UTILITY OF HBA1C IN THE PROGNOSIS OF DIABETES MELLITUS

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ABSTRACT

Diabetes mellitus is not a single disease entity but rather a group of metabolic disorders sharing the common underlying feature of hyperglycemia. The morbidity associated with long-standing diabetes of either type (Type I and Type II) results from several serious complications. The pathogenesis of the long-term complications of diabetes is multifactorial, although persistent hyperglycemia (‘glucotoxicity’) seems to be a key mediator. Many of the evidence supporting a role for glycemic control in ameliorating the long-term complications of diabetes has come from large randomized trials. The assessment of glycemic control in these trials has been based on the percentage of glycated hemoglobin, also known as HbA1c. The American Dietetic Association recommends that HbA1c be maintained below 7% in diabetic patients. Following widespread recognition that sustained hyperglycemia is an important determinant of the long term complication, there has been renewed interest in monitoring Control of diabetes. The discovery of glycated haemoglobin has therefore been timely, measurement of it should allow more objective assessment of control.

Key words: Diabetes mellitus, HbA1c.

INTRODUCTION

The glycosylated haemoglobins are becoming accepted as a measure of long-term glycaemic control in diabetes mellitus. The term HbA1c refers to glycated haemoglobin. It develops when haemoglobin joins with glucose in the blood, becoming “glycated”. Rahbar et al first discovered the association of increased HbA1c levels with diabetes mellitus in 1968. By measuring glycated haemoglobin (HbA1c), clinicians are able to get an overall picture of what our average blood sugar levels have been over a period of weeks/months. For people with diabetes this is important as the higher the HbA1c, the greater the risk of developing diabetes-related complications.

Glycosylated haemoglobins are the result of simple chemical reaction between haemoglobin and sugars after synthesis of haemoglobin is complete—that is post-translation modifications.

The reaction proceeds in two stages, enzymes are not involved:

1. Glucose combines with the α-amino acid group of the valine residue at the N-terminus of β-globin chains to form an aldimine compound (schiff base). The reaction is reversible, and dissociation to native haemoglobin and glucose occurs readily.
2. Internal rearrangement of the aldimine intermediate by the Amadori reaction yields a stable ketoamine derivative.

When the body processes sugar, glucose in the blood stream naturally attaches to haemoglobin. The amount of glucose that combines with this protein is directly proportional to the total amount of sugar that is in your system at that time. Because red blood cells in the human body survive for 8-12 weeks before renewal, measuring glycated haemoglobin (or HbA1c) can be used to reflect average blood glucose levels over that duration, providing a useful longer-term gauge of blood glucose control.

Current HbA1c recommendations:

- Assess the quality of diabetes care.
- Predict the risk for the development of complications.
- A patient is diabetic if he has an increased HbA1c, and an increased fasting plasma glucose concentration.

Current HbA1c recommendations:

<table>
<thead>
<tr>
<th>Normal</th>
<th>IDF</th>
<th>ADA</th>
<th>AACE</th>
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<tbody>
<tr>
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<td>&lt;110</td>
<td>90-130</td>
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<tr>
<td>Postprandial</td>
<td>&lt;140</td>
<td>&lt;155</td>
<td>&lt;180</td>
</tr>
</tbody>
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IDF— International Diabetes Federation.
ADA—American Diabetes Association.
AACE—American Association of Clinician Endocrinologist.
If your blood sugar levels have been high in recent weeks, your HbA1c will also be greater.

Advantages of HbA1c for the diagnosis of Diabetes mellitus:

Several researchers have investigated the possibility of using glycated haemoglobin measurements in diagnosis of diabetes mellitus. The advantage of using glycated haemoglobin would be:

- Only a single blood sample would be required.
- Fewer factors influence glycated haemoglobin levels than affect the glucose tolerance test.
- HbA1c correlates with retinopathy. There is a stronger correlation between HbA1c and retinopathy than between fasting glucose levels and retinopathy.
- HbA1c measurement can be used to differentiate hyperglycemia due to stress from that due to diabetes. For example, 10% patient admitted to the coronary care unit have undiagnosed diabetes mellitus. Measurement of HbA1c should be done.
differentiates these patients from large proportion of patients who have hyperglycemia due to stress secondary to infarct.16

2010 Consensus Statement on the Worldwide Standardization of the HbA1c Measurement:
- HbA1c test results should be standardized worldwide.
- The IFCC reference system for HbA1c represents the only valid anchor to implement standardization.
- HbA1c results are to be reported by clinical laboratories worldwide in SI units (mmol/mol, no decimals) and derived NGSP Units (% one decimal). (diabetes care, vol 33, number 8, july 2010)

HbA1c related with pregnancy:
Certainly HbA1c concentrations during pregnancy show a positive correlation with birth weight (corrected for gestational age) which is consistent with established experience that large babies are associated with poorly controlled diabetes.17

CONCLUSION:
The recent availability of glycosylated haemoglobin measurement has provided a valuable tool in the diagnosis and measurement of diabetes mellitus. This objective test allows for more reliable assessment of diabetic control than any other parameter. Along with, the physician should also be aware that there are certain clinical conditions which can lead to inappropriate results, like Uremia, Iron deficiency anaemia, Haemolytic anaemia, HbF, HbS.

REFERENCE:
9. www.diabeticretinopathy.org.uk