



The long-term impact of multiple sclerosis on the risk of divorce

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ABSTRACT

Background: Several studies have investigated the impact of multiple sclerosis (MS) on the risk of divorce. However, current evidence is inconclusive and limited by e.g. small sample populations, short follow-up, and/or lack of a control group. The objective of this retrospective, observational study was to estimate the long-term impact of MS on the risk of divorce.

Methods: Swedish patients diagnosed with MS between 1975 and 2012 were identified in a nationwide disease-specific register (the Swedish Multiple Sclerosis Registry) and matched with general population controls based on age, sex, region of residency, and marital status. We used survival analysis to estimate the cumulative incidence proportion of divorce after index (i.e. the MS diagnosis date).

Results: Our final sample comprised 3998 patients and 15,992 general population controls (mean age 44 years; 73% female). Mean follow-up was 10 years (range: 1–37 years). Unadjusted Kaplan-Meier failure functions revealed no significant differences in the cumulative incidence proportion of divorce between patients and controls (log-rank test, $p = 0.902$), or women with MS and female controls ($p = 0.157$). In contrast, men with MS were estimated to have a notably higher incidence of divorce compared with male controls ($p = 0.040$). Cox proportional-hazards model outcomes showed that men with MS had a 21% higher risk (HR: 1.21, $p = 0.032$) of divorce across follow-up compared with male controls when controlling for age, region of residency, and year of diagnosis. No significant adjusted risk increase was found for women with MS.

Conclusions: We show that MS is associated with an increased risk of divorce among men, but not women. Our result should be helpful to inform health policy and clinical interventions, such as relationship counselling programs, and highlight the socio-economic burden of the disease.

1. Introduction

During the last couple of decades, a wealth of evidence has been published with respect to the positive impact of marriage on well-being. (Hu and Goldman, 1990; Murphy et al., 1997; Robards et al., 2012; Murphy et al., 2007; Martikainen and Valkonen, 1996; Goldman et al., 1995; Kaplan and Kronick, 2006; Scafato et al., 2008; Murray, 2000) Research from a wide range of countries and time periods consistently show that those who are married enjoy better physical health and also live longer compared with their unmarried counterparts. The mechanisms behind these associations are not fully understood, but are thought to involve both selection and protection effects (Murray, 2000; Goldman, 1993 May; Waldron et al., 1996; Lillard and Panis, 1996). The former refers to the fact that individuals may be more likely to

become married because of characteristics such as physical attractiveness, earnings potential, and degree of self-sufficiency, which in turn may be associated with better health. Put differently, these healthy individuals are “selected” into marriage. (Joung et al., 1998) On the other hand, research also suggests that marriage may offer a protective effect on health through its causal impact on lifestyle, including spouses’ encouragement of healthy behaviours (e.g. good eating habits and regular physical exercise) and discouragement of unhealthy habits (e.g. tobacco smoking and heavy alcohol consumption) (Verbrugge, 1979; Umberson, 1987). Marriage can also result in improved financial stability (due to two incomes and economies of scale) (Lerman, 2002) which may reduce stress and increase access to healthcare, and also provide emotional and social fulfilment and life satisfaction, (House et al., 1988) in particular for those who are happily married.

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Multiple sclerosis (MS) is a chronic demyelinating and neurodegenerative disease of the central nervous system in most cases associated with extensive morbidity and impaired quality of life. MS is considered to be caused by a combination of environmental exposure and genetic susceptibility, usually affecting individuals between the ages of 20 and 40 years, and is more prevalent among women than men (Compston and Coles, 2008; Confavreux et al., 1980). Due to the significant disability caused by MS, in particular in advanced stages of the disease, many patients are unable to continue working, (Pfleger et al., 2010; Landfeldt et al., 2016) often withdraw from social activities, (Hakim et al., 2000; Beal and Stuijbergen, 2007) and rely on support from spouses, relatives, friends, and other informal caregivers to carry out most activities of daily living (Buhse, 2008; Buchanan et al., 2009; Figved et al., 2007).

A few studies have investigated the impact of multiple sclerosis (MS) on the risk of divorce (Hakim et al., 2000; Pfleger et al., 2010; Stenager et al., 1994; Morales-González et al., 2004; Glantz et al., 2009). However, current evidence is inconclusive and comparison and inference are limited by small sample populations, short follow-up, lack of a control group, differences in outcomes (e.g. remaining in marriage versus remaining in relationship with the same partner), and/or measurement errors associated with self-reported data and cross-sectional assessments (e.g. recall bias and incorrect reporting). Moreover, no study has to our knowledge investigated marital status as an outcome in patients with MS in Sweden. The objective of our study was to estimate the long-term impact of MS on the risk of divorce compared with members of the Swedish general population.

2. Material and methods

2.1. Study design and population

This retrospective, observational study was based on a population of patients with MS and Swedish general population controls for which details and results have been previously reported (Landfeldt et al., 2016). In summary, our patient sample was identified through a nationwide disease-specific registry (the Swedish Multiple Sclerosis Registry, encompassing more than 70 care-units in regions across Sweden (Hillert and Stawiarz, 2015)) and initially comprised all individuals diagnosed with MS between 1975 and 2012. We subsequently excluded patients that were not married or in a registered partnership (defined below) at the time of diagnosis. To obtain a control group, we next matched each patient with MS with four non-MS members of the general population based on age, sex, region of residency, and marital status (the latter to ensure that all patients and matched controls were married and thus at risk for the study outcome, defined below). In the matching procedure, the date of the MS diagnosis was defined as the index date for patients and matched controls.

We extracted patient-level data on age, sex, region of residency, migration, and marital status from the Swedish Total Population Register and the Longitudinal Integration Database for Health Insurance and Labor Market Studies (LISA), and dates of death from the Swedish Cause of Death Register. Patient identifiers were encrypted, and study ethical approval was granted by the Regional Ethical Review Board in Stockholm, Sweden.

2.2. Outcomes

The study outcomes were divorce from marriage or dissolution of registered partnership, assessed as a combined measure. In Sweden, divorce constitutes the only legal termination of a marriage when both spouses are alive. It can be filed by both spouses jointly, or one of the spouses alone, and does not require a showing of wrongdoing by either party (i.e. a so called “no-fault divorce”). Registered partnership, introduced in Sweden in 1995, was a civil union comparable to marriage for same-sex couples, which was replaced by same-sex marriage

following the adoption of a gender neutral marriage legislation in 2009. According to Swedish law, impediments to marriage or registered partnership include: (i) age below 18 years, (ii) direct blood relation, and (iii) marriage or registered partnership with another individual (The Swedish Tax Agency, 2017). For the remainder of this article, we will use the term “divorce” to refer to both divorce from marriage and dissolution of a registered partnership.

2.3. Statistical analysis

We investigated the association between diagnosis of MS and divorce using survival analysis. Specifically, we first estimated Kaplan-Meier failure functions with time (in years) measured from index to first divorce (i.e. the failure event). In the analyses, patients were right-censored for emigration, becoming a widow/widower (or a surviving partner in the case of a registered partnership), death, and date of last available record from the registries (December 31, 2012). We stratified our results by diagnosis of MS (i.e. patients with MS versus controls from the Swedish general population) and sex. We used log-rank tests to compare the cumulative incidence proportion across investigated strata.

Next, we used regression analysis to explore the adjusted impact of MS on the risk of divorce. Specifically, for a comparison of patients with MS and controls, we fitted two Cox proportional-hazards models to our survival data, one for each sex. The models were specified to include diagnosis of MS as the main explanatory variable, and age (at index), region of residency (at index, included as dummy variables), and calendar year (at index, included as dummy variables) to control for confounding effects. We tested the proportional-hazards assumption on the basis of Schoenfeld residuals. All analyses were conducted in Stata 14.

3. Results

A total of 3,998 patients with MS and 15,992 controls from the Swedish general population met all study inclusion criteria, contributing a total of 209,400 person years of observation time. The maximum follow-up was 37 years (1975 through 2012), mean follow-up 10 years, and median follow-up 9 years (IQR 4–15 years). Patients and general population controls had a mean (SD) age of 44 (9) years and 73% were female. Mean (SD) age for females and males were 44 (9) years and 46 (9) years, respectively.

Fig. 1 (panel a) shows the unadjusted cumulative incidence proportion of divorce after index for patients with MS and general population controls. Evident from the Kaplan-Meier failure functions, the incidence of divorce was similar for patients and controls (log-rank test, $p = 0.902$), and at the end of follow-up, 37 years after index, approximately 25% had terminated their marriage. As expected, given that most marriages in Sweden are opposite-sex marriages (as opposed to same-sex marriages), differences in the cumulative incidence proportion of divorce between women and men were not significant (log-rank test, $p = 0.111$), although marginally numerically higher for men (Fig. 1, panel b). Comparing the cumulative incidence proportion for patients with MS and general population controls stratified by sex, we found no significant differences across failure functions for women ($p = 0.157$) (Fig. 2, panel a). In contrast, as shown in Fig. 2 (panel b), our analyses revealed notable differences in the cumulative incidence proportion between men with MS and male controls ($p = 0.040$).

Results from the multivariate Cox proportional-hazards models are presented in Table 1. We found men with MS to have a 21% higher risk (HR: 1.21, p -value = 0.032) of divorce on average across follow-up compared with their counterparts from the general population when controlling for age, region of residency, and calendar year. Women with MS, on the other hand, did not have any significant risk increase compared with female controls (in fact, there was a trend, although not statistically significant, that they had a lower risk). Moreover, as

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