Will obese individuals with Impaired Fasting Glycaemia progress to Type 2 Diabetes Mellitus faster?

INSIDE THIS ISSUE

1. What are the forms of pre–diabetes?

2. Is obesity associated with a higher progression rate from newly diagnosed IFG to Type 2 DM?

Background

The prevalence of Type 2 Diabetes Mellitus (DM) among adults is high in Singapore. It has increased from 8.2% among adults in 2004 to 11.3% in 2010 (National Health Survey 2010).

What is pre-diabetes?

Conventionally, the gold standard of diagnosing diabetes is by an abnormal oral glucose tolerance test (OGTT). Pre-diabetes is the state in which some but not all of the diagnostic criteria for diabetes are met. It is often described as the "gray area" between normal blood sugar and diabetic levels. While in this range, patients are at risk for not only developing type 2 diabetes, but also for cardiovascular complication. There are 2 different forms of pre-diabetes

1. Impaired Glucose Tolerance (IGT)

2. Impaired Fasting Glycaemia (IFG)

What is Impaired Glucose Tolerance?

Impaired glucose tolerance (IGT) is a pre-diabetic state of dysglycaemia that is associated with insulin resistance and increased risk of cardiovascular pathology. According to the criteria of the World Health Organization and the American Diabetes Association, impaired glucose tolerance is defined as two-hour glucose levels of 7.8 to 11.0 mmol/L on the 75-g OGTT.

What is Impaired Fasting Glycaemia?

Impaired fasting glycaemia (IFG) refers to a condition in which the fasting blood glucose is elevated above what is considered normal levels (≥6.1mmol/L but <7.0 mmol/L). It is considered a pre-diabetic state, associated with insulin resistance and increased risk of cardiovascular pathology, although of lesser risk than IGT. IFG sometimes progresses to Type 2 DM. A systematic review and meta analysis of prospective studies has reported the annualized incidence of Type 2 DM in individuals with IFG to be between 1.6% and 34% [1].

In Singapore, fasting blood glucose is usually preferred as it is more convenient compared to oral glucose tolerance test, thus majority of patients with Impaired Glucose Tolerance are undiagnosed.

What is Time to Event analysis?

Time to Event (TTE) is the time taken for a key event to happen e.g. for an individual at risk to be *infected*, for a patient with diabetes to develop *complications*.

When we observe a cohort of individuals and track the time for the event to happen, not all will experience it by the end of the study period, so we have censored observations. Censored observations occur as a result of subjects dropping out of the study or premature death prior to developing the event of interest. TTE analysis will take into account both censored data as well as different starting times for the individuals which is likely in a rolling recruitment study.

TTE analysis helps to answer questions like:

- What is the fraction of population that will experience the event?

- Of those who do not, at what rate may they experience the event in the future?

Risk factors for IFG to develop Type 2 DM

- Obesity
- Sedentary lifestyles
- Family history of Type 2 DM
- Increased age
- History of gestational DM

The first two risk factors are potentially modifiable. The study below suggests that obese persons with newly diagnosed IFG have a higher progression rate to Type 2 DM than non-obese persons.

Aim

To compare the crude progression rates between obese (BMI≥27.5 kg/m^2) and non-obese (BMI <27.5 kg/m^2) persons with newly diagnosed IFG to Type 2 DM in NHG.

Subjects

490 men and women, aged 31-94 years, with newly diagnosed IFG in 2006-2007. Of these, 176 persons (35.9%) were obese (BMI >=27.5 kg/m2). (Data was extracted from NHG's Diabetes Registry, DSRB approved)

Analyses

- Time to Event analysis (See side bar above) was used for this study when the event of interest is Type 2 DM.

- Kaplan-Meier curve (Fig 1) was used to describe the proportions of obese and non-obese groups free of Type 2 DM at 1, 2, 3 and 4 years of follow-up.

- Log rank test was used to determine if the difference in rate of developing Type 2 DM between the two groups was significant.

Results

Table 1—Progression from IFG to Type 2 DM, obese vs non-obese

	Obese	Non-obese
Mean annual progression rate to Type 2 DM	9.2%	5.6%
Median duration to progression to Type 2 DM	1.36 years	1.90 years

Difference in progression rates, Obese vs non-obese: P=0.006 *(Log rank test)*

Fig 1 - Kaplan-Meier curves comparing progression rates, obese vs non-obese

Comments

Obesity is associated with a higher progression rate from newly diagnosed IFG to Type 2 DM, and should be considered as higher risk compared to non-obese subjects with newly diagnosed IFG. Weight management should be part of a national strategy to combat the rising incidence of Type 2 DM.
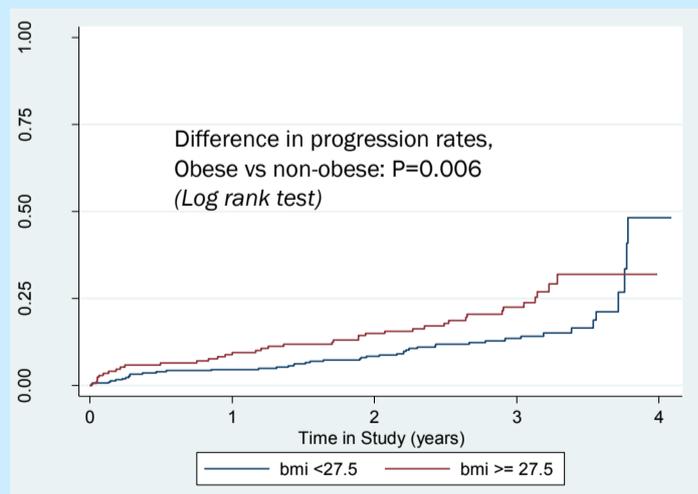
Reference

1. Gerstein HC, Santaguida P, Raina P, Morrison KM, Balion C, Hunt D, et al. Annual incidence and relative risk of diabetes in people with various categories of dysglycaemia: a systematic overview and meta-analysis of prospective studies. Diabetes Res Clin Pract. 2007;78(3):305-12.

Dr Ang Yee, Gary MBBS, MPH

Dr Gary is an advanced specialist trainee (Public Health) with interest in epidemiologic research on Type 2 Diabetes Mellitus. In his free time, he plays contract bridge and has represented Ministry of Health in the Star Game Contract Bridge Team Competition since 2006.