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Diabetes mellitus mortality in Spanish cities: Trends and geographical inequalities

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ABSTRACT

Aim: To analyze the geographical pattern of diabetes mellitus (DM) mortality and its association with socioeconomic factors in 26 Spanish cities.
Methods: We conducted an ecological study of DM mortality trends with two cross-sectional cuts (1996–2001; 2002–2007) using census tract (CT) as the unit of analysis. Smoothed standardized mortality rates (sSMR) were calculated using Bayesian models, and a socioeconomic deprivation score was calculated for each CT.
Results: In total, 27,757 deaths by DM were recorded, with higher mortality rates observed in men and in the period 1996–2001. For men, a significant association between CT deprivation score and DM mortality was observed in 6 cities in the first study period and in 7 cities in the second period. The highest relative risk was observed in Pamplona (RR, 5.13; 95% credible interval (95%CI), 1.32–15.16). For women, a significant association between CT deprivation

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score and DM mortality was observed in 13 cities in the first period and 8 in the second. The strongest association was observed in San Sebastián (RR, 3.44; 95%CI, 1.25–7.36). DM mortality remained stable in the majority of cities, although a marked decrease was observed in some cities, including Madrid (RR, 0.67 and 0.64 for men and women, respectively).

Conclusions: Our findings demonstrate clear inequalities in DM mortality in Spain. These inequalities remained constant over time are were more marked in women. Detection of high-risk areas is crucial for the implementation of specific interventions.

1. Introduction

Diabetes mellitus (DM) is a major cause of morbidity and premature mortality worldwide. In 2011, 1.39 million people died due to DM, which was the eighth greatest cause of death worldwide [1]. Moreover, the number of people with DM has increased dramatically over the last 20 years [2]. This increase is likely affected by many factors, including better diagnosis, ageing, decreased mortality, and a higher prevalence of risk factors [3–5]. Higher mortality has been described in adults with DM [6], especially women [7]. In Spain, DM is an major public health problem due to its high prevalence, its economic cost, and the number of premature deaths it cause [8]. Estimations of prevalence range from 10% to 15% in adult populations [9], with an age-standardized mortality rate of 10.4 deaths per 100,000 inhabitants [10], and significant geographical variation throughout the country [8].

Several studies have shown that material deprivation is associated with mortality and the development of chronic conditions [11,12]. Evidence supports an association between low socioeconomic position (SEP) and adverse health outcomes in people with DM and other chronic diseases, although the nature of the relationship between SEP and health is poorly understood [13]. Behavioural factors related to DM, such as unhealthy diet, physical inactivity, and cigarette smoking are more prevalent in disadvantaged socioeconomic groups [14]. Moreover, the underuse of interventions aimed at preventing, controlling, or treating complications in low SEP groups translates to poor disease management and poor treatment adherence [13]. In the majority of European countries the risk of DM mortality is higher in low SEP groups, and tends to be higher in women [15,16]. These results are consistent with those obtained in the Whitehall cohort [14], in which a socioeconomic gradient was observed for DM mortality, a phenomenon mainly linked to cardiovascular risk factors. A study of adults with DM reported an excess of mortality by all causes of 28% in the lowest SEP group [17]. In addition to individual characteristics, neighbourhood context may differentially affect the health of individuals as a consequence of healthcare availability, environmental pollution, or attitudes towards health and social support [18]. DM patients living in areas with high deprivation levels have a higher body mass index and more poorly controlled glycaemia, which implies increased morbidity and mortality [19]. A study conducted by Pearce et al. [20] reported an increase in geographical inequalities for a variety of diseases, including DM, during the period 1980–2001. In the United Kingdom, the prevalence of DM type 2 is significantly associated with area of residence, with a higher frequency of DM recorded in areas with higher deprivation levels [21]. These inequalities fluctuate over time. In Finland, a socioeconomic gradient in DM mortality appeared at the beginning of the 1980s for all age groups [22]. Between 1991 and 2003 mortality by all causes in DM patients decreased by 20% in men and 26% in women in non-manual workers, but by only 14% and 19%, respectively, in manual workers. The greatest socioeconomic differences were observed for mortality due to coronary disease and mortality related to alcohol and tobacco consumption [23].

The aim of the present study was to identify geographical patterns in DM mortality in 26 cities in Spain during the periods 1996–2001 and 2002–2007 and to analyse the contribution of socioeconomic factors to these differences in both men and women.

2. Materials and methods

2.1. Design

To identify inequalities in DM mortality at the small-area level in Spanish cities, we conducted an ecological study of trends with two cross-sectional cuts (1996–2001 and 2002–2007) within the framework of the MEDEA project (Socioeconomic and Environmental Inequalities in Mortality in Small Urban Areas of Spanish Cities). This project has been described elsewhere [24].

Spain is organized administratively and politically into 17 autonomous communities (AC) and 2 autonomous cities (Ceuta and Melilla). Our study included 26 Spanish cities in 11 ACs (Alicante, Almería, Avilés, Barcelona, Bilbao, Cádiz, Castellón, Cartagena La Unión, Córdoba, Gijón, Granada, Huelva, Jaén, Las Palmas de Gran Canaria, Logroño, Madrid, Málaga, Murcia, Oviedo, Pamplona, San Sebastián, Santa Cruz de Tenerife, Sevilla, Valencia, Vitoria, and Zaragoza). The total population of these cities is 11,252,297 inhabitants, which equates to 25% of the Spanish population. The geographical unit of analysis was the 2001 census tract (CT). The study population consisted of individuals residing in the aforementioned cities during the period 1996–2007.

2.2. Data and information sources

Deaths with the leading cause of death coded as 250 according to the International Classification of Diseases, 9th Revision (ICD-9), for the period from 1996–1998, and as E10–E14