

At what fasting blood glucose should we recommend oral glucose tolerance test for the diagnosis of diabetes mellitus?

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INTRODUCTION: At present, the oral glucose tolerance test (OGTT) is recommended for fasting plasma glucose of 110 to 125 mg/dl. We believe the actual burden of type 2 diabetes mellitus (T2 DM) might be under-estimated when OGTT is performed at that level. Hence we tried to find out fasting plasma glucose at which we need to request an OGTT to pick up more patients with impaired glucose tolerance and asymptomatic T2 DM. **METHODOLOGY:** We have analyzed consecutive 621 OGTTs in nonpregnant adults done in our hospital for diagnosis of diabetes. Patients were identified from our hospital-computerized database, and data were collected from case notes and the laboratory reports. **RESULTS:** Putting fasting glucose in 5 mg cohort, we have noted a clear trend of raised 2-hour glucose value above 140 when fasting goes above 90 mg/dl. A similar phenomenon was noted when fasting went above 110; the 2-hour values also went above 200 mg/dl. This trend is not affected by the two important risk factors for diabetes, viz., family history and hypertension. **CONCLUSION:** In our study, a fasting glucose above 90 mg/dl increases the risk of abnormal 2-hour value. Therefore, we recommend OGTT when fasting glucose is more than 90 mg/dl for people from our part of the world to diagnose impaired glucose tolerance and asymptomatic T2 DM irrespective of risk factors.

KEY WORDS: Fasting glucose, oral glucose tolerance test

Diabetes mellitus (DM), especially type 2 diabetes mellitus (T2 DM), is reaching epidemic proportions in our country. We currently follow the WHO criteria for

diagnosis of DM [Table 1]. As per WHO protocol, DM is diagnosed by one of the following: fasting venous plasma glucose (FPG), random blood glucose (RBG) or oral glucose tolerance test (OGTT). At present we recommend OGTT in nonpregnant adults when fasting is 110 mg/dl or more. Patients with impaired glucose tolerance (IGT) are at a relatively high risk for the development of diabetes in comparison to general population. So it is important to diagnose IGT as early as possible, particularly because of absence of symptoms during this phase and availability of treatment modalities to prevent diabetes mellitus. We believe with a cut-off of 110 mg/dl FPG, a lot of people will remain undiagnosed for impaired glucose tolerance (IGT) or asymptomatic T2 DM. So we conducted this study to find out a value of FPG at which we need to request an OGTT test so as to pick up more patients with IGT or asymptomatic T2 DM.

Methodology

We analyzed the data of 621 consecutive OGTTs done on nonpregnant adults in our hospital. The patients were identified from our laboratory database. Details regarding their history and physical examination were taken from our hospital records. The OGTT was done with 75 gm glucose as per WHO protocol. Positive family history (first-degree relatives) of diabetes and

Table 1: WHO criteria for diagnosis of diabetes^[1]

Venous plasma glucose (mg/ dl)		
Normal	Fasting	< 110
	2 hr post prandial	<140
IGT	Fasting	< 126
	2 hr post prandial	140-199
IFG	Fasting	110-126
Diabetes	Fasting	> 126
	2 hr post prandial	> 200

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hypertension were also taken into account. We could not document BMI as most of our hospital records had documentation of weight but not height. Subgroup data using family history and hypertension were analyzed.

Results

The fasting plasma glucose was divided into 5 mg cohorts, and the corresponding 2-hour values were plotted. There was a clear trend of 2-hour plasma glucose value to go above 140 mg/dl when fasting was more than 90 mg/dl [Figure 1]. Again when FPG was above 110 mg/dl, the corresponding 2-hour values were above 200 mg/dl. The same analysis was done for the two subgroups with positive family history of diabetes mellitus (n = 141), of hypertension (n = 135) and both (n = 210). In these categories also, the corresponding 2-hour value showed an upward trend above 140 mg/dl when the FBG was above 90 mg/dl and the 2-hour value above 200 mg/dl when fasting was more than 110 mg/dl.

Discussion

At present for the diagnosis of DM, OGTT is performed when the fasting venous plasma glucose is above 110 mg/dl.^[1] The question of whether there is an association between elevated fasting plasma glucose levels within the defined normal range and an increased risk of diabetes has not been answered. This issue is particularly important for young adults, in whom the association between FPG and diabetes may have been masked in earlier studies that analyzed populations with a wide age range with a cut-off in accordance with WHO criteria.^[2,3] Better and earlier identification of young adults at risk for development of diabetes is warranted,

given the success of interventions aimed at delaying the onset of diabetes among high-risk groups. An impaired fasting plasma glucose level is a known risk factor for diabetes, along with other traditional risk factors such as a family history, sedentary lifestyle, central adiposity, dyslipidemia and hypertension.

In this study we have clearly documented that elevated fasting glucose above 90 mg/dl increases the 2-hour value to above 140 mg/dl; and when FBG went above 110, 2-hour post-glucose value was almost always above 200 mg/dl. This means taking FPG less than 110 mg/dl as normal will underestimate the prevalence of IGT/T2 DM. Family history of T2 DM and hypertension are traditional risk factors of T2 DM, but surprisingly we have not found any difference in these two subgroups as opposed to people without risk factors. Unfortunately, the non-availability of height in the case records did not permit us to see the trend with different values of BMI.

In a recent study, it has been shown that a lower cut-off value of 104 mg/dl predicts future development of T2 DM than the accepted value of 110 mg/dl.^[3] Similarly, another study found that a range of fasting blood glucose within the normoglycemic range, along with BMI and triglycerides levels, predicted the future development of T2 DM.^[4]

We recommend an OGTT where fasting venous plasma glucose is above 90 mg/dl in people from our part of the world irrespective of whether a risk factor is present or not.

References

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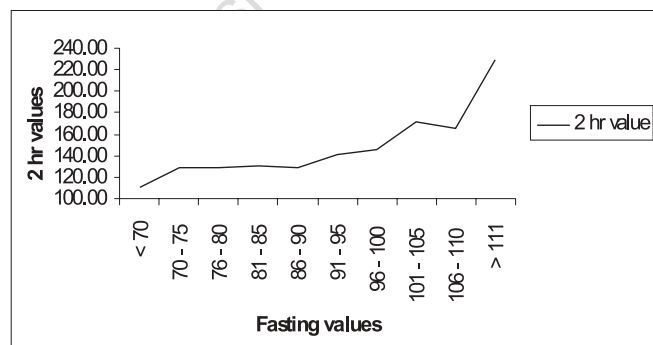


Figure 1: Relationship of fasting blood glucose (mg/dl) to 2-hr post-glucose blood glucose in oral glucose tolerance test

Source of Support: Nil, **Conflict of Interest:** None declared.