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Pathology Newsletter
April 2022

HBA1c as a marker for Diabetes Mellitus

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Introduction

The global prevalence diabetes mellitus (DM) is rapidly growing rising from 108 million in 1980 to 422 million in 2014. As the 9th leading cause of death worldwide, it also remains a major cause of kidney failure, cardiovascular disease and blindness. The medical consensus, as put forth by the World Health Organization (WHO) stands that DM can be treated and sequelae can be delayed or avoided through diet, physical activity, medication combined with regular screening for diagnosis and complications (1).

Who should be screened?

Table 1. ADA criteria on screening populations

Testing should be undertaken in all patients that are over-weight (BMI ≥25kg/m^2 WITH one or more of the following: 1. First-degree relative with DM 2. High-risk race/ethnicity 3. History of cardiovascular disease 4. Hypertension (≥140/90 mmHg or on therapy for hypertension) 5. HDL cholesterol level <0,9mmol/L and/or triglyceride level >2,82 mmol/L 6. Women with polycystic ovary syndrome 7. Physical inactivity 8. Other clinical conditions associated with insulin resistance (severe obesity, acanthosis nigricans etc)
Patients with prediabetes*
Women who were diagnosed with Gestational DM should have lifelong testing at least every 3 years
People with HIV
All patients from age 35 - If tests are normal, follow up testing should be undertaken every 3 years gaging based on other risk factors

* Prediabetes criteria to follow

Diagnosis of DM

The American Diabetes Association (ADA) published a revised the diagnostic criteria in 2022, from the 1998 version[2]. The mainstay of diagnosis remains the demonstration of elevated plasma glucose.

This can be achieved through direct measurement at random or as part of a 2-hour oral glucose tolerance test (OGTT), or the indirect demonstration of prolonged hyperglycaemia through glycated haemoglobin (HbA1c) (Table 2).

Table 2. Diagnostic criteria for the establishment of a diagnosis of Diabetes Mellitus

	DM
HbA1c**	≥ 6,5%
Fasting plasma glucose	≥ 7,0 mmol/L
2 hour OGTT with 75g anhydrous glucose in water	≥ 11,1 mmol/L
Random glucose WITH classic symptoms of hyperglycaemia	≥ 11,1 mmol/L

** Performed in a laboratory using a method that is NGSP certified and standardized to the DCCT assay as currently offered by JDJ Laboratories.

Although any of these assays can be utilized in screening, some patients may show variable sensitivity in terms of establishing a diagnosis.

Therefore, should there be a high index of suspicion and the first assay is not confirmatory, an alternative modality / platform can be used.

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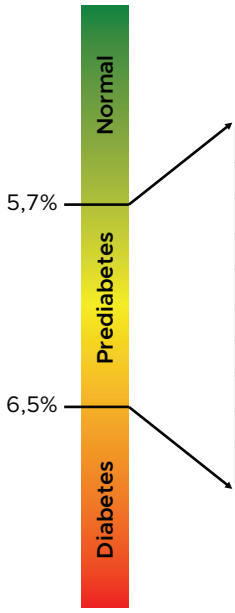
Prediabetes and the use of HbA1c

HbA1c provides an average blood glucose level without the need for patient preparation or fasting. It is based on the premise of converting the measurement of the glycated portion of the haemoglobin molecule into an average glucose level (Figure 1). It therefore assumes a normal red cell lifespan. In cases of haemolysis of whichever origin, this value will be falsely lowered due to a shorter duration of exposure of the haemoglobin molecules to glucose. In these cases, fasting plasma glucose remain more reliable.

In addition to diabetes diagnosis, prediabetes can also be gaged using the HbA1c assay (Figure 1). This finding in and of itself is not considered a diagnosis, but rather an independent risk factor for future DM.

Figure 1. Correlation of HbA1c with eAG and the diagnostic implications of use.



HbA1c	eAG*
%	*mmol/L*
6	7,0
6,5	7,8
7	8,6
7,5	9,4
8	10,1
8,5	10,9
9	12,6
10	13,4

*Estimated Average Glucose

References

1. https://www.who.int/news-room/fact-sheets/detail/diabetes
2. Diabetes Care 2022;45(Suppl. 1): S17–S38 | https://doi.org/10.2337/dc22-S002

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