

Incidence and Prevalence of Carotid Disease in Patients with Peripheral Arterial Disease at the CMN La Raza Specialty Hospital

Christian Varela Román^{1*}, Héctor Bizueto Rosas², Tayde Teresa Valdés González³, Oscar Andrés Rodríguez-Jiménez⁴, Estrella Denisse Rosas Zaragoza⁵, Carlos Sebastián Ficachi Morales⁶, Pablo Martín Boada Sandoval⁷, Bárbara Daniela Castro Luna⁶, Gerson Eduardo Guzmán Rodríguez⁶, Perla Lourdes Díaz-Aguirre⁶, Kevin Arturo Orta Luna⁶, Dafne Medina Terán⁶, Melanie Segoviano Sandoval⁶, Angela Elena de Luna Marmolejo⁵, Karla Valeria Diaz García⁵, Andrea Velasco Vázquez⁶ and Noelly Noemí Bizueto Blancas⁸

¹Vascular Surgeon, Guadalajara Jal, Mexico

²General and Vascular Surgeon of General Surgery at Hospital General "Dr. Dario Fernández Fierro" ISSSTE Mexico City, Mexico

³Resident General Surgery, Darío Fernández Fierro, General Hospital, ISSSTE, Mexico

⁴Chief of Vascular Surgery and Angiology, UMAE Hospital de Especialidades, Centro Médico Nacional "La Raza", Mexican Institute of Social Security, Mexico

⁵Resident of Vascular Surgery and Angiology, UMAE Specialty Hospital, National Medical Center "La Raza", Mexican Institute of Social Security, Mexico

⁶Department of Vascular Surgery and Angiology, Mexican Institute of Social Security, Mexico

⁷Vascular Surgeon Ecuador

⁸Undergraduate Internal Medic. Saint Luke School of Medicine, Mexico City, Mexico

***Corresponding author:** Christian Varela Román, Angiologist, Guadalajara Jalisco, Mexico

ARTICLE INFO

Received:  February 18, 2025

Published:  February 24, 2025

Citation: Christian Varela Román, Héctor Bizueto Rosas, Tayde Teresa Valdés González, Oscar Andrés Rodríguez-Jiménez, Estrella Denisse Rosas Zaragoza, Carlos Sebastián Ficachi Morales, Pablo Martín Boada Sandoval, Bárbara Daniela Castro Luna, Gerson Eduardo Guzmán Rodríguez, Perla Lourdes Díaz-Aguirre, Kevin Arturo Orta Luna, Dafne Medina Terán, Melanie Segoviano Sandoval, Angela Elena de Luna Marmolejo, Karla Valeria Diaz García, Andrea Velasco Vázquez and Noelly Noemí Bizueto Blancas. Incidence and Prevalence of Carotid Disease in Patients with Peripheral Arterial Disease at the CMN La Raza Specialty Hospital. Biomed J Sci & Tech Res 60(4)-2025. BJSTR. MS.ID.009487.

ABSTRACT

Introduction: Atherosclerosis is a systemic disease, with Peripheral Artery Disease (PAD) and carotid disease (CD) often coexisting. There is a close relationship between coronary artery disease, PAD and cerebrovascular disease (CVD), associated with increased cardiovascular risk and death.

Objective: To estimate the incidence and prevalence of CD in patients with PAD at the CMN la Raza Specialty Hospital.

Material and Methods: From 2019 to 2024 an ambispective cohort was carried out to determine the incidence and prevalence of CD in patients with PAD, determining the stenosis severity and hemodynamic alterations of the extracranial vessels, with Doppler ultrasound by the same interobserver; the results were analyzed with the statistical program SPSS-27.0.

Results: 120 patients, mean age 70 years, range 50 to 85, bilateral carotid disease in 40% and Rutherford category 5 PAD in 42%; DM2 46%, SAH 76%, smoking 66%, dyslipidemia in 42%, coronary heart disease 12%; overweight 73%. We obtained a prevalence of 16.0 % and incidence of 5.3%.

Conclusions: It is urgent to develop medical care protocols for these entities, especially in CVD, which is devastating and disabling, as they are public health problems, and their prevalence is increasing; vascular screening should be performed as recommended by the Society for Vascular Surgery (SVS).

Keywords: Peripheral Arterial Disease; Carotid Disease; Incidence

Abbreviations: CD: Carotid Disease; PAD: Peripheral Arterial Disease; AID: Aortoiliac Disease; FP: Femoropopliteal; TV: Tibial Vessels; ABI: Ankle-Brachial Index; USDC: Carotid Doppler Ultrasound; TBI: Transient Cerebral Ischemia; IH: Intracranial Hemorrhage; WHO: World Health Organization

Introduction

Worldwide, cardiovascular diseases are currently the main cause of morbidity and mortality, with atherosclerosis being the fundamental pathology, involving the coronary arteries, the aorta, the carotid artery, and lower limbs arteries [1]. Atherosclerosis is a systemic disease, with Peripheral Artery Disease (PAD) and carotid disease (CD) often coexisting. There is a close relationship between coronary artery disease, PAD and cerebrovascular disease (CVD), associated with increased cardiovascular risk and death. Between 10 and 15% of ischemic strokes are caused by carotid disease, most of which are of atherothrombotic origin. The World Health Organization (WHO) defines CVD as a clinical syndrome characterized by the rapid development of signs and symptoms corresponding to a focal neurological condition, and sometimes global, that persist for more than 24 hours or lead to death, with no apparent cause other than a neurovascular origin. The term CVD encompasses Cerebral Infarction (HF), Transient Cerebral Ischemia (TBI), Intracranial Hemorrhage (IH) and Cerebral Venous Thrombosis [2]. CVD is the second leading cause of mortality in the general population and the leading cause of death and disability in women; it has become a public health problem due to population ageing and lifestyle changes [3]. About 3% of individuals over the age of 65 have carotid artery disease. It may be asymptomatic even when the obstruction is severe. 30% of patients may develop TBI. Risk factors for CVD are like those for coronary artery disease, such as tobacco, high cholesterol, high blood pressure, diabetes.

The most common cause is the progression of atheromatous plaques in the carotid arteries [1]. Between 25% and 60% of patients with extracranial CD and no history of coronary artery disease show abnormal cardiac test results; the presence of bilateral CD was shown to be a better predictor of ischemic heart disease [1]. The atheromatous plaque conformation is more important than the degree of stenosis, so it is more appropriate to use the term "carotid disease" instead of "carotid stenosis" [4]. There is a high prevalence (44%) of severe coronary artery disease in patients with symptomatic severe carotid lesion, so even asymptomatic patients should be evaluated for ischemic heart disease [5]. Hernán et al. reported a prevalence of PAD greater than 20% in patients with coronary heart disease [6]. A considerable percentage of patients with PAD go unnoticed, so performing an ankle-brachial index (ABI) is essential as it is a non-invasive

method with sensitivity greater than 90%. An ABI of less than 0.9 is considered a predictor of coronary heart disease, CD, cardiovascular events and higher mortality [6].

Peripheral Artery Disease (PAD)

Patients with PAD are at increased risk of coronary heart disease and cerebrovascular disease. PAD encompasses a wide number of non-coronary arterial syndromes, which are caused by structural and functional alteration of the arteries affecting the extracranial circulation, visceral organs, and extremities; the risk of mortality, from any cause, is three times higher than in patients without PAD [7]. The risk factors most associated with PAD are smoking (OR 4.46) and T2DM (OR 2.71) [8].

Etiology and Risk Factors

Both diseases share SAH, DM2, obesity, smoking, metabolic syndrome, age, and male gender as vascular risk factors, however, smoking and dyslipidemia are the most closely associated factors to CD. According to the WHO (2004), cerebrovascular diseases affect approximately 15 million people per year, of which one third die and another third become permanently disabled [6]. In another report, 50 to 75% of patients with PAD have cerebral atherosclerosis, which carries a high risk of stroke [9]. They both coexist in 3.8% according to Dr. Delio's Thesis [10], as shown in Figure 1. The 4th place in general morbidity and mortality and the second cause of cardiovascular morbidity and mortality [11,12] Therefore, the detection and routine carotid Doppler ultrasound (USDC) prior to vascular surgery may be useful to detect CD in patients with PAD as CVD prevention [13]. USDC screening for carotid stenosis in patients with coronary artery disease who will not undergo revascularization surgery should not be performed routinely (Recommendation class III, level of evidence C) [10]. In CD, atherosclerotic plaque may narrow the arterial lumen and may sometimes ulcerate; We must consider that not only the stenosis degree and flow rate are important to determine the severity of the injuries, but also the surface, length, tandem lesions and soft plates, which are the most unstable. The importance in determining these epidemiological data lies in the fact that CD is one of the preventable causes of HF, also considering that it is also the subtype with the highest rate of recurrence, reaching 26% at three months in patients with TBI [11].

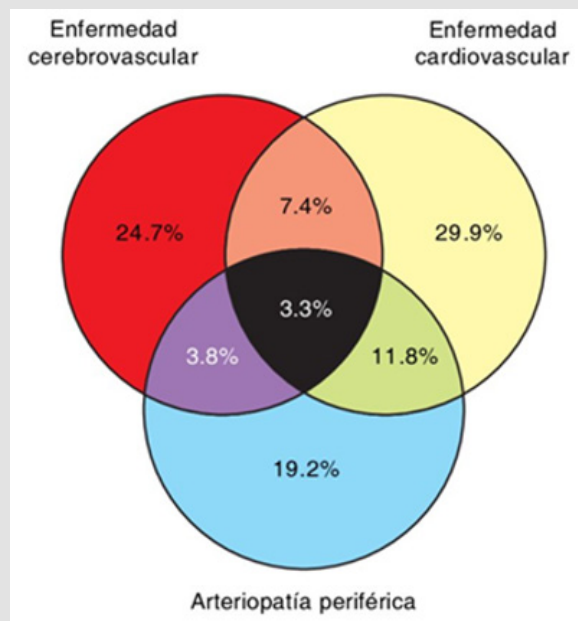


Figure 1: Taken from: Martínez-Blanco Delio Felipe (2019) degree thesis (10).

CD develops later in life compared to coronary heart disease [6]. CD may remain asymptomatic, cause TBI or cerebral vascular events. Patients who debut with HF (30% of cases), if not properly studied, will have a heart attack in less than 3 months in 20%. In Mexico, there are 232 cases per 100,000 people annually and 3 out of 10 dies during the 30 days followed the event, without forgetting that it is an underdiagnosed disease. In the next 8 years, it is expected that more than 60% of people with chronic diseases will die from cardiovascular and brain diseases; according to the WHO, 15 million people suffer a stroke every year (EFE, Oct 26, 2021) and half are left with sequelae and disability (Sánchez-Arreola14). Due to the large amount of information available and the fact that, in our country, there are no incidence and prevalence data, we carried out the following research, what is the CD incidence and prevalence in patients with PAD at the CMN la Raza Specialty Hospital in a period of 5 years? Even though CD is the least common cardiovascular disease, in its most severe form it can produce disabling neurological sequelae and death, so it is important to know the relationship between these two pathologies and intentionally carry out a diagnostic screening for both when one of them occurs, since CD occupies an important place in the causes of dementia and disability as well as family problems, to such an extent that they are currently being implemented by the Preparation of Health Care Protocols Committee, derived from the DOF publication, on June 30, 2023, of integral attention protocols (IAP) which establishes the obligation for the Public Medical Care Administration dependencies and entities, both federal and local, where our institution sets the tone at different levels of medical care [2,14].

Regarding PAD and CD, the USDC is a proven noninvasive diagnostic tool for detecting asymptomatic carotid artery stenosis (CAS) that can assess carotid structural abnormalities, as well as the severity of arterial damage from atherosclerotic changes, in patients with PAD for the prevention of CVD [4,9,13-15]. Computed tomography (CT) and magnetic resonance imaging (MRI) are useful to confirm the diagnosis and evaluate CAS complications, however, carotid stenosis may exist even though there are no visible complications on MRI and CT, so angiography will be the diagnostic method of choice [16].

Treatment

In the case of patients with asymptomatic CD, only those with stenosis between 60 and 99%, a high risk of stroke and life expectancy greater than 5 years should undergo revascularization (carotid endarterectomy, carotid stenting and/or transcervical carotid stenting); all others should remain with optimal medical treatment. In the case of patients with symptomatic disease who have stenosis greater than 50%, the intervention should be performed within the first 14 days of the symptomatic event, to achieve maximum benefit [17,18] Re-stenosis usually begins 3 to 6 months after the procedure, secondary to neointimal hyperplasia. The factors that predispose to re-stenosis are smoking, SAH, DM2, female gender, carotid diameter less than 5 mm, residual stenosis [18,19]. The objective of our research was to estimate the incidence and prevalence of CD in patients with PAD at the CMN la Raza Specialty Hospital.

Results

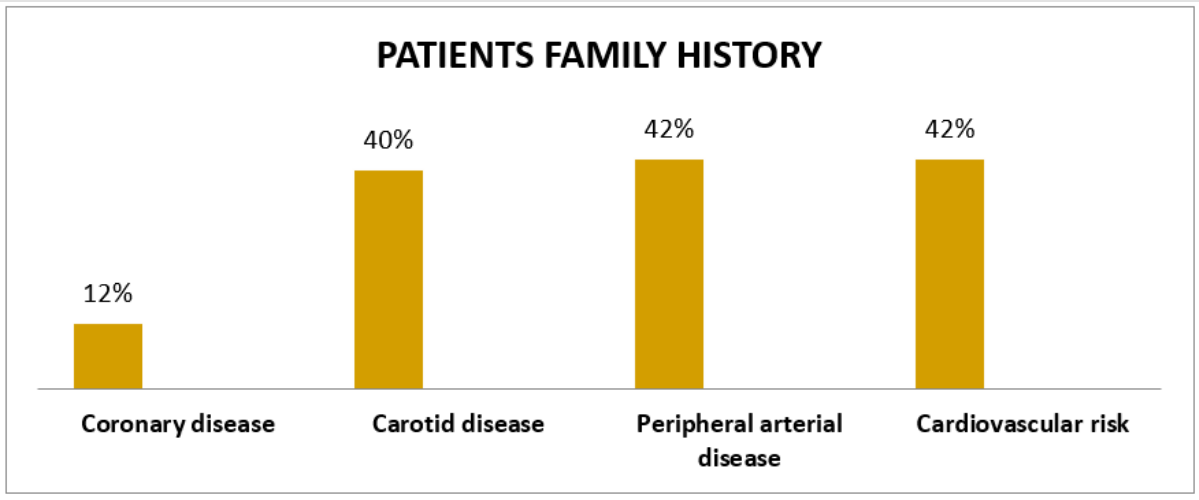
Out of a population of 320 patients with peripheral arterial disease, 120 patients who met the inclusion criteria were included, over a period of 5 years (April 2019 – April 2024); mean age of the patients was 70 years; 78 (65%) were males and 42 (35%) were females, 88 (73%) were overweight, Table 1. Among the risks that could not be modified, such as patients’ family history under study were bilateral carotid disease in 40% and Rutherford’s category 5 PAD in 42%, among others Figure 1. Of the modifiable risks, the personal history was found to be SAH in 76%, smoking 66%, dyslipidemia in 42%, Figure 2. It was observed that the frequency of any degree of carotid ste-

nosis in patients with PAD was as follows: left internal carotid 23%, right internal carotid 24%, left common carotid 20%, left bulb 32%, right common carotid 20% and right bulb 27%, Figure 3. The frequency of carotid stenosis ≥ 50% in patients with PAD was as follows: left internal carotid 16%, right internal carotid with 9%, left common carotid 8%, left bulb 16%, right common carotid 8% and right bulb 10%, Figure 4. The frequency of PAD in patients was as follows: Rutherford 5 femoropopliteal (FP) in 30%, R3 FP in 18%, R 5 EAOI in 16%, and the same VT R5 frequency, 16%. When calculating the incidence of CD, a value of 5.3% and prevalence of 16.0% were obtained. Atheromatous lesions were more frequent on the left side, in the bulb and in the internal carotid Figure 5.

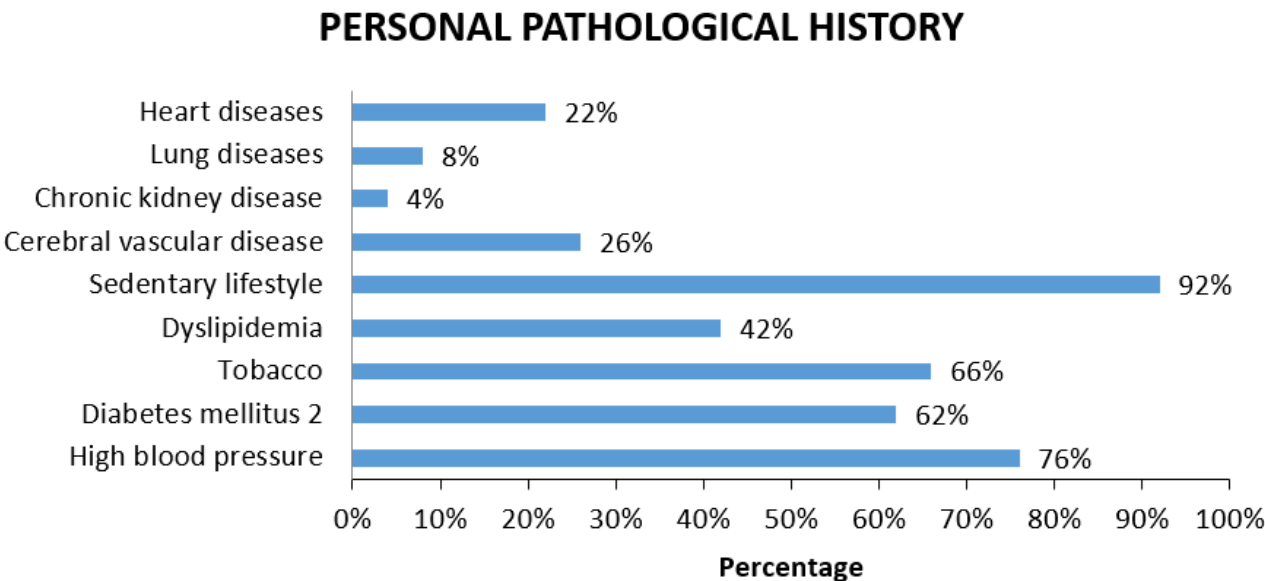
Table 1: Characteristics of patients with peripheral arterial disease. N= 120/320.

Characteristics	Average	Standard deviation
Age	70.3	10.4
Sex	Frequency	Proportions
Male	78	65
Female	42	35
Physical constitution		
Normal	18	15
Overweight	88	73
Obesity grade I (BMI=30-34.9 kg/m²)	14	11.6

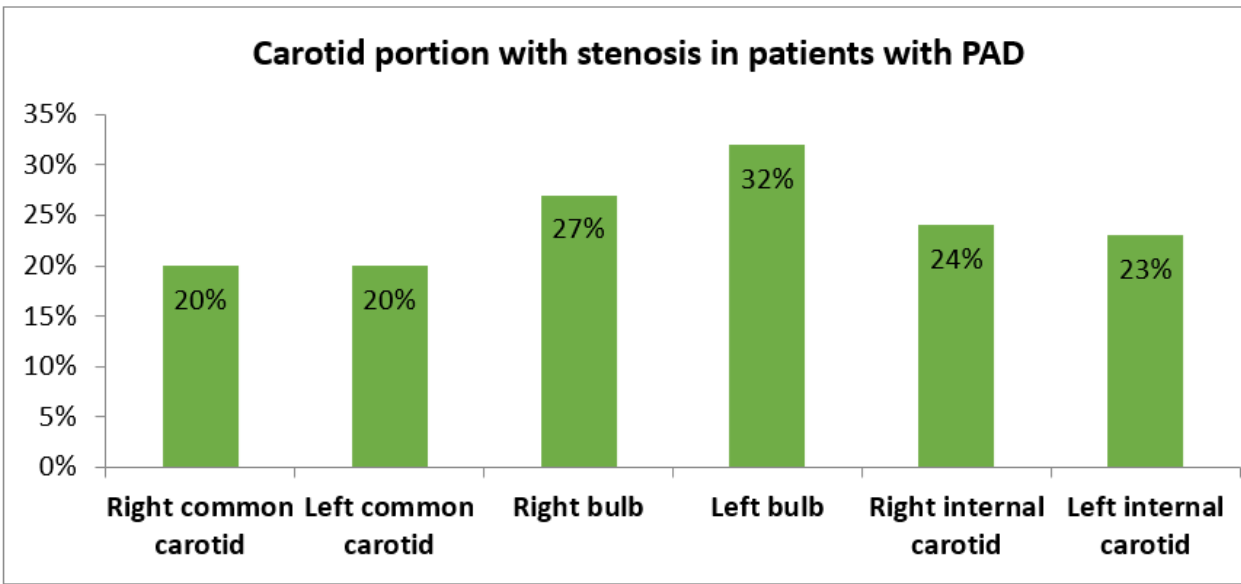
Note: Source: Clinical archive of the “Antonio Fraga Mouret” Specialty Hospital, La Raza National Medical Center and database of the Angiology service.



Note: Source: Clinical archive of the Specialty Hospital and database of the Angiology service.
Figure 2: Modifiable risk frequency in patients with PAD N= 120/320.



Note: Source: Clinical Archive of the “Antonio Fraga Mouret” Specialty Hospital, Medical Center National La Raza and Angiology Service Database.
Figure 3: carotid stenosis degree in patients with PAD. N= 120/320.



Note: Source: Clinical archive of the “Antonio Fraga Mouret” Specialty Hospital, La Raza National Medical Center and database of the Angiology service.
Figure 4: Carotid stenosis $\geq 50\%$ in patients with PAD. N= 120/320.

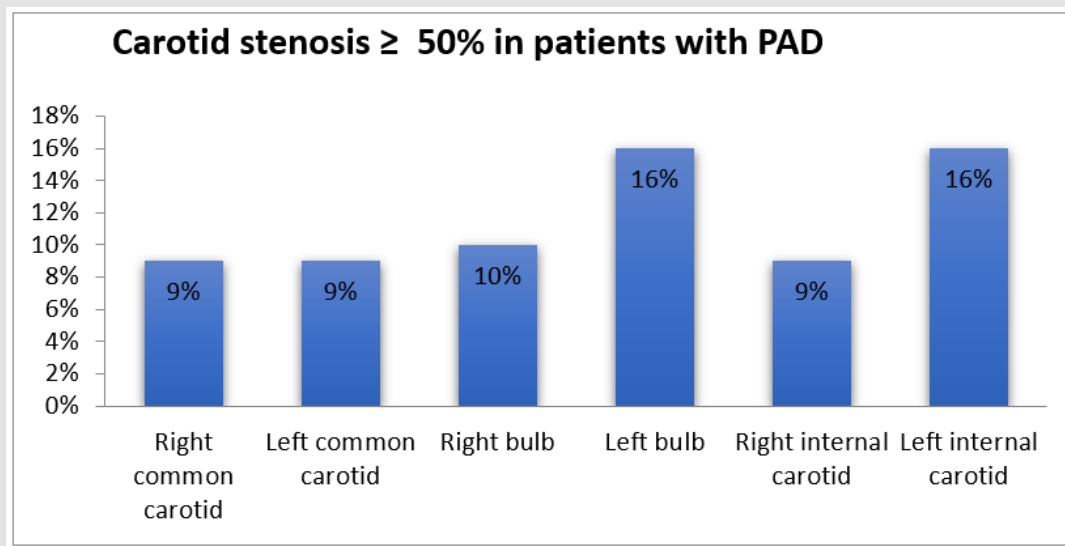


Figure 5.

Discussion

As in PAD, a large percentage of CD occurs subclinically. CD is an early manifestation of subclinical atherosclerosis. Atheromatosis of the extracranial carotid artery is a frequent cause of cerebral infarction and to avoid it, preventive programs should be established [16]. Our institution is the strongest in health services; our hospital belongs to the northern delegation with more than 12 million beneficiaries 10 and since CVD is the main cause of disability, we have the obligation to detect CD on time and exercise appropriate preventive and therapeutic measures. Four things in our research are striking, that 33.3% of patients with PAD have CD in contrast to the international literature, which reports 3.8%, however, in most epidemiological studies, they report that up to 50% of patients with PAD present symptoms of cerebrovascular or coronary heart disease [9,20]. In Latin America, only a quarter of patients who suffer from HF go to an Adequate Hospital Center in a timely manner within the treatment window stage, so 75% are left with sequelae or die, in addition to the fact that neither the patient nor family members know the symptoms of HF [20]. In every minute that passes, up to 1.9 million neurons can be lost, as Dr. Daniel Sánchez Arreola, president of the Mexican Society of Emergency Medicine affirmed [21]. Another important reason for early diagnosis is that it is estimated that one in 6 people in the world will suffer a stroke in their lifetime and most of them could be left with sequelae after the event [22]. It should be noted that in Mexico during the COVID-19 pandemic, mortality increased in 2020 due to this cause. In Mexico, 80% of CVD is ischemic. According to the Manuel Velasco Suarez National Institute of Neurology and Neurosurgery, report that in Mexico 170,000 HFs are registered annually and that it represents the fourth cause of death; however, as we have mentioned,

there are no reliable statistics, to such an extent that in Argentina and Cuba, it is estimated that it represents the second cause of death [23]. Another very important factor that we have to keep in mind, as we had mentioned at the beginning, is that a considerable percentage of patients with PAD remain undervalued as well as patients with CD and even when they do not have manifestations of coronary artery disease (pathology that is among the three main causes of perioperative morbidity and mortality) and above all, those who have risk factors that indicate a higher probability of AMI or sudden death, we must keep in mind that in patients with CD, they have a higher frequency of asymptomatic coronary artery disease; 25 to 60% of patients with CD without symptoms of coronary artery disease have abnormal results in ischemia-provoking tests or angiographic evidence of severe coronary artery disease (considering severe coronary disease to be defined when it affects more than three coronary vessels or the trunk of the left coronary artery), which, as we know, represents 30%. that is, of patients with PAD, 60 to 80% have electrocardiographic abnormalities and of these, 30% require coronary revascularization surgery before cerebral revascularization or, in very selected cases, simultaneous surgery [24]. For this reason, we must take into consideration what Aboyans V et al. mentioned in a second review in 2017, in which they are in favor of screening patients with risk factors for atherosclerosis disease and thus be able to detect problems or lesions in the extracranial vessels [25] Taking into consideration the reports in most studies that refer to a higher percentage of CD involvement in patients with PAD (50 to 75%) 9 and our minor results, we could inline two situations: first, that ultrasound is operator-dependent and second, that in our country, very few radiologists are certified ultrasonographers.

Conclusions

It is urgent to develop medical care protocols for these entities, especially in CVD, which is devastating and disabling, as it is becoming a public health problem, and its prevalence is increasing. Vascular screening should be performed as recommended by the SVS. The objective is to make interventions at the right time to reduce the disability and mortality derived from this condition, which although it is more frequent in people over 65 years of age, currently, due to the high rates of overweight, obesity, high blood pressure and dyslipidemias, cerebral infarctions are increasingly common in younger people [26].

Conflict of Interest

The authors declare that there is no conflict of interest. We agree to accept the open access publication in accordance with the journal's policy.

Ethical Responsibilities

Right to privacy, confidentiality of data and informed consent. The authors state that they have followed their workplace's protocols on publication of patient data and that no patient data appears in this article.

Financing

This research has not received any specific grants from public sector agencies.

References

- Xu M, Zhang M, Xu J, Zhu M, Zhang C, et al. (2019) The independent and add-on values of radial intima thickness measured by ultrasound biomicroscopy for diagnosis of coronary artery disease. *European Heart Journal-Cardiovascular Imaging* 20(8): 889-896.
- (2022) Comprehensive Care Protocols - cardiovascular diseases - Brain Code.
- Brea A, Laclaustra M, Martorell E, Pedragosa A. (2013) Epidemiology of cerebral vascular disease in Spain. *Clinical and Research in Arteriosclerosis* 25(5): 211-217.
- Sposato LA, Klein F (2011) Extracranial atherosclerotic carotid disease. *Neurology Argentina* 3(1): 26-53.
- Álvarez MJ, Rolfo R U B E N, Panero N, Pereyra Sueldo C, Alemandri E M I L C E, Scarlato P A B L O (2006) Relationship between carotid disease and coronary heart disease. Role of the cardiologist. *Rev Fed Arg Cardiol* 35: 117-20.
- Hernán MF, Pérez FS, Sierra CM, Camacho EG, Gamboa CR (2017) Treatment protocol for ischemic heart disease in patients with vascular pathology. *Medicine-Accredited Continuing Medical Education Program* 12(37): 2256-2261.
- Ankle Brachial Index Collaboration (2008) Ankle brachial index combined with Framingham Risk Score to predict cardiovascular events and mortality: A meta-analysis. *JAMA: the journal of the American Medical Association* 300(2): 197-208.
- Lahoz C, Mostaza JM (2006) Ankle-brachial index: A useful tool for stratifying cardiovascular risk. *Spanish Journal of Cardiology* 59(7): 647-649.
- Norgren L, Hiatt WR, Dormandy JA, Nehler MR, Harris KA, et al. (2007) Inter-society consensus for the management of peripheral arterial disease (TASC II). *Journal of vascular surgery* 45(1): S5-S67.
- Martínez-Blanco, Delio Felipe (2019) Arteriographic pattern and morbidity and mortality of atherosclerosis lesions of the lower limbs in the beneficiaries of the "Doctor Antonio Fraga Mouret" Specialty Hospital. (degree thesis). Mexican Institute of Social Security, Mexico City, Mexico.
- (2015) Reviews of Health System: Mexico 2015.
- Soto Estrada G, Moreno Altamirano L, Pahua DD (2016) Epidemiological panorama of Mexico, main causes of morbidity and mortality. *Rev Fac Med (Mex)* 59(6): 8-22.
- Virtanen J, Varpela M, Biancari F, Jalkanen J, Hakovirta H, et al. (2020) Association between anatomical distribution of symptomatic peripheral artery disease and cerebrovascular disease. *Vascular* 28(3): 295-300.
- (2024) Work Report of the Ministry of Health.
- Bluro IM (2015) Peripheral vascular disease consensus: criteria for determining the degree of stenosis in ICA. *Rev Argent Cardiol* 83 (Supl 3): 1-108.
- Clavijo Rodríguez T (2014) Diagnostic imaging of carotid disease. *Cuban Journal of Angiology and Vascular Surgery* 15(2): 129-144.
- Heck D, Jost A (2021) Carotid stenosis, stroke, and carotid artery revascularization. *Progress in Cardiovascular Diseases* 65: 49-54.
- Christian Varela-Román Christian (2023) Incidence and prevalence of carotid disease in patients with peripheral arterial disease at the CMN la Raza Specialty Hospital. (degree thesis). Mexican Institute of Social Security, Mexico City, Mexico.
- Martínez E M, Montealegre F H, Guillén A H, Zúñiga P O, Elizondo M A B, et al. (2021) Update of the European Society of Vascular Surgery guidelines for the management of carotid atherosclerotic disease of 2017. *Medical Journal of Costa Rica and Central America* 85(627): 8-15.
- (2021) Only 25% of patients with stroke are treated in a timely manner EFE, Santo Domingo.
- (2021) Interview with Sánchez-Arreola D. Half of those who suffer a stroke suffer sequelae and disability.
- Adolfo Leyva Rendón. In Mexico, around 170 thousand strokes are registered.
- Austral University Hospital. Stroke is the second leading cause of death in Argentina.
- (2013) ACCF/ACR/AIUM/ASE/ASN/ICAVL/SCAI/SCCT/SIR/SVM/SVS 2012 appropriate use criteria for peripheral vascular ultrasound and physiological testing Part I: Arterial ultrasound and physiological testing. *Journal for Vascular Ultrasound*, 37(3): 145-179.
- De Isla L P, Ducajú G M, García A G, Suero S R, Castro Ó D, et al. (2018) Comments to the 2017 ESC Guideline on the Diagnosis and Treatment of Peripheral Artery Disease. *Spanish Journal of Cardiology* 71(2): 74-78.
- Aizenberg DJ (2016) Cardiovascular testing in asymptomatic patients: Carotid duplex, cardiac stress testing, screen for peripheral arterial disease. *Med Clin North Am* 100(5): 971.

ISSN: 2574-1241

DOI: [10.26717/BJSTR.2025.60.009487](https://doi.org/10.26717/BJSTR.2025.60.009487)

Christian Varela Román. Biomed J Sci & Tech Res



This work is licensed under Creative Commons Attribution 4.0 License

Submission Link: <https://biomedres.us/submit-manuscript.php>



Assets of Publishing with us

- Global archiving of articles
- Immediate, unrestricted online access
- Rigorous Peer Review Process
- Authors Retain Copyrights
- Unique DOI for all articles

<https://biomedres.us/>