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Care of Patients with Peripheral Artery Disease in the Hospitals of the Costa Rican Social Security System

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Abstract

Aim: Cardiovascular diseases are the main cause of death in Costa Rica. Peripheral Arterial Disease (PAD) is considered a silent disease whose health and socioeconomic impact is considered high. Since epidemiological studies do not exist in our country, it is difficult to determine the impact of the problem and the guidelines to follow. The objective of this study was to estimate: prevalence, rate of mortality and cost of treatment of PAD in Costa Rica.

Methods: A descriptive, cross-sectional study was designed, using three main databases, which included 1) all the cases hospitalized with PAD during the year 2008 (962 discharged) in the Caja Costarricense de Seguro Social (CCSS) which treats 96% of the people with this condition, 2) mortality in Costa Rica, as registered by the Instituto Nacional de Estadistica y Censos (INEC) during the years 1997 – 2008, and 3) the "Encuesta Nacional de Salud" survey from 2006. The analysis of variance was used to compare the groups under study.

Results: The prevalence of PAD is 0,02 % in patients younger than 50 year old; 2.5% in subjects aged between 50 and 60 and 8.3% in subjects over 60. The analysis by sex demonstrated predominance in male (55%). The mean age for female subjects was 73 years (CI 95%:71,8- 74,3) and for male subjects was 69.6 (CI 95%:68.7-71.0). The mortality rate ratio was 0.6% per 100,000 habitants; the mean death rate was 74 years. The estimate of the potential loss in life years is approximately 10.2 years.

Conclusion: Since the prevalence of PAD in Costa Rica is similar to that of developed countries, it is important to organize strategies to attend this health priority.

Key words: Peripheral Arterial Disease PAD, prevalence, mortality, cost.

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Unlike other Central American countries, Costa Rica has a special feature in its health system: high life expectancy at birth (76.8 years for men and 81.8 years for women), low infant mortality (8.84%) and low illiteracy (4.8%).

This is the result of its socioeconomic progress and of the public health policies implemented during the last 50 years.

The country faces a peculiar problem, given its achievement in increased years of life: cardiovascular diseases have replaced infectious diseases as the main cause of death.[1]

Amongst cardiovascular diseases, peripheral arterial disease (PAD) secondary to atherosclerosis holds an important place as a cause of morbidity and mortality.[1, 2]

PAD is understood as the condition in which fat deposits (called plaque) accumulate along the walls of the arteries that carry blood to the extremities, causing a calibre decrease that limits flow and perfusion pressure.[2] PAD may be asymptomatic or symptomatic.[1, 4]

This disease appears in a larvate form; given its incidence it is currently an important cause of morbidity and mortality, with a high socioeconomic impact.[3, 4]

Most of the information on this pathology is to be found in meta-analyses based on European and North American populations, where prevalence in persons over 40 years of age is 10-11%.[1, 3, 4] Due to Costa Rica's characteristics in health matters, it is necessary to specify the status of PAD in the Costa Rican population.

Materials and methods

The population that forms the object of the study comprises persons of both sexes who were hospitalized during 2008 in 29 hospitals belonging to the *Caja Costarricense de Seguro Social* [Costa Rican Social Security Institution]; which provided medical care to close to 330 000 hospital admissions, that represent 96% of the country's hospitalizations due to PAD (including public and private service).

A multicenter study that parts from the retrospective review of the medical records of hospitalized patients. Also, the following were used: registered deaths data base from the *Instituto Nacional de Estadística y Censos* [National Institute of Statistics and Census] for the period 1997-2008; the national data from the *Encuesta Nacional de Ingresos y Gastos* [Income and Expenses National Survey] (2004); the *Encuesta de Prevalencia de Factores de Riesgo de Enfermedades Crónicas aplicada en tres áreas de salud* [Survey on the Prevalence of Risk Factors for Chronic Diseases on Three Areas of Health] (carried out by the *Escuela de Salud Pública de la Universidad de Costa Rica* [School of Public Health, University of Costa Rica]) and the Encuesta Nacional de Salud [National Health Survey] (carried out by the *Escuela de Economía de la Universidad de Costa Rica* [School of Economics of the University of Costa Rica] along with the *Instituto Nacional de Estadística y Censos* [National Institute of Statistics and Census].

Besides, data from the *Encuesta de Causas de Consulta Externa y Causas de Consulta de Urgencias* [Survey on Outpatient Consultation and Emergency Causes] of the *Área de Estadística de Salud de la Gerencia Médica de la Caja Costarricense de Seguro Social* [Health Statistics Area of the Medical Management Department of the Costa Rican Social Security Institution].

The definition of PAD, is based on the International Classification of Primary Care (ICPC-2) for cardiovascular health problems.

In this study, the diagnoses reviewed were grouped into: Atherosclerosis of the limb arteries (I70.2), Unspecified peripheral vascular disease (I73.9), Thrombo-embolism of lower limb arteries (I74.3); Thrombo-embolism of the iliac artery (I74.5) and Peripheral angiopathy in diseases classified elsewhere (I79.2).

The International Classification of Diseases ICD-9 (1996) was used to classify the revascularization and amputation procedures (minor, major, disarticulation). As a diagnostic tool, the ankle-brachial index, and in some cases an arteriography, were used.

Costs were calculated as the sum of the costs of medical care during hospitalization days, total cost of outpatient consultation, the cost of medical care in emergency services and the total cost in disability payments made to patients who were treated from these causes.

Statistical Analysis

As a means to assess the quality of data to detect possible errors in recording and codification, the database was reviewed in order to determine concurrence between the diagnoses, procedures performed and associated comorbidity. The quality of data was considered adequate and information was obtained from the institutional database, safeguarding the confidentiality of patients. A statistical analysis was carried out on frequency distribution, variable cross tabulation, calculation of measures of central tendency such as mean; percentiles and modal values. Also, variability measures such as standard deviation and interquartile range were calculated. Confidence intervals were calculated to 95%, and analysis of variance was carried out to determine statistically significant differences between groups.

Results

The CCSS receives annually close to 17 million outpatient visits; these visits represent 76% of medical care provided in the country, considering both public and private sectors; this implies a rate of 3.7 consultations per habitant.[30]

Of the 330 000 hospital admissions, 962 (0.29%) are related to PAD, according to the ICD-10 classification. There is a greater proportion of men, 55%. The patients' average age is 71 years (95%CI: 70.5-72.2), with a median of 73 years, this indicates that 50% of patients converge between 63 and 81 years.

94% of patients are older than 50 years, therefore the distribution shows an inverted pyramid distribution, showing a higher prevalence in men aged 70-74 years and in women aged 80-94 years (Figure 1).

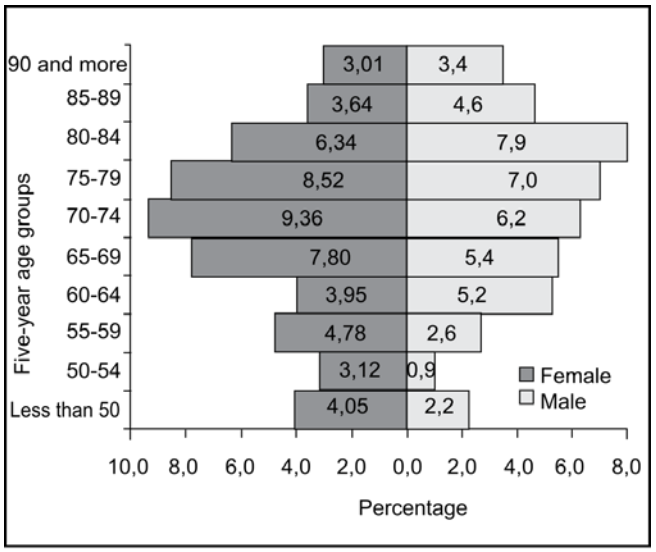

Figure 1. Percentage distribution of patients with PAD per sex according to five-year age groups. CCSS: 2008

The average age of women is 73.0 years (95%CI, 71.8-74.3); 50% of them are between 66 and 82 years, while men have an average age of 69.9 years (95%CI: 68.7-71.0); 50% of them fall between 62 and 79 years.

A growing trend in the prevalence of hospital care due to PAD is shown, according to age groups, evidencing a prevalence below 0.02% in patients under 50 years, then it increases exponentially to reach around 2.5% in the groups of 90 years and older (Figure 2).

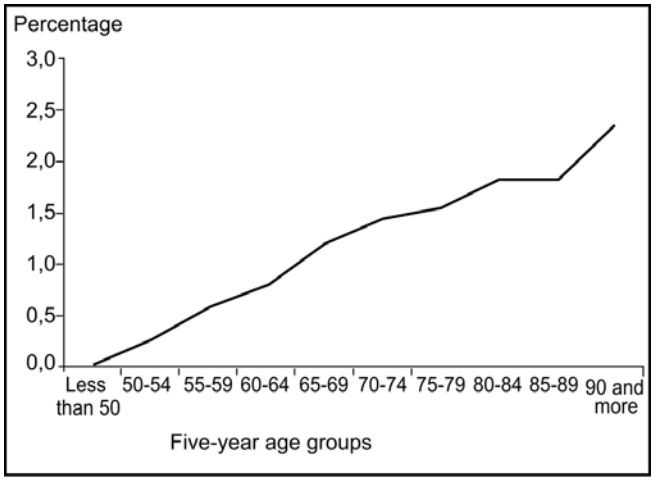

Figure 2. Percentage of patients with LE-PAD, according to age groups. CCSS 2008.

The study found that 489 (50.2%) of patients with any kind of PAD did not undergo any of the

procedures of interest to this study (revascularization and/or amputations).

161 patients (16.7%) underwent revascularization procedures, and they were hospitalized for an average of 13 days; 46.6% were women with an average age of 70 years.

312 (32.4%) patients underwent amputation due to PAD, of whom 57.1% are men; this group has an average age of 73 years and the average hospital stay is 17.8 days.

At the national level, there is an average of 31 deaths per year due to PAD; this represents 0.16 of the total number of deaths observed during the period 2004-2008 (Table 1).

Table 1. Total deaths and due to PAD, per year. Costa Rica 1997-2008.

Year	Total deaths	PAD	
		#	%
1997	14,260	22	0.15
1998	14,708	29	0.20
1999	15,052	16	0.11
2000	14,944	16	0.11
2001	15,608	26	0.17
2002	15,004	19	0.13
2003	15,800	25	0.16
2004	15,949	25	0.16
2005	16,139	25	0.15
2006	16,766	35	0.21
2007	17,071	27	0.16
2008	18,021	28	0.16

The mortality rate observed in the period 1997-2008 due to PAD is 0.60 per every 100 000 inhabitants, with an average age of 80 years.

An average of 10.2 years of potential loss of life is estimated due to this disease. 50% of deaths occur after 82 years of age. The economic cost of hospital care for these diseases was 2672 million colones (5.45 million dollars) for the year 2008.

Discussion

Studies show an increasing curvilinear relationship between prevalence and age, the former is very low amongst young people but increases significantly after 55-60 years, as shown in the population study of San Diego; the risk of PAD nearly doubled for each decade increase in age, regardless of other risk factors.[5] In said study the prevalence of PAD was: 5.8% in persons between 40 and 50 years[6], 11% in persons between 50 to 60 years[7]; in persons over 70 years, this figure exceeds 25%[8-12] These results are 10 times greater than those found in the hospitals of the CCSS, where the prevalence of PAD was: 0.80% in patients between 40 and 50 years, 1.2% in patients between 50 and 60 years.

This study demonstrated that the percentage of patients hospitalized due to PAD was 0.01% in those under 40 years; while this percentage increased to 1.08% in patients 50 years and older.

The socioeconomic, sanitary and educational development of our country in recent years has resulted in high life expectancy at birth (74.4 years for men and 79.7 years for women), low infant mortality and low illiteracy. The trend towards an ageing of the population explains the increase in cardiovascular diseases and associated risk factors (obesity, sedentary lifestyle, tobacco consumption, psychological factors) since the beginning of the third millennium.[13]

Cardiovascular diseases are currently the leading cause of mortality caused by morbidity in Costa Rica, and their health, social and economic impact have reached an important magnitude.[13]

The sex of individuals is a demographic characteristic related to PAD.[9] In our study, out of the 962 hospital admissions, 55% were men and 45% women. This is consistent with the findings of international studies such as Rotterdam Study, that showed a male/female relationship of 1,83.[9] On the contrary, the ARIL study showed a male/female relationship of 0.71.[14,15] Meijer et al, and other studies show that the risk factors are the same for both sexes.[9, 16, 17] According to Juliard et al[18], women in an advanced age have a higher prevalence of PAD than men because they live longer and are generally diabetic, hypertensive, with an atypical PAD that delays diagnosis and treatment.

This article depicts a high median length of stay: 12.8 days on average (2.3 times the overall average length of stay), which is due to the systemic nature of the atherosclerotic disease, whose mortality is high. Since cardiovascular diseases share the same risk factors, coronary; peripheral arterial and carotid disease coexist in the same subject. Out of the patients with clinical PAD, 40-60% suffer from coronary disease[19,20] and 30% from carotid stenosis.[21] In the cardiovascular study Health Study, the prevalence of myocardial infarction was 2.5 times higher in subjects with peripheral arterial disease and 3.3 times higher in subjects with ictus.[10,14,15,21,22] A prolonged hospital stay is also related to the fact that most patients with PAD suffer from multiple chronic non communicable diseases which sometimes remain unnoticed and are usually diagnosed and treated during hospitalization.

With respect to the natural evolution of the disease, this study shows that 2% of patients did not require treatment; 16.7% underwent some kind of revascularization surgical procedure and 32.4% required some form of amputation. This is consistent with other studies on the progression of PAD in patients with claudication, which show that after 5 years: 75% of patients showed stabilization or improvement of symptoms and only 25% show a progression in the disease that requires an aggressive strategy[23, 24, 25] In the study, Edinburgh Artery Study, 8.2% of patients with claudication required some kind of amputation.[9] The study SMART, conducted in Holland, showed an amputation rate of 7.6%.[24] This difference may be explained by the fact that studies have been conducted in non-Hispanic white patients. It is important to emphasize that in our study, the rate of amputation is higher than that found in the literature, the explanation is correlated with the high incidence of *Diabetes mellitus* and PAD. It has been recently demonstrated that in diabetic patients, PAD is more frequent, occurs earlier and is more severe than in patients without diabetes. Moreover, in Costa Rica, the onset of *Diabetes mellitus* occurs earlier than in Europe. The relative risk of PAD occurring in diabetic patients is approximately four for men and six for women. The risk of amputation is multiplied by a factor of 10 to 20 in both sexes.[26]

In our country, cardiovascular diseases are the main cause of death. In 2006, mortality due to these diseases represented 24.47% of total deaths; the mortality rate from cardiovascular diseases was 110 per thousand inhabitants, 40% higher than the death rate from cancer in that year.

Unfortunately, the lack of early diagnosis and treatment of PAD has caused a mortality rate of 0.61 per 100000 inhabitants in Costa Rica, with an average age of 80 years and a potential life loss of 10.2. Multiple studies support this correlation.[27] In a meta-analysis including 9 international studies (around 28,000 subjects) it was associated with a high mortality due to cardiovascular disease in patients with PAD, showing a relative risk of between 2 and 5.[28] The direct gross cost of patients with PAD was 2672 million colones (5.45 million dollars), 0.32% of the CCSS' budget. These results are due to the fact that the patient with PAD is a patient with systemic atheromatous disease, carrier of multiple chronic non communicable diseases whose diagnosis, exams, treatment and handling of complications produce a relatively high cost to the CCSS due to the specialized care provided according to the norms established in the clinical guidelines for diagnosis and treatment. Such costs must be added to the ones related to lost productivity of those affected and to the indirect costs associated with the patients' relatives. Some studies promoted by European institutions have estimated the cost per patient with PAD in 13 383 euros[10], this is equivalent to nearly 20000 dollars.

This article illustrates the limitations of retrospective studies such as the over registration of the disease, use of a non-random sample, inability to calculate the incidence, possible variability by professionals in the routine use of different scales of clinical diagnosis. Furthermore, the relationship between PAD and risk factors was not considered nor were parameters of metabolic control or polypharmacy utilized.

Despite the limitations, this study is highly relevant for the country, as it will serve as a basis for future research and for decision-making in health policy and planning.

This work reveals the high socioeconomic impact of PAD considered as a health priority, that demands efforts to aid assessment of the magnitude of the problem and which allow for early diagnosis

and treatment. A majority of publications have shown that the greatest benefits are achieved through the implementation of prevention programs, either at the society (regular exercise, reduction of smoking, combating obesity and diabetes, etc.) or at the individual level.

This study is a window, that allows visualization of the extent of the problem at the national level, and to establish health planning guides that allow the development of new cost-effective strategies that facilitate a better control of cardiovascular risk factors, decrease in the prevalence and incidence of the peripheral arterial disease as well as of its associated morbidity and mortality.

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Abbreviations: PAD: peripheral arterial disease; CCSS, Caja Costarricense de Seguro Social [Costa Rican Social Security Institution]
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