Impact of Socioeconomic Status on Peripheral Arterial Disease–Critical Limb–Threatening Ischemia (PAD-CLTI): A Review of Health Disparities Among Genders

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Abstract

Background: Low socioeconomic status (SES) is well known to be a significant determinant of health associated with many debilitating cardiovascular diseases. However, knowledge of the impact SES has on peripheral vascular disease remains largely uninvestigated. From our study and review, we aim to provide a focused evaluation of the influence of SES on the care, prevalence, and treatment of peripheral arterial disease (PAD) and critical limb-threatening ischemia (CLTI). **Methods:** A review of 100 consecutive patients with low SES, who were diagnosed with PAD-CLTI at the Texas Tech University PAD Center of Excellence, was collected from April 2022 to July 2022 in order to identify potential barriers responsible for preventing access to health care. Patients were asked to complete a survey questionnaire regarding their perceptions on various determinants of care, including socioeconomic factors (ie, employment accessibility and healthcare affordability), PAD-CLTI knowledge, and adherence to treatment. Additionally, demographics and comorbidities were recorded and analyzed. **Results:** Of the 100 patients recorded, 55% were men and 45% were women. Of this population, 61% were non-Hispanic and 39% were Hispanic. All Hispanic women with PAD reported to be unemployed and reliant on government-based insurance. Although men reported higher rates of comorbidities, women presented with similar rates as men at a much lower mean age. When analyzing our questionnaire, Hispanic women reported multiple hurdles to health care access involving the existence of language barriers ($P<.001$) between healthcare providers and patients as well as transportation access ($P<.01$) to receive PAD care. Work/family obligations were also expressed at higher rates of impact between Hispanic women and non-Hispanic women. **Conclusion:** From our study and review, disparities among various socioeconomic factors appear to have a compelling contribution to the prevalence, care, and treatment of PAD-CLTI, especially in minority women. Although further research may be required, it is clear that disparities in cardiovascular risk factors, prevalence of disease, awareness, and access to health care exist and seem to affect mainly Hispanic women in our study population. To mitigate the negative impact of such disparities, it is urgent to implement community outreach programs to increase awareness and facilitate access.

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Key words: low socioeconomic status, peripheral arterial disease, critical limb-threatening ischemia

Introduction

With upwards of 200 million people globally diagnosed with some spectrum of peripheral arterial disease (PAD)[1,2] or its advanced form, critical limb-threatening ischemia (CLTI), PAD-CLTI presents a significant public health problem. PAD is initially a silent disease, primarily involving the peripheral vasculature of the lower extremities and classically presenting years after onset with claudication, impaired wound healing, neuropathy, and muscular atrophy.[3] Due to its slow progression, the ability for early detection and proactive management can be impaired. The delay in treatment is further compounded by the wide spectrum and frequently atypical presentation of clinical symptoms in PAD-CLTI. With such obscure clinical presentations and slow onset, most affected individuals, especially minorities and women, are unaware of its significant risks. These factors can allow the disease to progress to CLTI. Patients in advanced stages face a greater than 20% mortality rate. For those who undergo amputation, the mortality rate climbs to 48% after 1 year and 71% at 3 years.[2,4] This amputation burden not only affects the patient but also has a tremendous impact on family members, caretakers, and society.

As the incidence and prevalence of PAD-CLTI continues to rise in the United States, disparities in its management have become a popular topic of cardiovascular research. However, PAD-CLTI research efforts have primarily focused on racial disparities, such as differences in the diagnosis, treatment, and outcomes between White and Black Americans.[4-6] Despite the large amount of literature evaluating such disparities, few studies have focused on the burden of PAD-CLTI among other groups, especially minority female populations. From the studies that are available, these minority female populations are more likely to be diagnosed with PAD at an older age and to present with advanced forms of the disease. Furthermore, they are less likely to undergo revascularization procedures. Among the minority population, in general, lower extremity amputation rates increase dramatically due to late diagnosis.[4]

One speculation is that minorities are subjected to high levels of intersectionality with a lack of access to care and health inequality. Studies supporting this theory show high-rate amputation areas associated with African American and Hispanic populations in rural counties.[6] These locations typically have fewer available health care resources and lower utilization of these resources.[7] Regarding this limitation, this paper seeks to outline some of the socioeconomic status (SES) disparities and their relation to PAD-CLTI among gender and Hispanic and non-Hispanic populations.

Methods

We examined all randomly selected patients presenting with PAD-CLTI related care to our institution at the Texas Tech University PAD Center of Excellence as a summer initiative from April 2022 to July 2022. This study is part of an ongoing initiative from our PAD Lonestar registry to evaluate and analyze the numerous health barriers that may be affecting the care, treatment, and diagnosis of PAD. Patients under 18 years of age and over 90 years of age, as well as pregnant women, were excluded. Patients gave informed consent for the study, with authors conforming to institutional guidelines and ethics. Demographic factors were age, gender, ethnicity, insurance status, and employment. Comorbidities of hypertension, smoking status, alcohol use, diabetes, heart disease, chronic heart failure, coronary artery disease, kidney disease, and hyperlipidemia were collected for our study.

Table 1. Patient demographics and characteristics

	Overall	Males	Females	*P*-value	His F	NHis F	*P*-value
Age	65.8 ± 12.7	67.2 ±12.2	64.1 ± 13.1		67.7 ± 9.4	61.7 ± 14.8	
Tobacco history	70.0%	76.4%	62.2%	0.125	50.0%	70.4%	0.048
Alcohol use	59.0%	70.9%	44.4%	0.007	33.3%	51.9%	0.030
Hypertension	90.0%	92.7%	86.7%	0.315	94.4%	81.5%	0.359
Diabetes	58.0%	58.2%	57.8%	0.968	61.1%	55.6%	0.198
Heart disease	47.0%	58.2%	33.3%	0.013	33.3%	33.3%	0.054
Chronic heart failure	16.0%	18.2%	13.3%	0.511	16.7%	11.1%	0.873
Coronary artery disease	56.0%	65.5%	44.4%	0.035	50.0%	40.7%	0.173
Hyperlipidemia	71.0%	76.4%	64.4%	0.191	50.0%	74.1%	0.161
Kidney disease	19.0%	20.0%	17.8%	0.778	27.8%	11.1%	0.562

The above table denotes the patient demographics and characteristics used in the assessment of peripheral arterial disease disparities between male and female populations. Values are % and mean ± SD.
His F = Hispanic female; NHis F = non-Hispanic female

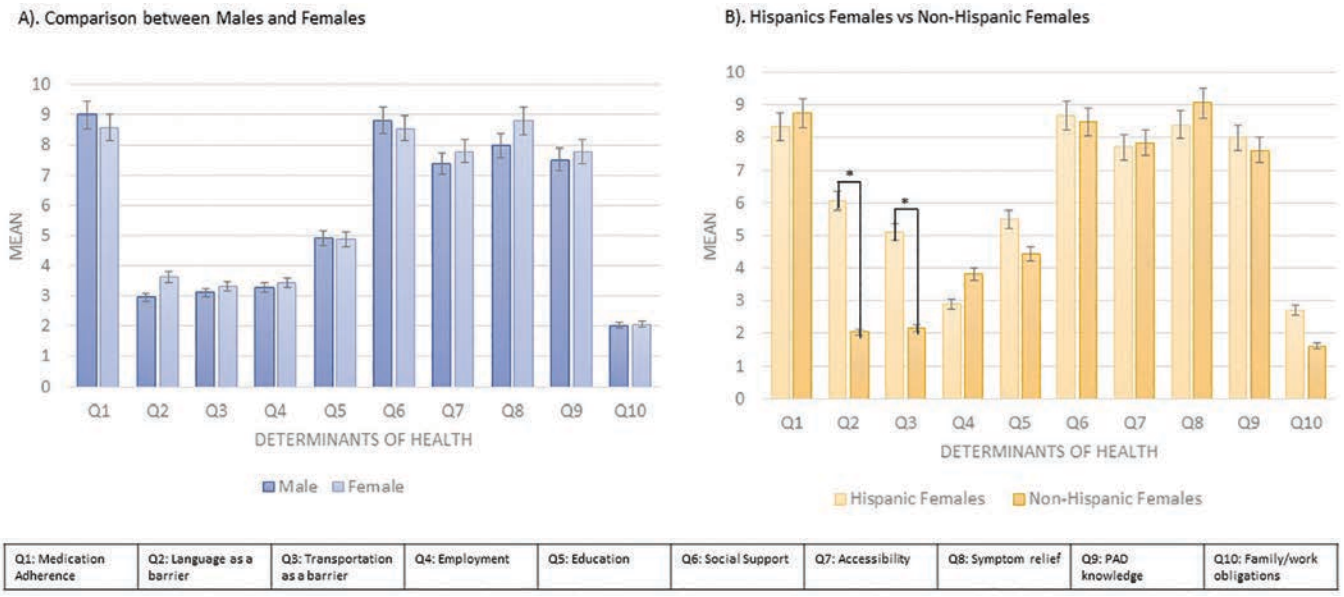

FIGURE 1. Distribution of Determinants of Health Between Gender. (A) There were no statistically significant differences between men and women found. (B) Language and transportation barriers were found to have a significant impact for Hispanic women compared with non-Hispanic women. Additionally, family/work obligations were increased among the Hispanic female population.

Additionally, patients were asked to complete a self-reported questionnaire regarding their own perceptions of potential health barriers that may impact their access to quality PAD care. This included questions on topics of SES, including employment, affordability, accessibility, proper understanding of PAD-CLTI, transportation barriers, language barriers, medication adherence, social support, accessibility, and family/work obligations. Each question consisted of a scale from 1 to 10, with 1 being least impactful and 10 being most impactful. Spanish translators were used as aides to assist the Spanish-speaking-only patients.

For univariable analysis, non-parametric $\chi 2$ tests and Fisher's exact tests were performed to assess association of patient demographics to comorbidities. Two-sample independent t-tests were used to assess the results from each patient's 10-question self-reported survey. All statistical analysis was performed using IBM SPSS Statistics Version 28 and Microsoft 365 Excel Version 2206. $P<.05$ was considered statistically significant.

Results

Answers from a total of 100 patients with PAD were collected and analyzed. The mean age of all patients was 65.8 ± 12.7 years, with 55% men and 45% women. When categorized by ethnicity, 61.0% were non-Hispanic and 39.0% were Hispanic. Patient characteristics are shown in **Table 1**.

Hypertension (90%), hyperlipidemia (71%), and history of tobacco use (70%) were among the most common comorbidities. Alcohol use (59%), diabetes (58%), and kidney disease (19%) also comprised the study population's characteristics. Significant differences in coronary artery disease and alcohol use among men compared with women (men, 65.5% vs women, 44.4%; $P<.035$ and men, 70.9% vs women, 44.4%; $P<.007$ respectively) as well as additional information are reflected in Ansari, Pham, et al.[9] Additionally, non-Hispanic women reported a higher history of alcohol and tobacco use compared with Hispanic women (non-Hispanic women, 51.9% vs Hispanic women, 33.3%; $P<.048$ and non-Hispanic women, 70.4% vs Hispanic women, 50%; $P<.030$, respectively). When categorized into men and women, both genders demonstrated similar rates for most PAD risk factors/comorbidities despite the significant decrease in age difference seen in women. Additionally, all Hispanic patients with PAD reported to be unemployed and reliant on government-based insurance.

From our questionnaire, when asked which social determinants of health greatly impacted their access to health care, no significant differences were reported between the genders. However, findings significantly differed when women were separated by ethnicity (non-Hispanic vs Hispanic). As seen in **Figure 1**, Hispanic women reported increasing hurdles to health care access. These barriers involved the existence of language barriers between health care providers and patients, transportation access, and work/family obligations.

Discussion

The Texas Tech University Health Science Center is located in Lubbock, Texas, providing care to a 300-mile radius in areas

including the Texas Panhandle and Eastern New Mexico. Our institution serves over 3 million patients, many from rural and/or urban areas. We extrapolated the initial data from Ansari, Pham, et al[8] and performed a more detailed analysis over the aspects of disparities that emphasize socioeconomic impacts on PAD care. From our data, lack of employment among Hispanic women appeared to greatly impact not only the disparities seen within the subset of population for PAD care but also issues involving dynamics within the family and culture. This is another potential issue that may be related to underlying causes of health care disparities. As seen, accessibility, affordability, and availability serve as the prime factors in influencing patient utilization of health care.[9] Any discrepancy among these factors may result in substantial barriers to care among patient populations.

SES of individuals emphasizes the variation in levels of the 3 aforementioned factors. With lower SES status, patients have historically faced significant barriers to health care. Importantly, all the women in our study were unemployed, which could possibly contribute to the subsequent barriers of transportation, language, and work/family obligations. As noted in the results section, transportation and language barriers were disproportionately significant among Hispanic women when receiving PAD-CLTI treatment. Previous literature has suggested that women with PAD-CLTI face higher rates of severe symptoms and delayed diagnosis compared with their male counterparts.[10] Lack of transportation and access serves as a possible explanation for these findings. These factors are confounded by the predisposition of low SES status, prevalent at higher rates among Hispanic women. Patients who experience the burden of barriers are less likely to seek care, delaying diagnosis and treatment of PAD-CLTI. Without early care, women with PAD-CLLTI are subject to adverse symptoms of muscular atrophy, claudication, and extremity amputation at higher rates compared with their male counterparts. Supplementation of care with means of transportation and interpreters would eliminate barriers that lead to exacerbation of these patients' disease and progression to advanced stages. This implementation would not only improve access to care but also reduce costs to the patient and health care system, avoiding more complicated disease management for advanced PAD-CLTI progression.

Furthermore, there may be a potential cultural aspect put into consideration alongside these barriers to care. As previously noted, none of the Hispanic women who were surveyed were employed. A potential reason behind this could be due to a prevalent ideology within male Hispanic culture colloquially known as "machismo", which encourages Hispanic men to work while Hispanic women tend to stay at home to care for the family.[11] This cultural tendency contributes to a relatively high rate of Hispanic women being unemployed compared with women from other ethnicities. The high rate of unemployment may contribute to a low SES, which in turn impacts their ability to seek care for PAD.

There is no question that PAD-CLTI, its prognosis, and the potential health-related and financial implications for the family, community, and society present a significant burden to our population. If we are to mitigate disparities in health care, it is paramount that we look at how obstacles preventing access and care for PAD can be overcome. Increasing awareness of PAD and improving recognition of disparities challenging at-risk PAD populations among primary care physicians may be one considerable avenue to improve the outcomes for many patients. Being the first point of contact for many, primary care physicians serve as the most valuable link to connect the community of patients with access to health care and facilitate early diagnosis and treatment of PAD-CLTI. This is especially important in marginalized groups where disease progression is most common, precisely due to the lack of early access and diagnosis.

Study Limitations

One must argue the small sample size could be a limitation to the study. However, patients were randomly selected across a spectrum of PAD symptoms in the Texas Tech University Health Science Center of Cardiovascular Excellence. Additionally, input from multiple physicians also found similar representation.

Conclusion

From our study, it is clear that expanding awareness efforts to our local communities and beyond, particularly in those with increased women and minority populations, is imperative. Among many contributing factors that continue to silently feed and increase the burden of PAD-CLTI, lack of knowledge and inadequate awareness are among the top factors highlighted by our study. These factors underscore the importance of increasing our presence in these community and clinical settings and the need to push for more comprehensive education initiatives. We believe that by leveraging both clinical and community resources, we can help alleviate the burden of PAD-CLTI and promote more equitable access to care.

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