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Original article

A family history of diabetes determines poorer glycaemic control and younger age of diabetes onset in immigrants from the Middle East compared with native Swedes

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Abstract

Aims. – Immigrant populations from the Middle East develop diabetes earlier than indigenous European populations; however, the underlying etiology is poorly understood. This study looked at the risk factors associated with early diabetes onset and, in non-diabetics, glycaemic control in immigrants from Iraq compared with native Swedes.

Methods. – This cross-sectional population-based study comprised 1398 Iraqi immigrants and 757 Swedes (ages 30–75 years) residing in the same area of Malmö, Sweden. Outcomes were age at diabetes onset and glycaemic control (HbA_{1c}) as assessed by Cox proportional hazards and linear regression, respectively.

Results. – In Iraqis vs Swedes, clustering in the family history (in two or more relatives) was more prevalent (23.2% vs 3.6%, $P<0.001$) and diabetes onset occurred earlier (47.6 years vs 53.4 years, $P=0.001$). Having an Iraqi background independently raised the hazard ratio (HR) for diabetes onset. Diabetes risk due to family history was augmented by obesity, with the highest HRs observed in obese participants with clustering in the family history (HR: 5.1, 95% CI: 3.2–8.2) after adjusting for country of birth and gender. In participants without previously diagnosed diabetes (Iraqis: $n=1270$; Swedes: $n=728$), HbA_{1c} levels were slightly higher in Iraqis than in Swedes (4.5% vs 4.4%, $P=0.038$). This difference was explained primarily by clustering in the family history rather than age, obesity, lifestyle or socioeconomic status.

Conclusion. – The study shows that the greater predisposition to diabetes in Middle Eastern immigrants may be explained by a more extensive family history of the disorder; clinical interventions tailored to Middle Eastern immigrants with such a family history are thus warranted.

Keywords: Heredity; Hyperglycaemia; Middle East; Immigrant; Diabetes onset

1. Introduction

The Middle East is one of five areas in the world where type 2 diabetes (T2D) prevalence is especially high [1]. Migration and urbanization are established risk factors for T2D and cardiovascular disease [2–4]; and in the previous population-based MEDIM (Impact of migration and ethnicity on diabetes in Malmö) study, we showed that, in immigrants from Iraq, the largest non-European immigrant group in Sweden [5], the prevalence of T2D is twice that of the native Swedish population (11.6% vs 5.8%, $P<0.001$) [6]. Similar diabetes prevalences have been reported in other studies conducted in immigrants to Sweden from the Middle East (Turkey, Iran, Iraq and Pakistan) and in studies of immigrants to Norway from Pakistan [7–9].

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Even higher diabetes prevalence rates were reported in a population with Iraqi and Swedish backgrounds living in a deprived Swedish neighbourhood [10]. In 2010, immigrants from Iraq and native Swedes living in the socioeconomically deprived neighbourhood of Rosengård in Malmö were screened for T2D. The prevalence was 20% in both ethnic groups and, notably, the Swedish population in Rosengård had a fivefold higher diabetes prevalence compared with the Swedish population in general [10]. These data are consistent with studies from the United Kingdom (UK), reporting that the diabetes prevalence among adult Europeans, Pakistanis and African Caribbeans exceeds 20%, and that relative poverty, obesity and physical inactivity are likely contributors [11].

Age at diabetes onset also varies across ethnicities with, for instance, diabetes onset in Mexicans and Jamaicans [12] and Pima Indians in the United States (US) [13] often being in adolescence and early adulthood. In the UK, diabetes onset occurs almost 10 years earlier in non-white populations (Black African, Caribbean and South Asian ethnicities) than in whites [14]. Moreover, Israeli Arabs are at higher risk of diabetes and are also reported to be younger at diabetes onset than Israeli Jews [15].

An early age of diabetes onset is associated with a particularly poor prognosis, most notably with regard to diabetic complications and rapidly declining glycaemic control [16]. Recently, results from the US National Health and Nutrition Examination Survey (NHANES) revealed that earlier diabetes onset is associated with poorer glucose regulation [17] and concluded that aggressive individualized treatment could benefit this higher-risk group.

Diabetes accounts for over 8% of excess mortality in the Middle East [18]. However, studies of long-term glycaemic control, as assessed by HbA_{1c}, in ethnically diverse diabetes-free populations are scarce and, thus, it is important to identify the risk factors associated with poor glycaemic control before the onset of diabetes in high-risk ethnically diverse populations. This would help to inform evidence-based guidelines on how best to identify those at risk and help to optimalize preventative interventions for these high-risk groups. In the present population-based survey of Iraqi immigrants in Sweden, the age of diabetes onset was compared with that observed in native Swedes. Also, in a subsample of participants without previously diagnosed diabetes, the factors that explained differences in glycaemic control (HbA_{1c}) in immigrants from Iraq compared with native Swedes were also examined.

2. Methods

2.1. Participants

Individuals born in Iraq represent the largest immigrant group in Malmö, Sweden, collectively accounting for almost 9000 of the city's ~300,000 inhabitants [5]. According to the census register, the population of Iraqi immigrants aged 30–75 years in Malmö in 2010 consisted of 4397 people with a mean age of 44.8 years, of whom 57.8% were men. Swedish-born citizens living in the same geographical area in Malmö were randomly selected from the census register to obtain a similar age and gender distribution as the Iraqi population (mean age 45.2 years, $P = 0.08$; 57.4% males, $P = 0.74$). These Iraqi and Swedish individuals were then contacted by post and phone, and invited to participate in the study. The goal was to recruit a final sample of 2:1 Iraqi and Swedish participants to reach a similar age and gender distribution in the final study participants as in the original background population (Table 1).

Considering the eligible study population that met the inclusion criteria (Iraqis = 2894; Swedes = 2364), Iraqi men and women had a participation rate of 45.9% and 52.1%, respectively, compared with 32.2% and 31.8%, respectively, of the Swedish participants (Fig. S1, Supplementary data). All individuals invited to participate were also asked if they had previously been diagnosed with either type 1 diabetes or T2D. People with type 1 diabetes, or severe physical or mental illness or disabilities, were excluded from the study. To minimize assessment biases, examinations were conducted within a relatively short timeframe (1 February 2010 through 31 December 2012).

2.2. Physical examination

The investigation took place at Skåne University Hospital in Malmö. Swedish- and Arabic-speaking research nurses conducted standard physical examinations. Assessments of standard physical and clinical variables such as blood pressure, height, weight, waist circumference and Body Mass Index (BMI) were performed as described previously [10]. Normal weight was defined as BMI < 25 kg/m^2, overweight as BMI ≥ 25 kg/m^2 but < 30 kg/m^2, and obesity as BMI ≥ 30 kg/m^2 [19]. Abdominal obesity was defined as a waist circumference ≥ 94 cm in men and ≥ 80 cm in women, as recommended for Middle Eastern and white populations by the International Diabetes Federation/American Heart Association/National heart, lung, and blood institute [20].

2.3. Blood samples and oral glucose tolerance tests (OGTTs)

Participants were instructed to abstain from food, fluids (except water) and tobacco from 10 pm the night before the test; they were also asked to bring a record of their current medications. The following morning, a 75-g OGTT was performed. Blood samples were collected prior to glucose loading and at 30, 60, 90 and 120 min thereafter; glucose was measured in fresh plasma from venous whole blood immediately after sampling, using a photometer (HemoCue AB, Ängelholm, Sweden) as described previously [10]. Plasma insulin, total cholesterol, triglyceride (p-TG), high-density lipoprotein (p-HDL), low-density lipoprotein (p-LDL) and HbA_{1c} levels were determined as previously described [10,21].

Normal glucose tolerance (NGT) was defined as fasting glucose levels < 6.1 mmol/L and a 2-h plasma glucose < 7.8 mmol/L. Isolated impaired fasting glucose (IFG) was defined as fasting plasma glucose ≥ 6.1 mmol/L but < 7.0 mmol/L, and a 2-h plasma glucose < 7.8 mmol/L [22]. Isolated impaired glucose tolerance (IGT) was defined as fasting plasma