

## Use of Hemoglobin A1c and Fasting Plasma Glucose to Diagnose Type 2 Diabetes in the Real World

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**D**iabetes mellitus globally is expected to double from 175 million in the year 2000 to 353 million in 2030.<sup>1</sup> This results in the urgent need for cheap and effective screening and diagnostic methods. Although several are available, fasting plasma glucose (FPG) is routinely used both for monitoring and for diagnosing diabetes mellitus. The use of FPG is inconvenient for the patient, as it requires a 12 h fast.<sup>2</sup> Glycated hemoglobin is now recommended for the diagnosis of diabetes mellitus.<sup>2,3</sup> The benefits of the hemoglobin A1c (HbA1c) assay include relative stability of samples after collection, sample collection is convenient because a fasting period is not required, and samples can be randomly obtained. These factors have supported the use of HbA1c instead of FPG and 2 h glucose. The study compared the diagnosis of type 2 diabetes mellitus (T2DM) using FPG with HbA1c among patients seen in a primary care setting in which a first-time diagnosis of diabetes was contemplated without existing morbidities.

Patients with no prior confirmation of T2DM were eligible for entry into the study. Of the 308 patients entered into the study using a FPG >128 mg/dl, 102 (33.1%) were classified as having T2DM, 64 (20.8%) were classified as having impaired fasting glucose (110–125 mg/dl), and the remaining 142 (46.1%) were classified as euglycemic (plasma glucose <110 mg/dl). On the other hand, 152 (49.4%) participants had a HbA1c assay >6.5% and were classified as having T2DM. In other words, more participants (50; 16%) were classified with diabetes using HbA1c (**Table 1**).

The study observed the poor performance of the FPG compared with HbA1c in the diagnosis of diabetes mellitus. The implication of this finding is that 42.76% of patients who were referred for a FPG only and may truly have T2DM will remain undiagnosed. These findings are consistent with Kim and associates.<sup>4</sup> Our study showed the poor correlation ( $r = 0.02$ ) between FPG and HbA1c for values of FPG <126 mg/dl, indicating that, at the current cutoff point of 126 mg/dl, the FPG was unreliable compared with HbA1c. Perry and colleagues<sup>5</sup> also showed that using HbA1c assay increased the sensitivity of diagnosis for values of FPG greater than 126 mg/dl. Therefore, for patients with FPG close to 126 mg/dl, it should be mandatory to also have a HbA1c assessment. On the other hand, when the FPG exceeded 126 mg/dl, the correlation was significantly stronger,  $r = 0.72$  ( $p \leq .05$ ). The proportion of patients diagnosed with diabetes using HbA1c criteria (49.4%) was significantly larger than for FPG (33.1%) criteria ( $p < .01$ ).

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**Abbreviations:** (FPG) fasting plasma glucose, (HbA1c) hemoglobin A1c, (T2DM) type 2 diabetes mellitus

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**Table 1.**  
**Comparison between Fasting Plasma Glucose and Hemoglobin A1c**

	FPG > 126 mg/dl	FPG <126 mg/dl	Total
HbA1c > 6.5 mmol/liter	87	65	65
HbA1c < 6.5 mmol/liter	15	77	77
Total	102	142	142

In conclusion, against a HbA1c  $\geq 6.5\%$ , for a single fasting glucose  $\geq 126$  mg/dl, the sensitivity and specificity for detection of diabetes were 57% and 90%, respectively (area under the curve, 0.79). Hemoglobin A1c classified more people as having diabetes (49.4%) compared with FPG (33.1%).

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