A natural history of impaired glucose tolerance in North Jordan

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Abstract

The objective of the study was to determine the conversion rate of subjects with impaired glucose tolerance (IGT) to Type 2 diabetes mellitus (NIDDM) and to identify factors which predict such conversion.

Sixty eight subjects previously diagnosed with IGT in a survey conducted in 1995 in Sikhra, a Jordanian town of 10,000 people located in North Jordan, were reassessed for conversion to Type 2 diabetes two years later. A control group of 144 participants in the 1995 survey with normal glucose tolerance was also similarly reassessed for conversion to Type 2 diabetes. Diagnosis of IGT and NIDDM was based on WHO criteria[1].

Of the 68 IGT cases, 10 (14.7%) progressed to Type 2 diabetes, 27 (29.7%) reverted to normal, and the remainder persisted with IGT. A positive family history was a significant predictor of progression to diabetes irrespective of the IGT status. During the two year follow-up period a significantly larger increase in systolic blood pressure (SBP) was observed among those who progressed to Type 2 diabetes compared with those who did not. Age ≥40 and hypertension were consistent with a higher rate of progression to Type 2 diabetes but the association failed to attain statistical significance at the 0.05 level (p = 0.055 and 0.07 respectively).

Key words

diabetes mellitus; impaired glucose tolerance; Jordan

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Introduction

Based on the available evidence, IGT can be considered as a pre-diabetic phase[2,3]. A study among Pima Indians suggested that even transient IGT might be associated with a higher risk of developing Type 2 diabetes[6]. IGT has been linked to coronary artery disease[7,9]. Reported risk factors of IGT are similar to those of Type 2 diabetes[10,12]. Several attempts have been made to delay or prevent progression of IGT to Type 2 by changing lifestyle or prescribing drugs[13,15].

A recent community-based survey in Jordan showed a high rate of Type 2 diabetes (12.4%) as well as high rate of IGT among adults aged ≥25 years. In the present study we report on the progression of subjects identified with IGT in that survey to Type 2 diabetes and attempt also to identify predicting factors of such progression.

Methods

Four community-based surveys of cardio-vascular risk factors were carried out in four Jordanian towns with different geographical locations during the period September 1994 to February 1996. Details of the survey have been published elsewhere[16]. In brief, a systematic sample of households in each town was selected and all individuals aged ≥25 years were eligible for inclusion in the survey. At the local health centre two blood samples were obtained from each participant (fasting and two hours after 75g oral anhydrous glucose challenge) and analysed for glucose. cholesterol, triglycerides and other constituents. Weight, height and blood pressure were also measured. In addition, a structured questionnaire was completed by a trained interviewer. Standard techniques were followed for all measurements.

All subjects identified with IGT in one of the surveyed towns, Sikhra, were invited to the local health centre two years later for reassessment. Of the 121 subjects invited, 68 responded, 10 had moved from the town, and five were dead. A sample of 200 individuals with normal glucose tolerance from participants in the initial survey was selected as a control group. The control group was frequency matched to the IGT group for age (within five years) and sex. Of the 200 subjects selected as controls. 144 responded. The response rate in the baseline survey in Sikhra was 79%.

Both groups (IGT and control) were subjected to the same protocol as that used in the baseline survey. Hypercholesterolaemia (HC) was defined as a serum cholesterol level of > 6.1 mmol/L; hypertriglyeridaemia (HTG) was defined as a serum triglyceride level > 2.2 mmol/L; obesity was defined as a body mass index (BMI) of ≥ 30 kg/m² for males and ≥ 27 kg/m² for females; hypertension (HT) was defined as SBP of ≥ 160 mm Hg, DBP ≥ 95 mm Hg or the use of antihypertensive medication. A positive family history of diabetes refers to diabetes in first and/or second degree relatives.

Results

The rate of progression to Type 2 diabetes is shown in *Table 1*. The rate of progression in-

Table 1. Progression to Type 2 diabetes among the impaired glucose tolerance (IGT) and control groups, Jordan. 1997

	Total	Progressed to Type 2 diabetes	
		n	(%)
IGT group	68	10	14.7
Control group	144	10	6.9
p-value = 0.12			

the IGT group was more than double that of the control group (14.7% and 6.9% respectively) but the difference failed to attain statistical significance at the 0.05 level (p= 0.12).

In the IGT group, 39.7% reverted to normal and 45.6% persisted with IGT. IGT developed in 9% of the control group. In an attempt to identify risk factors for progression to Type 2 diabetes we assessed the rate of progression in relation to a number of variables using the baseline values obtained earlier. As shown in *Table 2*, only a positive family history of diabetes was associated with a significant increase in progression to Type 2 diabetes (p=0.05). Older age (≥ 40 years) and hypertension seemed to predict progress in to Type 2 diabetes but these associations failed to attain statistical significance probably because of the small sample size (p=0.055 and 0.07 respectively). Gender, BMI, HC and HTG seemed to have no relation to subsequent development of Type 2 diabetes.

The rate of progression to Type 2 diabetes was also examined for a relationship with changes in the values of a number of variables between the first and second assessment. A rise in SBP was significantly associated with progression to Type 2 diabetes (p=0.05). Changes in BMI, cholesterol, and triglycerides were not related to progression to Type 2 diabetes.

Discussion

The rate of progression of subjects with IGT to Type 2 diabetes, as observed in the present study, is 7.4% per year of follow-up, which is a strikingly high rate when compared with data from the United Kingdom[12] (1.5% per year of follow-up) and even with the Pima Indians of the United States[2] (7% per year of follow-up). It should be noted that the progression rate was also high (3.5% per year of follow-up) among the control group, which may be consistent with the recent changes in lifestyle among Jordanians and provide an explanation for the high prevalence of Type 2 diabetes recently observed in

Table 2. *The relationship of a number of variables to subsequent progression to Type 2 diabetes in the study population (n=212) over a follow-up period of two years, Jordan, 1997*

Variable	Total	% Converted to Type 2 diabetes	p-value
1. Age			
< 40 years	77	3.9	
> 40 years	130	13.1	0.055
2. Hypertension			
No	157	7.0	
Yes	47	17.0	0.07
6. Family History			
No	96	4.2	
Yes	99	13.1	0.05

this population (12.4%).

Comparison of participants in the present study with non-participants showed no evidence of selection on the basis of potential risk factors for progression to Type 2 diabetes. However, given the small sample size and the short period of follow-up in this study, we feel that the problem should be further investigated using larger sample size and/or longer period of follow-up.

Conclusion

In conclusion, IGT in Jordan is associated with a strikingly high risk of progression to Type 2 diabetes. A family history of Type 2 diabetes and a rise in SBP were the only significant predictors of progression to Type 2 diabetes.

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Key points

- The study reports on the progression to Type 2 diabetes, of subjects identified earlier as having impaired glucose tolerance in Jordan. The rate of progression was more than double that of a control group.

- A positive family history of Type 2 diabetes was identified as the major risk factor for progression from IGT to Type 2 diabetes. Older age and hypertension might predispose to the progression. Gender, BMI, HC and HTG had no correlation.

- Recent changes in lifestyle among Jordanians might explain the high prevalance of Type 2 diabetes (12.4%) recently observed in this population.