The impact of gender on differences in the diagnosis of peripheral arterial disease: The staggering effects of social determinants seen highest in women

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ABSTRACT

Peripheral arterial disease (PAD) is a clinical manifestation of atherosclerosis, affecting primarily the peripheral vasculature in the lower extremities. In its terminal form, PAD can result in critical limb ischemia with subsequent amputation if inappropriately managed. As the prevalence of PAD continues to rise in the United States, disparities in its incidence and treatment have become a major focus point of cardiovascular research. However, most research efforts thus far have focused on the presentation and treatment of PAD in men. Given that women appear to be just as affected by PAD as men, more emphasis is needed on understanding the disparities and challenges affecting women with PAD. This paper aims to identify disparities in the treatment of PAD between males and females, with a closer look at gender disparities between Hispanic and non-Hispanic patients.

Keywords: Peripheral arterial disease, women, Hispanics, disparities

INTRODUCTION

Peripheral arterial disease (PAD) is a clinical manifestation of atherosclerosis, affecting primarily the peripheral vasculature in the lower extremities.[1] In its advanced form, PAD can result in critical limb ischemia or critical limb threatening ischemia. Therefore, early detection and proactive management are critical to patient outcomes.[2] Diagnosis and treatment can be delayed, however, due to the wide spectrum of its clinical presentations. While there are classical PAD symptoms, such as claudication, lower extremity hair loss, and non-healing ulcers or sores of the legs and feet, PAD is complex, and its frequent atypical presentation complicates its management.[3] Furthermore, changes in its definition (previously based on intermittent claudication, now based on ankle-brachial index <0.90) have contributed to varying estimates of its burden in communities. Nonetheless, recent studies estimate that PAD and its associated conditions affect more than 200 million patients worldwide, and with continued trends in the aging demographic and lifestyle practices in Western culture, the incidence of PAD is predicted to increase.[4]

As the incidence and prevalence of PAD continues to increase in the United States, disparities in its diagnosis, treatment, and outcomes have become a major focus point in cardiovascular research.[5] Notably, the disparity in PAD between men and women is an increasing concern. Recent studies have revealed that women are more likely than men to present with late-stage PAD and PAD-related complications, such as critical limb ischemia, and are less likely to undergo revascularization procedures. What is less clear, however, are the contributing factors for this disparity. This

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paper seeks to outline some of the disparities affecting the diagnosis, treatment, and outcomes of PAD between males and females in both Hispanic and non-Hispanic populations.

Methods

One hundred patients were examined during follow up visits for PAD-related care at Texas Tech University Health Sciences Center-University Medical Center in Lubbock, Texas, as a summer initiative to investigate the leading determinants of care affecting patients' access. Patients were previously diagnosed with PAD by history and physical examination, ankle brachial index (ABI), arterial doppler, and angiogram. Diagnostic criteria included symptoms, history and physical presentation, and an ABI of less than or equal to 0.90 for symptomatic patients with normal coexisting comorbidities. Patients less than 18 years of age and greater than 90 years of age as well as pregnant women were excluded. These patients gave informed consent for the study with authors conforming to institutional guidelines and ethics. Other information recorded from patient records included demographics (gender, ethnicity, BMI), social history (tobacco use, alcohol use), and coexisting comorbidities (hypertension, diabetes, heart disease, heart failure, hypercoagulable states, coronary artery disease, hyperlipidemia, kidney disease, and/or history of any other cardiovascular disease).

Participants were presented with a self-reported survey consisting of two sections. No information on nonrespondents was collected. The first section asked study participants two questions related to gender and ethnicity. Options for gender were male (M) and female (F). Options for ethnicity were Hispanic and non-Hispanic. The second section consisted of ten interval-based questionnaires with answers on a scale from 1 to 10. These questions related to perceptions on various determinants of care as shown in Table 1.

To evaluate patient characteristics, frequencies were reported for categorical variables and mean (± standard deviation) were reported for continuous variables. Nonparametric χ^2 tests and Fisher's exact tests were used to assess the association of PAD risk factors/comorbidities to gender (male and female) and ethnicity (non-Hispanic and Hispanic). To evaluate patient's access to care based on various determinants, part two of the survey consisting of ten questions was analyzed. Each question has a scale from 1 to 10 with 1 being least impactful and 10 being most impactful. Two-sample independent t-tests comparing mean results from each question on the survey were used to investigate statistical differences in responses between gender and ethnic groups (male vs. female, non-Hispanic vs. Hispanic, non-Hispanic males vs. Hispanic males, non-Hispanic female vs. Hispanic females). All statistical analysis was performed using IBM SPSS Statistics Version 28 and Microsoft 365 Excel Version 2206. P values <0.05 were considered statistically significant. A second set of authors independently reviewed, calculated, analyzed, and rechecked all data to confirm the findings.

Table 1. Patients were Surveyed on Their Perceptions of the Various Determinants of Care

Q1: Medication Adherence	Q6: Social Support
Q2: Language as a Barrier	Q7: Accessibility
Q3: Transportation as a Barrier	Q8: Symptom Relief
Q4: Employment	Q9: PAD Knowledge
Q5: Education	Q10: Family/Work Obligations

This research project and the data collected were approved by the Institutional Review Board at Texas Tech University Health Sciences Center, Lubbock, Texas (L22-187).

Results

The 100 patients in this study included 55 men, 45 women, 61 non-Hispanics, and 39 Hispanics. When asked which social determinants of health greatly impacted the patents' access to health care, the lack of transportation and increased work/family obligations were among the highest with women. When separated by ethnicity, Hispanic women reported an additional hurdle to healthcare access involving the existence of language barriers between health care providers and patients (Figure 1). Furthermore, when

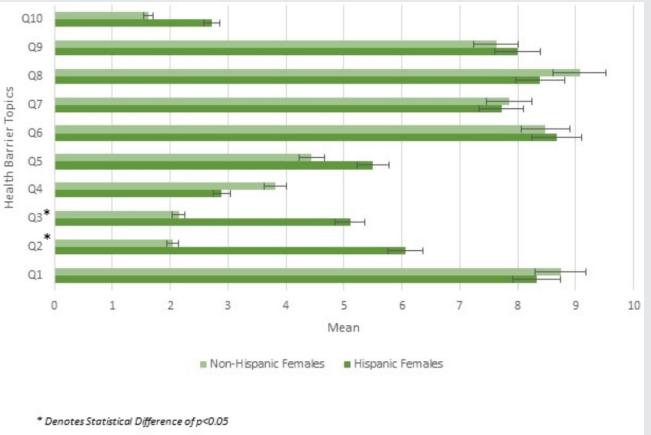

Figure 1. This figure shows distribution of health barriers by ethnicities among women. See Table 1 for determinants.

considering comorbidities, women presented with similar rates of comorbidities as men (Table 2).

Discussion

Our study indicates that numerous barriers and treatment disparities for PAD exist between men and women. These gender disparities emphasize the urgent need for an increased focus on mitigating the barriers that affect both Hispanic and non-Hispanic women. These findings speak to the issues that underlie PAD treatment that warrant further study in patients with PAD. While men have higher rates of comorbidities, women present with similar rates of PAD. Our study appears to be the first to indicate that language and transportation barriers and medication adherence may account for higher prevalence of PAD in women. The most important aspect confirming the gender disparity is the finding that the disparity occurs between non-Hispanic women and men as well as Hispanic women and men. Disparities in PAD care for women affects both minority and general populations, highlighting how ubiquitous this disparity is and the urgent need to address it.

The disparities found in PAD treatment also emphasize the need for mass scale education and outreach to women regarding the prevention and care of PAD. It should also include education programs for primary care physicians to understand this disparity to help resolve it. Just as there are nation-wide campaigns

Table 2. This Table Reports the Demographics and Comorbidities of Male and Female Participants and Hispanic and Non-Hispanic Females

	Overall	Males	Females	His F	NHis F
Demographics					
Age	65.8 ± 12.7	67.2 ± 12.2	64.1 ± 13.1	67.7 ± 9.4	61.7 ± 14.8
BMI	30.5 ± 7.2	29.8 ± 6.4	31.3 ± 8.1	31.4 ± 7.5	31.1 ± 8.6
Comorbidities					
Tobacco History	70.0%	76.4%	62.2%	50.0%	70.4%
Alcohol Usage	59.0%	70.9%	44.4%	33.3%	51.9%
Hypertension	90.0%	92.7%	86.7%	94.4%	81.5%
Diabetes	58.0%	58.2%	57.8%	61.1%	55.6%
Heart Disease	47.0%	58.2%	33.3%	33.3%	33.3%
Chronic Heart Failure	16.0%	18.2%	13.3%	16.7%	11.1%
Hypercoagulable	3.0%	3.6%	2.2%	0.0%	3.7%
Coronary Artery Disease	56.0%	65.5%	44.4%	50.0%	40.7%
Hyperlipidemia	71.0%	76.4%	64.4%	50.0%	74.1%
Kidney Disease	19.0%	20.0%	17.8%	27.8%	11.1%

Values are % and mean ± SD.
His F = Hispanic Females; NHis F = Non-Hispanic Females.

to educate the public on heart disease, similar campaigns and outreach efforts must be put forth to target peripheral artery disease and the disparities that affect its diagnosis and treatment. Through these mass outreach efforts, the ultimate goal is that there will be a significant reduction in women presenting to the clinic with PAD-related complications as well as a reduction in PAD-related mortality. This study confirms that PAD disparities affecting women is a major issue, as the differences between non-Hispanic men and non-Hispanic women were similar to the disparity seen between Hispanic men and Hispanic women.

It is important to state that the term disparity used in this paper may allude to a connotation of purposeful bias. However, this is not the case in our paper. What we are referring to in our study is simply the differences in the social determinants of health that greatly influence patient care. This topic is recognized as one of the many kinds of disparities that has been commonly described in the current medical literature.

Conclusion

This study identified a notable difference in disparities affecting PAD care between male and female patients. However, while there was a difference between Hispanic men vs Hispanic women and non-Hispanic men vs non-Hispanic women, what was remarkable is that the discrepancy is quite similar with Hispanic women and non-Hispanic women, which indicates that women suffer the most disparities in the overall picture of PAD disparities.

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References

1. Eid MA, Mehta KS, Goodney PP. Epidemiology of peripheral artery disease. Semin Vasc Surg 2021;34(1):38–46. doi: 10.1053/j.semvascsurg.2021.02.005
2. Selvin E, Erlinger TP. Prevalence of and risk factors for peripheral arterial disease in the United States. Circulation 2004; 110(6):738–743. doi: 10.1161/01.CIR.0000137913. 26087.F0
3. Aggarwal NR, Patel HN, Mehta LS, et al. Sex differences in ischemic heart disease: advances, obstacles, and next steps. Circ Cardiovasc Qual Outcomes 2018;11(2):e004437. doi:10.1161/CIRCOUTCOMES.117.004437
4. Demsas F, Joiner MM, Telma K, et al. Disparities in peripheral artery disease care: A review and call for action. Seminars in vascular surgery 2022;35(2):141–154. https://doi.org/10.1053/j.semvascsurg.2022.05.003
5. Schramm K, Rochon PJ. Gender differences in peripheral vascular disease. Seminars in interventional radiology 2018;35(1): 9–16. https://doi.org/10.1055/s-0038-1636515