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Socioeconomic deprivation is not associated with reduced survival of lung transplant recipients

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ABSTRACT

Background: Important risk factors for long-term survival of lung transplant (LT) recipients are infection, acute graft rejection (AR) and chronic lung allograft dysfunction (CLAD). Socioeconomic deprivation (SED) is associated with increased graft failure rate after heart and kidney transplantation, but has not been investigated in LT recipients. The aim of this study was to evaluate an association between LT recipients' SED status and development of AR, CLAD, and long-term survival.

Methods: This was a retrospective cohort study. Over a 23 y period, 233 patients were identified from the Auckland City Hospital Lung Transplant Registry, Auckland, New Zealand. All patients were divided into two groups according to the 2013 New Zealand Deprivation Index Score.

Results: The incidence of AR in the higher SED group was 34.0/100 person-y (95% confidence interval [CI]: 24.7-46.7/100 person-y) and in the lower SED group 40.2/100 person-y (95% CI: 33.5-48.3/100 person-y) ($P = 0.373$). The incidence of CLAD in the higher SED group was 10.7/100 person-y (95% CI: 6.2-18.4/100 person-y) and 9.3 (6.9-12.5/100 person-y) in the lower SED group ($P = 0.645$). Mortality in the higher SED group was 12.9/100 person-y (95% CI: 9.2-17.9/100 person-y) and 12.4/100 person-y (95% CI: 10.0-15.3/100 person-y) in the lower SED group ($P = 0.834$).

Conclusions: SED status of LT recipients in New Zealand has no negative effect on development of AR, CLAD, and patients' survival.

Introduction

Lung transplantation (LTx) is a well-established treatment for end-stage lung disease.[1] Important risk factors for reduced survival of lung transplant (LT) recipients include older age, comorbidity profile, underlying disease, obesity, malnutrition, infection, acute graft rejection (AR) and chronic lung allograft dysfunction (CLAD).[2-5]

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Socioeconomic deprivation (SED) refers to the material disadvantage of an individual or a group of people relative to the wider community. Its main determinants include education, occupation, and income. SED is emerging as an independent risk factor for reduced long-term survival in cardiovascular, end-stage kidney disease, and after hematopoietic cell, pancreas, kidney, and heart transplantation.[6-11] SED is associated with limited access to health care, nonadherence with medication therapy, increased kidney transplant graft failure and poor patients' survival.[12-14] In the UK, kidney transplant recipients from the least socioeconomically deprived areas had 34% lower mortality at 1 y and 35% at 5 y compared with those living in the most socioeconomically deprived areas (hazard ratio [HR] = 0.66; 95% confidence interval [CI]: 0.57-0.76; $P < 0.001$ and HR = 0.65; 95% CI: 0.54-0.77; $P < 0.001$, respectively).[9] The least socioeconomically deprived heart transplant recipients from the UK also had better outcomes when compared with the most socioeconomically deprived recipients. The most socioeconomically deprived patients had higher long-term all-cause mortality by 27% using the overall survival model (adjusted HR = 1.27; 95% CI: 1.04-1.55; $P = 0.021$) and by 59% with the use of a conditional survival model (adjusted HR = 1.59; 95% CI: 1.22-2.09; $P = 0.001$).[8]

An association between SED and LT recipients' survival has not been investigated. We hypothesized that socioeconomic disparities may have a negative impact on long-term survival of LT recipients. The study aim was to assess an association between SED status of LT recipients and development of AR, CLAD, and long-term survival.

Methods

Study population

It was a retrospective LT registry–based cohort study. Over a 23 y period (from March 1993 to September 2016) 233 patients underwent 238 LTx in New Zealand. Patients' clinical data were obtained from their hospital electronic discharge summaries, outpatient clinic visits, laboratory tests, and radiological and biopsy histology reports. The NZDep2013 index of deprivation (deprivation scale and score) based on the 2013 national census data was obtained using patients' address at LTx.

Socioeconomic deprivation

NZDep2013 is calculated using nine variables including "People aged <65 y with no access to the internet at home", "People aged 18-64 y receiving a means tested benefit", "People living in equivalized households with income below an income threshold", "People aged 18-64 y unemployed", "People aged 18-64 y without any qualifications", "People not living in own home", "People aged <65 y living in a single parent family", "People living in equivalized households below a bedroom occupancy threshold," and "People with no access to a car". These variables represented the dimensions of SED such as communication, income, employment, qualifications, owned home, support, living space, and transport.[15] According to the 2013 Census, there were 1867 Statistic New Zealand (SNZ) geographical units. Each SNZ unit consisted of meshblocks. In 2013, there were 44,211 meshblocks each on average contained 81 people.

Outcomes

Study points of outcome were the prevalence of AR per the first year after LT, the incidence of CLAD, mortality, time to event (CLAD, mortality), and NZDep2013 score.

Asymptomatic LT recipients underwent surveillance lung biopsies at 1, 3, 6, and 12 wk, 6 and 12 mo after LTx. LT patients with fever, cough, dyspnea, hypoxia, and crackles on lung auscultation had diagnostic bronchoscopy sometimes with transbronchial lung biopsies. AR was diagnosed on the identification of lymphocytic or peribronchial infiltrates in lung biopsy specimens and classified as acute vascular (A-grade) or airway (B-grade) rejection.

CLAD was diagnosed with lung function test as a persistent decline in forced expiratory volume in 1 second and/or forced vital capacity ≤80% of the baseline for ≥3 wk. Patients with suspected CLAD underwent high resolution computed tomography imaging and bronchoscopy with transbronchial lung biopsies.

Statistical analysis

Stata/SE (version 13) software package (StataCorp LP, College Station, TX) was used for statistical analysis. Continuous variables were analyzed with the skewness/kurtosis test for the normality of data distribution. If normally distributed continuous variables were expressed as the mean and standard deviation, non-normally distributed data were presented as median and range. Normally distributed continuous variables data were analyzed with the two-sample mean-comparison test and non-normally distributed data with the two-sample Wilcoxon rank-sum test. Categorical variables were presented as an absolute number (n) and percentage (%). Categorical variables were analyzed using the two-sided exact Fisher's test. Mortality per 100 person-y after LT was calculated dividing the number of deaths by time at risk multiplied by 100. Cox proportional hazards regression was used to estimate survival curves adjusting for baseline differences between the higher and lower SED groups. Two-sided *P*-values less than 0.05 were accepted as statistically significant.

An association between SED of LT recipients and the prevalence of AR, incidence of CLAD, and their long-term survival was assessed with comparison of the higher and lower SED groups. Patients with NZDep2013 scores in the upper quartile were allocated to the higher SED group and those with NZDep2013 scores in the lower three quartiles to the lower SED group.

Ethics statement

This study has been registered by the Auckland City Hospital Research Office as an Audit (Research ProjectA+7354).