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The effect of socioeconomic status on treatment and pregnancy outcomes in women with epilepsy in Scotland ☆

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ABSTRACT

Compared to the background population, people with epilepsy tend to have lower rates of education and employment, lower rates of marriage and childbearing, and lower overall socioeconomic status (SES). Disparities in epilepsy care based on sociodemographic factors have been observed in the literature, but it is not known whether any such disparities exist in the UK.

The UK Epilepsy and Pregnancy Register is a prospective, observational, registration and follow-up study that was set up to determine the relative safety of all AEDs taken in pregnancy. Here, we report outcomes of registered pregnancies to women with epilepsy living in Scotland from December 1996 to June 2012, based on the degree of socioeconomic deprivation of their postcode area. The Scottish Index of Multiple Deprivation (SIMD) quintile scores from 2006 were used to determine degree of socioeconomic deprivation, and group 1 (most deprived) and group 5 (least deprived) were compared.

There were 1526 pregnancies with complete outcome data to women living in Scotland. Of these, 1453 (95.1%) resulted in a live birth and 68 (4.7%) had a major congenital malformation (MCM). Postcodes could not be reliably identified or verified for an additional three women, who have been excluded from SIMD group analysis. Of all women included in this study, 32.4% were in group 1 and 13.2% in group 5. No difference in MCM rate was observed between the two groups (4.4% in group 1 compared to 4.7% in group 5, $p = 0.84$). Women in group 5 were more likely to take preconceptual folic acid (56.8% compared to 14.0%, relative risk: 4.1; 95% CI: 3.1–5.2) and less likely to have generalized tonic–clonic seizures in pregnancy (13.0% compared to 29.2%, relative risk: 0.4; 95% CI: 0.3–0.7) than those in group 1. Women in group 5 were more likely to be on monotherapy regimens (80.2% compared to 65.9%, relative risk: 1.2; 95% CI: 1.1–1.3), less likely to be on valproate (19.5% compared to 28.0%, $p = 0.05$), and more likely to be on lower doses of the drug (825.9 mg/day compared to 1012.0 mg/day, $p = 0.05$) compared to those in group 1.

Although no change in MCM rate was seen based on SES, differences in treatment between socioeconomic groups do exist, particularly for preconceptual folic acid consumption, AED regimen, and seizure frequency. Greater emphasis on the importance of preconceptual counseling, both to discuss AED choice and folic acid intake, would be of benefit, particularly to those living in areas of high socioeconomic deprivation, to improve equity of healthcare delivery for women with epilepsy in Scotland.

1. Introduction

Epilepsy is a common, chronic neurological disorder with a prevalence of between 4 and 10 people per 1000 [1]. The mainstay of therapy for people with epilepsy involves long-term treatment with antiepileptic drugs (AEDs) to prevent seizures. It is well recognized that a diagnosis of epilepsy affects socioeconomic status (SES). People with epilepsy tend to have lower rates of education [2], employment [2,3], marriage, and childbearing, with lower overall SES [3]. Lower

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SES is also associated with reduced adherence to AED treatment regimens [2], which in turn can lead to reduced seizure control [4].

There is some evidence that SES affects the treatment people with epilepsy receive. A recent study from Sweden by Mattsson et al. observed disparities in epilepsy care and AED prescription patterns based on age and sociodemographic factors [5]. As is the case for the National Health Service in the UK, the Swedish Healthcare Act states that patients should be provided with the care they need regardless of SES. However, in this study, patients with epilepsy were more likely to see a neurologist if they were female, young (less than 34 years of age), well educated (secondary or university level education), had a high income (third quintile or higher), and lived in large cities. Females and young people were more likely to be prescribed lamotrigine, while those over the age of 34 were more likely to be prescribed carbamazepine or phenytoin. Patients with high educational level or high income were more likely to receive lamotrigine and less likely to receive carbamazepine or phenytoin, and those living in large cities were less likely to be prescribed valproate [5]. It is not known whether any such disparities exist in the UK.

It is well recognized that prenatal exposure to AEDs increases the risk of major congenital malformations (MCMs) from the background risk of 1% to 2% to between 4% and 9% [6–9]. These risks are known to be lower with exposure to some newer AEDs such as lamotrigine and levetiracetam and higher with valproate [9–11]. The National Institute of Clinical Excellence (NICE) recommends that prior to pregnancy, women with epilepsy should be specifically informed of the risks and benefits of treatment with individual drugs. The risk of continued use of valproate to the unborn child should be specifically discussed, and all women and girls on AEDs should be offered 5 mg per day of folic acid before any possibility of pregnancy [12]. Access to this standard of care should not be affected by SES. However, if disparities in epilepsy care according to SES exist in the UK, differences in antiepileptic drug prescribing might influence MCM rates between social groups.

The Scottish Index of Multiple Deprivation (SIMD) provides a relative measure of deprivation for each individual postcode in Scotland [13]. It is published by the Scottish government and takes into account seven domains (income, employment, health, education, skills and training, geographic access, housing, and crime) to calculate a rank of social deprivation. The lower the rank, the greater the relative degree of socioeconomic deprivation, ranging from 1 to 6505. Areas can be compared by individual rank, by vigintile, by decile, or by quintile. The SIMD is updated every three years, and postcodes may change ranks across different versions of SIMD. Other deprivation indices are available for the rest of the UK, but these are not directly comparable.

We used SIMD scores to ascertain the effect of socioeconomic status on AED prescribing and MCM rates in women with epilepsy in Scotland. If more frequent exposure to potentially teratogenic AEDs (such as valproate) and higher MCM rates were observed in socially deprived areas, this would suggest inequality in the way epilepsy care is accessed by women in Scotland.

2. Materials and methods

The UK Epilepsy and Pregnancy Register is a prospective, observational, registration and follow-up study that was set up to determine the relative safety of all AEDs taken in pregnancy. In this report, we have focused on all pregnancies to women with epilepsy residing in a Scottish postcode area from December 1996 through to June 2012. Full methodological details have been published previously [9].

Suitable cases were women with epilepsy residing in Scotland who became pregnant while taking AEDs and who were referred before the outcome of the pregnancy was known. Postcodes for all registered pregnancies on the UK Epilepsy and Pregnancy Register computer database were screened, and all Scottish postcodes were isolated. Postcodes were searched individually in the tables provided on the SIMD website [13]. The SIMD quintile score from 2006 was used, and registrations were allocated to groups 1 to 5 based on the SIMD score for their postcode. Group 1 represents the bottom 20% (most deprived) postcodes and group 5 the top 20% (least deprived). The main outcome measures were MCM rate and AED prescription patterns between groups. Secondary outcome measures were preconceptual folic acid intake and the proportion of women having generalized tonic–clonic seizures in pregnancy.

A MCM was defined as an abnormality of an essential embryonic structure requiring significant treatment and present at birth or discovered in the first six weeks of life based on the definitions and lists of disorders in the EUROCAT registry [14].

Major congenital malformation rates and AED prescription patterns as well as patient characteristics were compared for each SIMD quintile group. As there can be some change in the SIMD score over time, in this report, we have concentrated on comparing groups 1 and 5, as it was felt that there would be minimal social mobility between these two extremes of the social status spectrum during the study period.

2.1. Statistical analysis

Malformation rates were calculated as [total number of live births with a malformation] + [total number of pregnancy losses with a malformation] ÷ [total number of live births] + [total number of pregnancy losses with a malformation]. Ninety-five percent confidence intervals were calculated using the traditional method. Fisher's exact test, Mann–Whitney *U* test, and Kruskal–Wallis were used to compare characteristics between groups. Significance was determined at $p < 0.05$.

3. Results

Through to June 2012, from over 7000 prospectively registered pregnancies with complete outcome data, 1526 pregnancies were registered to women residing in a Scottish postcode area. Of these, 1451 pregnancies (95.1%) resulted in a live birth. There were 69 pregnancy losses without a MCM, giving a total of 1457 pregnancies for analysis. Postcodes could not be reliably identified or verified for an additional three cases, and these have not been included in the SIMD group analysis. Sixty-eight pregnancies resulted in infants with a MCM (4.7%). Four hundred and seventy-two women (32.4%) were in group 1 and 192 (13.2%) in group 5 (see Fig. 1 for a graph of the number of registrations by group). Patient characteristics and pregnancy outcome data for groups 1 and 5 are outlined in Table 1.

There was no difference in MCM rate between the two groups, with 4.4% in group 1 and 4.7% in group 5 ($p = 0.84$). There were no significant differences in the types of MCMs seen in the two groups (Table 2). However, there was a nonsignificant increase in the

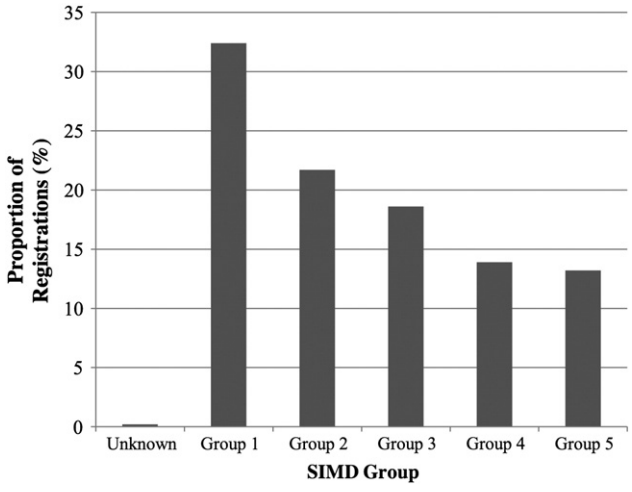

Fig. 1. Proportion of patients in each SIMD group.