2022 Best Research Poster Award

Risk Factors for the Progression or Regression to Diabetes or Normoglycaemia for Men with Impaired Fasting Glucose

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Introduction

Diabetes mellitus is a chronic metabolic disease. The progression from normoglycaemia and impaired fasting glucose (IFG) to diabetes is complex involving many factors. Previously body mass index (BMI), weight, waist and hip circumference, systolic and diastolic blood pressure, serum triglycerides, and fasting plasma glucose have been found to be risk factors in Australian women and people from other countries[1,2]. IFG, also known as prediabetes, is defined by an elevated fasting plasma glucose. Approximately 5% of people with IFG progress to diabetes each year with an equivalent proportion reverting to normoglycaemia[3].

Objectives

The aims of this study are to determine the prevalence of diabetes and IFG in Australian men, and identify risk factors for the progression to diabetes and regression to normoglycaemia.

METHOD

Participants were from the Geelong Osteoporosis Study (GOS). At baseline, glycaemia statues was established for 1170 men (ages 20-97y). Of these, 419 had sufficient information at the 15-year follow-up to perform the progression analysis. Diabetes was classified as a fasting plasma glucose ≥7.0mmol/L, self-report of the condition and/or use of antihyperglycaemic medication. IFG was defined as a fasting plasma glucose between 5.6-6.9mmol/L. Body mass index (BMI) was calculated from measured height and weight, and fat and lean mass by Dual-energy X-ray Absorptiometry (Lunar). Physical activity levels, smoking status and medication use was gathered through self-report questionnaires. Alcohol consumption was determined using a food frequency questionnaire, developed by the Cancer Council Victoria[4]. Multivariable logistic regression was used to identify risk factors for progression to diabetes and regression to normoglycaemia.

Project has been approved by Barwon Health HREC (project 00/56).

RESULTS

Table 1: Descriptive characteristics for men with normoglycaemia, impaired fasting glucose (IFG) or diabetes. Data presented as mean±SD, median (IQR) or n(%).

	Normoglycaemia (n=790)	IFG (n=256)	Diabetes (n=124)	p value
Age (yr)	57.0 (41.2-74.6)	67.7 (53.0-76.8)	70.3 (61.1-75.5)	<0.001
Weight (kg)	81.2±13.9	86.9±15.3	85.7±14.3	<0.001
Height (cm)	174.7±7.4	174.1±7.1	172.5±6.9	0.006
BMI (kg/m^2)	26.6±4.0	28.6±4.3	28.8±4.6	<0.001
Waist circumference (cm)	96.1±10.4	102.3±11.7	103.6±12.0	<0.001
Hip circumference (cm)	99.8±8.4	103.6±9.0	104.7±9.5	<0.001
Systolic blood pressure (mmHg)	135.4±17.0	141.3±17.8	142.9±20.0	<0.001
Diastolic blood pressure (mmHg)	84.9±11.2	87.7±14.6	85.4±14.6	0.011
Fat mass (kg)	20.8±8.0	24.6±8.4	24.4±8.4	<0.001
Lean mass (kg)	57.4±7.4	58.6±7.4	57.6±7.2	0.102
Smoking	108 (13.7)	27 (10.6)	13 (10.5)	0.371
High alcohol consumption	169 (21.8)	66 (26.7)	19 (16.2)	0.068
Low mobility	180 (22.8)	84 (32.8)	45 (36.3)	<0.001
FPG (mmol/L)	4.9±0.5	6.0±0.3	7.7±2.1	<0.001
Serum Triglycerides (mmol/L)	1.5±0.8	1.9±1.0	1.8±0.8	<0.001
Cholesterol-HDL	1.3±0.3	1.3±0.3	1.2±0.3	<0.001
Cholesterol-LDL	3.1±0.8	3.1±0.9	2.8±0.9	<0.001

Abbreviations: IFG=impaired fasting glucose, BMI=body mass index, FPG=fasting plasma glucose.

The characteristics of those with IFG were intermediates between the other two groups (Table 1). Men with IFG or diabetes were older, and had higher measures of adiposity, blood pressure, lipid levels and fasting plasma glucose.

The age-standardised prevalence of IFG was 18.2% (95% CI 15.7-20.7), greater than for diabetes (7.3% 95% CI 5.8-8.8).

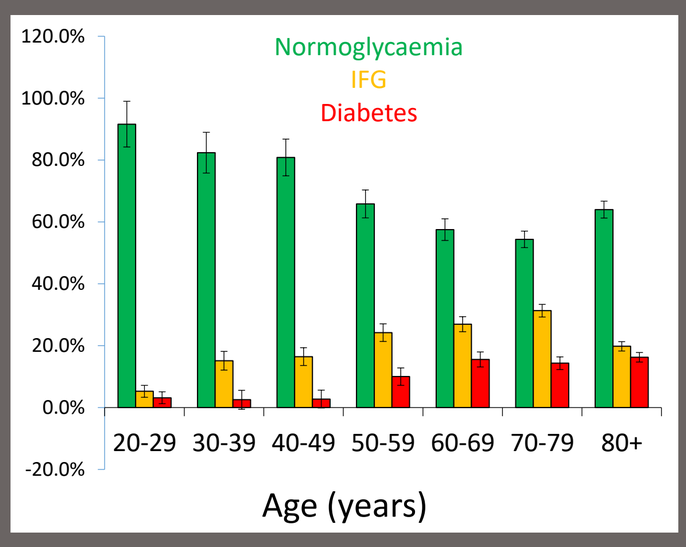

Figure 1: Prevalence of normoglycaemia, impaired fasting glucose (IFG), and diabetes for different age groups. Error bars represent 95% Confidence Intervals.

Over the follow-up 32 men progressed to diabetes (21 IFG), 384 remained without diabetes. Factors associated with progression to diabetes included fasting plasma glucose, age, BMI, body fat mass and height (Table 2).

Of the 92 men with IFG at baseline who followed-up 44 regressed to normoglycaemia. Factors associated with regression to normoglycaemia included age and cholesterol-HDL (Table 2).

Table 2: Odds ratios of risk factors for the progression to Diabetes and regression to normoglycaemia

Factors for progression	Multivariable analysis OR (95% CI)	p value
Fasting glucose level	5.64 (2.74-11.61)	<0.001
Age (yr)	1.05 (1.01-1.09)	0.012
Cholesterol-HDL	0.08 (0.01-0.45)	0.004
Measures of body composition*		
Height (cm)	0.93 (0.87-0.99)	0.025
Body fat percent	1.08 (1.01-1.16)	0.033
Factors for regression		
Age (yr)	0.95 (0.91-0.99)	0.011
Cholesterol-HDL (mmol/L0	13.2 (1.98-88.1)	0.008

DISCUSSION

Compared to a similar study in women also using data from the GOS, this study reported a lower age-standardised prevalence of IFG (18.2% vs 31.5%) and higher prevalence of diabetes (7.3% vs 5.6%)[1].

Other studies have observed fasting plasma glucose, age, and triglyceride levels to be associated with increased risk of progression to diabetes[1,2,5,6]. Knowledge of these strategies to prevent individuals progressing to diabetes. This study also reported risk factors for regression to normoglycaemia, which can also be useful for reducing the risk of progression to diabetes.

CONCLUSION

This study identified that men with elevated fasting plasma glucose, higher BMI or body fat have a high risk of progression to diabetes. These are modifiable factors, and therefore, may be the subject of interventions targeted at preventing progression to diabetes.

Also, regression to normoglycaemia was associated with younger age and higher cholesterol-HDL. Age is not modifiable, and HDL is difficult to modify. Higher HDL indicates that severity of underlying derangement may be a factor in determining progression to diabetes or regression to normoglycaemia.

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