CIMT≥ 0.71 mm (OR: 2.802; 95%CI: 1.092-7.188; P=0.032).

According to relation between HbA1C level and carotid artery stenosis , It show highly statistically significant differences between them, Our findings were corroborated by research of **Hoke et al. (2019)** as they revealed that includes 1,065 people with carotid atherosclerosis who are neurologically asymptomatic (median follow up: 11.8 years). 335 (31.5%) of the individuals had diabetes, with T2DM accounting for the majority (95.3%). According to this research, the adjusted hazard ratio (HR) for all-cause mortality was 1.21 (P<0.01) for every 1% rise in glycated hemoglobin (HbA1c) values.
Also, **Yang et al., (2021)** demonstrated that HbA1C was taken as independent variable for atherosclerosis. The analysis confirmed that carotid stenosis was associated with atherosclerosis.

Conclusion

We may infer from the results of this research that there was a significant incidence of carotid artery stenosis in individuals with chronic lower limb ischemia. There was highly positive significant correlation between HbA1C and Carotid Artery Stenosis.

References

- **De Angelis M, Scrucca L, Leandri M, Mincigrucci S, Bistoni S, Bovi M, et al. (2003).**Prevalence of carotid stenosis in type 2 diabetic patients asymptomatic for cerebrovascular disease. Diabetes NutrMetab, 16(1):48-55. **Hoke M, Schillinger M, Minar E. (2019).**Carotid ultrasound investigation as a prognostic tool for patients with diabetes mellitus. CardiovascDiabetol, 18:90.
- **Joakimsen O, Bonaa KH, Mathiesen EB, Stensland-Bugge E, Arnesen E. (2000).** Prediction of mortality by ultrasound screening of a general population for carotid stenosis: the Tromso Study. Stroke, 31: 1871– 1876.
- **Marso SP, Hiatt WR. (2006).**Peripheral arterial disease in patients with diabetes. J Am CollCardiol, 47:921–929.
- **Orlandi G, Parenti G, Bertolucci A, Murri L. (1997).**Silent cerebral microembolism in asymptomatic and symptomatic carotid artery stenoses of low and high degree. EurNeurol, 38: 39– 43.
- **Sacco RL. (2001).**Clinical practice. Extracranial carotid stenosis. N Engl J Med, 345: 1113– 1118.
- **Yadav JS, Wholey MH, Kuntz RE, Fayad P, Katzen BT, Mishkel GJ, et al. (2004).**for the Stenting and Angioplasty with Protection in Patients at High Risk for Endarterectomy Investigators. Protected carotid-artery stenting versus endarterectomy in high-risk patients. N Engl J Med, 351: 1493– 1501.
- **Yang Z, Han B, Zhang H, Ji G, Zhang L, Singh BK. (2021).**Association of Lower Extremity Vascular Disease, Coronary Artery, and Carotid Artery Atherosclerosis in Patients with Type 2 Diabetes Mellitus. Computational and Mathematical Methods in Medicine.
- **Zhang Y, Zhang H, Li P. (2019).**Cardiovascular risk factors in children with type 1 diabetes mellitus. J PediatrEndocrinolMetab, 32:699-705.