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Original article

Impact of socioeconomic status and gender on glycaemic control, cardiovascular risk factors and diabetes complications in type 1 and 2 diabetes: A population based analysis from a Scottish region

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Abstract

Aims. – In this cross-sectional study, the aims were to investigate the association of the socioeconomic status and gender on the prevalence of type 1 and 2 diabetes, glycaemic control, cardiovascular risk factors plus the complications of diabetes in a population-based analysis in the county of Ayrshire and Arran, Scotland.

Methods. – Quality Outcome Framework data was obtained from General Practices in Ayrshire and Arran, Scotland ($n = 15{,}351$ patients).

Results. – In type 1 diabetes, there was an increasing linear trend in HbA_{1c} across deprivation levels ($P < 0.01$). In type 1 diabetes, obesity in women ($P < 0.01$) and increased non-fasting triglyceride levels in both men and women were associated with deprivation ($P < 0.05$). In type 2 diabetes, there was a significant prevalence trend with deprivation for women ($P < 0.01$) but not with glycaemic control ($P = 0.12$). Smoking, ischaemic heart disease and neuropathy ($P < 0.01$) were all associated with increasing deprivation with gender differences. In type 2 diabetes, reduced HDL cholesterol ($P < 0.01$ both genders), and percentage of people on lipid lowering therapy (men $P < 0.05$; women $P < 0.01$) were associated with deprivation. Smoking, ischaemic heart disease, peripheral vascular disease and neuropathy plus foot ulcers ($P < 0.05$) were all associated with increasing deprivation with gender differences.

Conclusions. – Socioeconomic status and gender are associated with changes in glycaemic control and cardiovascular risk factors plus complication development in both type 1 and 2 diabetes. The mechanisms are unclear but follow-up of these patients should allow greater understanding.

Keywords: Type 1 diabetes; Type 2 diabetes; Obesity; Cardiovascular risk; Diabetes complications

1. Introduction

Numerous studies have found an association between health and socioeconomic status [1–4]. There have been numerous reports of variations in diabetes prevalence, management and outcomes between socioeconomic and ethnic groups. Diabetes-related morbidity and mortality appear to be inversely related to socioeconomic status and income, with higher complication rates found in manual, compared with non-manual occupational groups. However, previous studies have predominantly concentrated on type 2 diabetes and have not considered gender differences [4–12]. The National Health Service in the UK has invested substantially in recent years to try and improve standards and to reduce the variations in health care for individuals with chronic conditions such as diabetes [13–16].

In 2004, the Scottish Index of Multiple Deprivation (SIMD) was introduced, replacing the Carstairs index, which had been based on only four indicators (unemployment, overcrowding, car ownership and social class of head of household). SIMD ranks the 6505 geographic data zones in Scotland on the basis

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Table 1
Mean age, deprivation and prevalence for BMI, smoking status, lipid levels, cardiovascular risk factors and diabetes complications by diabetes and gender.

	Type 1 diabetes		Type 2 diabetes	
	Males	Females	Males	Females
Mean (Std Dev) age	42.38 (17.89)	42.98 (19.23)	64.33 (11.89)	66.44 (12.69)
Mean (Std Dev) deprivation quintile	3.07 (1.44)	3.13 (1.39)	3.13 (1.39)	3.29 (1.37)
BMI $\geq 30\,kg/m^2$	219/979 (22.4%)	218/769 (28.3%)	3758/7364 (51.0%)	3446/5992 (57.5%)
Smoking prevalence	246/975 (25.2%)	162/763 (21.2%)	1425/7432 (19.2%)	1171/6071 (19.3%)
Total cholesterol level (> 5 mmol/L or on treatment)	648/916 (70.7%)	524/728 (72.0%)	6467/7401 (87.4%)	5417/6031 (89.8%)
Non-fasting triglyceride (> 1.7 mmol/L)	325/757 (42.9%)	182/585 (31.1%)	3726/6527 (57.1%)	3046/5378 (56.6%)
HDL cholesterol level (males < 1.0 mmol/L; females < 1.3 mmol/L)	153/864 (17.7%)	73/687 (10.6%)	2760/7063 (39.1%)	1132/5809 (19.5%)
On lipid lowering therapy	533/1030 (51.7%)	428/805 (53.2%)	6272/7440 (84.3%)	5179/6076 (85.2%)
Ischaemic heart disease	112/1030 (10.9%)	79/805 (9.8%)	2098/7440 (28.2%)	1334/6076 (22.0%)
Peripheral vascular disease	40/1030 (3.9%)	24/805 (3.0%)	461/7440 (6.2%)	269/6076 (4.4%)
Neuropathy	59/1030 (5.7%)	27/805 (3.4%)	237/7440 (3.2%)	204/6076 (3.4%)
Foot ulcer	28/1030 (2.7%)	10/805 (1.2%)	138/7440 (1.9%)	120/6076 (2.0%)

of the level of deprivation, with 31 indicators across 7 domains, including current income, housing and health [16].

The aims of this cross-sectional study were to investigate the impact of the socioeconomic status and gender on the prevalence type 1 and 2 diabetes, glycaemic control, cardiovascular risk factors plus the complications of diabetes in a population-based analysis in the county of Ayrshire and Arran, Scotland. Ayrshire and Arran has advantages for studies of socioeconomic variations, since the county contains a mix of environments, from post-industrial areas with high unemployment, to affluent rural areas where farming is a key industry.

2. Methods

All 50 general practices using General Practice Administration System for Scotland (GPASS) in NHS Ayrshire and Arran (population 340,377) contributed data from their practice computer systems. The data included type of diabetes, duration of diabetes, body mass index (BMI), HbA_{1c}, smoking status, lipid levels and lipid lowering therapy, and complications including ischaemic heart disease, cerebrovascular disease, diabetic foot ulcers, retinopathy and neuropathy. The data was extracted in October/November 2009.

Socioeconomic groups based on SIMD 2008 quintiles were derived using patient postcodes [17]. SIMD quintiles range from 1 (least deprived) to 5 (most deprived). As a whole, the population of Ayrshire and Arran is more deprived than the rest of Scotland. If the population of Ayrshire and Arran shared the same socioeconomic status to the rest of the Scottish population, one would expect around 20% in each quintile. However, 27.7% of the total population is in the most deprived quintile and only 12.9% in the least deprived quintile. As a result of the skew towards a more deprived population than the rest of Scotland, Health Board weighted (HBW) deprivation figures were used to provide SIMD quintiles for Ayrshire [10]. In addition, if patients with diabetes shared similar levels of deprivation to the rest of the Ayrshire and Arran population one would expect around 20% of the population with diabetes in each quintile.

3. Statistical analysis

Health board weighted prevalence by deprivation carried out using Chi^2 test for linearity after weighting for age. Age weighting necessary as the age profiles differed by gender and calculated by dividing the sample into age quintiles and calculating age weights for males based on the relative percentages in each quintile. Age weights for females were set at 1. Trend analysis for unadjusted risk prevalence by socioeconomic status was carried out using Chi^2 test for linear trend. Glycaemic control by socioeconomic status and gender were estimated using factorial analysis of covariance with age as covariate and Bonferroni tests to compare mean difference between most and least deprived quintiles. Adjusted socioeconomic odds ratios for lipid levels and cardiovascular risk factors were estimated using hierarchical logistic regression with covariates of age, BMI and smoking status controlled. Mean age difference from least deprived quintile tested by Analysis of variance and Bonferroni tests. Polynomial contrasts were used to test for linear trends. All analysis were performed using SPSS version 18.

The audit was registered with the Clinical Governance Department, NHS Ayrshire and Arran, and Caldicott Guardian approval was obtained.

4. Results

There were a total of 15,351 patients on the data file: 1835 (12%) patients with type 1 and 13,516 (88%) with type 2 diabetes. The prevalence's were 0.6% for type 1 diabetes and 4.4% for type 2 diabetes (based on the total GPASS cohort of 303,687).