

Original Article

Levels of Glycosylated Haemoglobin in newly discovered Sudanese Diabetics

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Abstract

Background: Diabetes mellitus (D.M) is one of the most known chronic illnesses in the world. The exposure of blood to variable concentrations of glucose gives rise to variable levels of Haemoglobin (Hb) glycation, a non-enzymatic reaction. This phenomenon had led to the concept of measurement of glycosylated Hb as an indicator of glycemic control of diabetic patients; furthermore, it could be a diagnostic tool for the disease.

Objectives: The research aimed to measure the level of glycosylated Hb -designated HbA1c- in the newly discovered diabetics in Sudan.

Material and Methods: This was a retrospective case-control study, done at the Police Hospital and Bahri Diabetic Centre during the period from June 2011- October 2011. The populations of the sample were newly discovered Sudanese diabetics, in two age groups. Forty patients and forty controls were assessed via questionnaire, and venous blood to perform the test of HbA1c using Nycocard© machine.

Results: The mean of HbA1c in young diabetics was 10.0%, while that of old diabetics was 8.8%. There was no correlation between HbA1c and random blood glucose, body mass index, hypertension, or the duration of symptoms.

Conclusion: HbA1c levels in newly discovered diabetics was found to be elevated, with significant difference between diabetics of less than forty, and above forty years of age.

Key words: Diabetes, HbA1c, Ketoacidosis, Hypertension.

Glycosylated hemoglobin (glycated hemoglobin, hemoglobin A1C, A1C, or Hb1c; sometimes also HbA1c) is a form of hemoglobin which is measured primarily to identify the average plasma glucose concentration over prolonged periods of time. It is formed in a non-enzymatic glycation pathway by hemoglobin's exposure to plasma glucose. Normal levels of glucose produce a normal amount of glycated hemoglobin. As the average amount of plasma glucose increases, the fraction of glycosylated hemoglobin increases in a predictable way. This serves as a marker for average blood glucose levels over the previous months prior to the measurement.

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The 2010 American Diabetes Association Standards of Medical Care in Diabetes added the A1c ≥ 48 mmol/mol ($\geq 6.5\%$) as another criterion for the diagnosis of diabetes¹.

In diabetes mellitus, higher amounts of glycosylated hemoglobin, indicating poorer control of blood glucose levels, have been associated with cardiovascular disease, nephropathy, and retinopathy.

Objective:

The objective was to elucidate the percentage of HbA₁C of the newly discovered diabetics in Sudan.

Materials and Methods

In this study 40 newly diagnosed diabetic patients were randomly selected, in addition to 40 controls. They were divided into two groups: below 40; and above 40 years of age.

Inclusion criteria were newly discovered diabetics; not on treatment or dietary control for more than eight weeks. Excluded patients were those with known sickle cell anaemia,

G-6-PD deficiency, spherocytosis, megaloblasticaemia, or with recent history of blood loss or surgery.

Data were collected via questionnaire, which included personal data, presence of family history of diabetes, presence of complications (target organs symptoms e.g. peripheral neuropathies, retinopathies, foot ulcers ...etc), presence of other chronic illnesses, level of HbA1c, and a recent blood glucose level. About 1ml of venous blood was taken in EDTA container to perform the HbA_{1C} test. Blood samples were analyzed for glycosylated hemoglobin level by a modified ELISA reader known as Nycocard®.

Results:

From the analysis it had been found that the mean HbA1c of the young patients (≤40 years) was 10.0%(Figure 1). The control group of the same age had a mean of 5.45%(Table 1), and the difference was significant(Table 2). The older patients (>40 years) had a mean HbA1c of 8.8% (Figure 1). In comparison with the control group of the same age, their mean HbA1c was 5.83%(Table 1), and the difference between the two means was significant(Table 2). An important finding is that the HbA1c of the younger patients was significantly higher than the olderpatients(Table 2), but no difference recorded between the two control groups. The results showed positive correlation between the presence of family history and the level of HbA1c. It also showed a negative correlation between the level of HbA1c and the presentation with diabetic ketoacidosis, and there was no correlation between presence of hypertension in olderdiabetics and the level of HbA1c. Moreover, the symptom duration, BMI, and RBG had no correlation to the level of HbA1c in both patient groups.

Table1: Frequency Table of HbA_{1C} in the different groups.

Category	Mean HbA _{1C}	Median	Mode
younger Patients	10.04%	9.95%	9.40%
younger control	5.46%	5.50%	5.00%
Older Patients	8.75%	7.80%	6.20%
Older Control	5.83%	5.90%	5.90%

Discussion:

The result concerning HbA1c in both patients groups is justifiable with the fact that diabetes in elderly is of a resistance (Type II) etiology, but in young diabetics-which is most likely type I diabetes- is related to a deficiency state. Negative association between DKA and the level of HbA1c in the research could be due to the insufficient sample population-only 6 patients presented with DKA. Random glucose level was not associated with HbA1c level, and this is logic because the random level is changeable and not related to a chronic glycaemic level, as HbA1c measures. The fasting glucose level would be a better index for comparison, or a local trial to establish the eAG (estimated Average Glucose) of Sudanese patients and compare it with the DCCT trial². Body Mass Index (BMI) also was not correlated to HbA1c level, although obesity is a known risk factor for Type II diabetes mellitus; this may also be due to the small sample size.No correlation was found between the duration of symptoms and the level of HbA1c; however, 34% of the patients were discovered accidentally during routine check, or during preparation for surgery; moreover it is a subjective measure. As opposed to a local study done in 1989, it had been found that the duration of the disease is negatively related to the level of HbA1c, probably by treatment and self-education³.

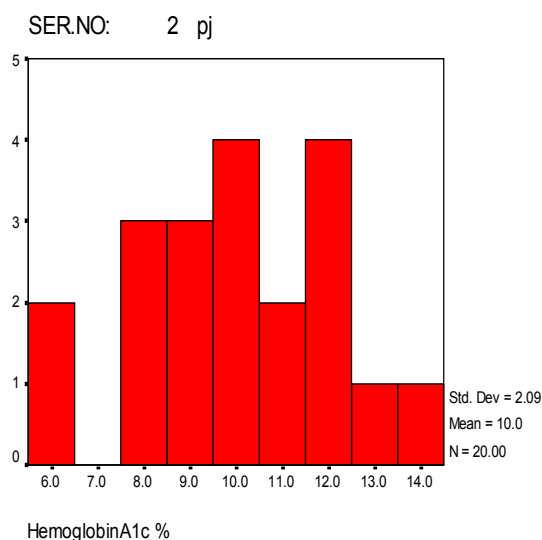


Fig1: Histogram of the Hba1c results in the younger patients group (≤40 yr).

Table2: Significance of the differences in means of HbA1c in different groups.

(I) serial number	(J) serial number	(I-J) Mean Difference	Std. Error	Sig.	95% Confidence Interval Lower Bound Upper Bound	
	Py	-4.595(*)	.5252	.000	-5.641	-3.549
Cy	Co	-.380	.5252	.472	-1.426	.666
	Po	-3.305(*)	.5252	.000	-4.351	-2.259
Py	Cy	4.595(*)	.5252	.000	3.549	5.641
	Co	4.215(*)	.5252	.000	3.169	5.261
	Po	1.290(*)	.5252	.016	.244	2.336
Co	Cy	.380	.5252	.472	-.666	1.426
	Py	-4.215(*)	.5252	.000	-5.261	-3.169
	Po	-2.925(*)	.5252	.000	-3.971	-1.879
Po	Cy	3.305(*)	.5252	.000	2.259	4.351
	Py	-1.290(*)	.5252	.016	-2.336	-.244
	Co	2.925(*)	.5252	.000	1.879	3.971

* The mean difference is significant at the .05 level (or below).

Cy: younger control group; Py: younger patients; Co: older control group; Po: older patients.

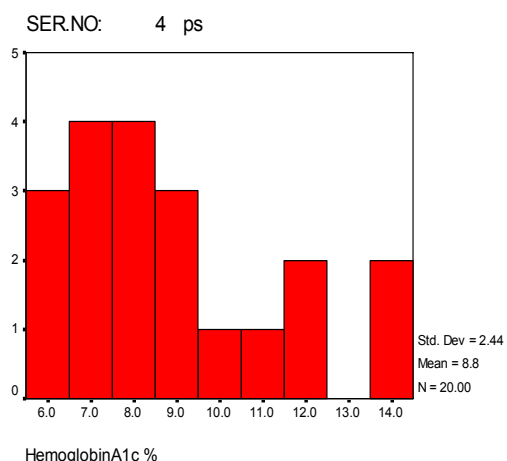


Fig2: Histogram of the HbA1c results in the older patients group (>40 yr).

Conclusion:

Sudanese patients with D.M were found to have a high level of HbA1c at presentation, the younger diabetics below forty years having higher level (10.0% Mean) than the old-above forty- patients (8.8% Mean).

The level of Random Blood Glucose was not correlated to the level of HbA1c. Possible associated factors such as symptoms duration and obesity were not correlated with the level of hbA1c, and a non-convincing negative correlation between presentation with DKA and level of HbA1c was recorded. Establishment of a screening program of DM using the HbA1c level, with special concerns to elderly citizens, obese, and patients with family history is recommended.

References

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