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Low Socioeconomic Status is an Independent Risk Factor for Survival After Abdominal Aortic Aneurysm Repair and Open Surgery for Peripheral Artery Disease

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WHAT THIS PAPER ADDS

In this study the influence of low socioeconomic status (SES) on severity of disease at presentation and survival following vascular surgery was assessed. The present data underline the importance of socioeconomic deprivation as a risk factor for delayed presentation and the prognosis of vascular surgical patients independent of healthcare disparities. Therefore, increasing focus on low SES as a risk factor may improve outcome of socioeconomically deprived patients undergoing vascular surgery.

Objective/Background: The association between socioeconomic status (SES), presentation, and outcome after vascular surgery is largely unknown. This study aimed to determine the influence of SES on post-operative survival and severity of disease at presentation among vascular surgery patients in the Dutch setting of equal access to and provision of care.

Methods: Patients undergoing surgical treatment for peripheral artery disease (PAD), abdominal aortic aneurysm (AAA), or carotid artery stenosis between January 2003 and December 2011 were retrospectively included. The association between SES, quantified by household income, disease severity at presentation, and survival was studied using logistic and Cox regression analysis adjusted for demographics, and medical and behavioral risk factors.

Results: A total of 1,178 patients were included. Low income was associated with worse post-operative survival in the PAD cohort ($n = 324$, hazard ratio 1.05, 95% confidence interval [CI] 1.00–1.10, per 5,000 Euro decrease) and the AAA cohort ($n = 440$, quadratic relation, $p = .01$). AAA patients in the lowest income quartile were more likely to present with a ruptured aneurysm (odds ratio [OR] 2.12, 95% CI 1.08–4.17). Lowest income quartile PAD patients presented more frequently with symptoms of critical limb ischemia, although no significant association could be established (OR 2.02, 95% CI 0.96–4.26).

Conclusions: The increased health hazards observed in this study are caused by patient related factors rather than differences in medical care, considering the equality of care provided by the study setting. Although the exact mechanism driving the association between SES and worse outcome remains elusive, consideration of SES as a risk factor in pre-operative decision making and focus on treatment of known SES related behavioral and psychosocial risk factors may improve the outcome of patients with vascular disease.

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INTRODUCTION

The association between socioeconomic deprivation and poor health in the general population is well documented. Low socioeconomic status (SES) also negatively affects the prognosis and outcome of treatment for a variety of diseases, such as colon carcinoma and pulmonary disease.[1,2] A limited number of studies have demonstrated a similar association between low SES and poor outcome for vascular

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diseases, including stroke and critical limb ischemia (CLI), as well as for vascular surgery.[2–5]

Many of these studies have been performed in the USA, where SES related disparity in access to and provision of healthcare exists and is extensively affected by income.[2,6,7] Consequently, the relationship between low SES and poor outcome is often ascribed to healthcare disparities.[5,7,8] Alternatively, as the prevalence of conventional cardiovascular risk factors and poor lifestyle is higher in socially deprived regions, the association between SES and outcome may also be mediated through patient factors.[9] Owing to healthcare inequality, the impact of SES related patient factors on outcome remains largely undetermined.

Healthcare in the Netherlands is publicly provided and has been credited with being the most equally accessible healthcare system in the world.[10,11] Therefore, minimal differences could be expected in access to and provision of care, including screening and access to medication, both in hospital and in primary care settings. Hence, as opposed to the US system, the Dutch healthcare system provides the opportunity to study the association between SES and outcome irrespective of healthcare disparities.

The objective of this study was to determine SES as a predictor for survival following surgical treatment for peripheral artery disease (PAD), abdominal aortic aneurysm (AAA), and carotid artery stenosis (CAS). Additionally, the study aimed to assess whether SES is associated with severity of disease at presentation.

PATIENTS AND METHODS

Patients undergoing elective open or endovascular surgery under general or locoregional anesthesia for PAD, abdominal aortic aneurysm (AAA), or carotid artery stenosis (CAS) in the Erasmus University Medical Center between January 2003 and December 2011 were retrospectively included. Patients undergoing completely percutaneous procedures under local infiltration analgesia (i.e., carotid artery stenting, lower extremity angioplasty and/or stenting, or percutaneous endovascular aneurysm repair) or open surgical procedures performed under local infiltration analgesia were not included in this study. Identification was done using operation codes and surgical reports. When a patient underwent multiple vascular procedures within the study period, the first operation in this period was defined as the index operation, and survival was assessed from that moment onward. Baseline characteristics were obtained from the medical records and included age at index operation, sex, comorbidities, prior vascular interventions, smoking status (current, former, or never), and body mass index (BMI). Patients without registered and/or obtainable household income (e.g., owing to illegal residency) were excluded. Institutional approval for this study was obtained, and no informed consent was required according to local directives for retrospective studies. The study complied with the principles of the Declaration of Helsinki.

Definitions

Diabetes mellitus was recorded if diabetes was mentioned in the medical history or if patients used insulin or oral diabetic medication. Hypertension was defined as blood pressure >140/90 mmHg or the use of antihypertensive medication, and a history of cancer was defined as past or current malignant neoplastic disease, except for basal cell carcinoma. Further, severity of PAD at presentation was classified as claudication or CLI (Fontaine stages III and IV), and smoking alludes to all active and former smokers. Cerebrovascular disease was defined as mentioning of symptomatic cerebrovascular disease (i.e., transient ischemic attack [TIA] or stroke) and/or a carotid endarterectomy (CEA) or stenting procedure in the medical history. Ischemic heart disease was considered if one of the following was present: reference to previous cardiac ischemic events in cardiology notes, prior coronary intervention, or evidence of myocardial ischemia in provocative pre-operative tests (dobutamine stress echocardiography or myocardial scintigraphy). Finally, prior vascular interventions were defined as either surgical or percutaneous vascular treatment prior to the index operation, not including coronary revascularization.

Follow up

Survival status was obtained by inquiry of the civil registry. The latest date of follow up was considered to be 31 December 2012.

SES

Income is one of the most widely accepted and used methods to quantify SES and was found to provide a superior reflection of SES related health disparities than other approaches such as educational status.[12–14] The income data used for this study were the gross household income earned in 2003, which included every form of income of all people sharing a household or place of residence combined. The household income was not adjusted for household size. However, it has been demonstrated that adjustment for number of members in a household does not improve predictability of the associated health disparities.[13] Incomes were assigned percentiles and quartiles in accordance with the national income distributions, with the first quartile being the lowest income group and the fourth quartile including households with the highest incomes. The annual earnings were obtained from the Dutch Central Bureau of Statistics (CBS) (study ID: 7465). To obtain information on SES, a database consisting of medical data on all study participants was anonymized by authorized data managers employed by CBS and matched to the household income dataset maintained by this entity. Income data are documented on an individual and household basis. According to Dutch privacy legislation, data analysis was only allowed to authorized researchers (KU and FBG) from designated institutions inside a secure environment after approval from the institutional ethical committee. Furthermore, output