

## Research Article

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## Glycated Haemoglobin as Seen at the Plateau Specialist Hospital, Jos. Nigeria

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### ABSTRACT

The use of glycated haemoglobin (HbA1c) in assessing long term glycemic control is well known. However, its use as cardiovascular risk remains controversial. Availability, technicality and cost has made it uncommon among the developing countries. A short over view may add up to the scanty literature on HBA1c in Plateau Specialist Hospital, Jos. Nigeria.

**Design and methods:** We conducted a retrospective analysis of HBA1c records from the side-laboratory of the Jos University Teaching Hospital. The test was determined using STANDARD TM A1cCare analyzer.

**Results:** A total of 264 patients were tested in the “point-of-care” laboratory within six months (1st quarter 2020). They consisting of 149 (56.4%) female, with a total mean age of 55years. 80.7% of total records were diabetic and 14.4% diabetic hypertensive. A heterogeneous group of non-diabetics consist of the remaining 19.3%. The non-diabetic group had a mean HBA1c of 6.79 % (+/- 2.2). The group of diabetes without hypertension had a mean HBA1c 8.54% (+/- 2.9) while diabetic hypertensive had a mean HBA1c of 8.8% (+/- 3.7). AVOVA showed significant variation in the three group (p<0.002). a two-unpaired t-test among the two diabetic group showed no statistical difference (p-0.66).

**Conclusion:** Patients that are not diagnosed to be diabetic attending clinics for other ailments were more likely to be pre-diabetics. Long term diabetic control in the Jos University Teaching Hospital is rather poor and hypertension appear not to have significant effect on HBA1c level.

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**Keywords:** HBA1c, Diabetics, Diabetic Hypertensive

### Introduction

Glycated haemoglobin (HBA1c) primarily determine a three-month average blood glucose level. It is used as a diagnostic tool as well as glycemic control monitor for diabetes mellitus 1-4. Its level has been shown to be associated with cardiovascular diseases, nephropathy, neuropathy and retinopathy in diabetes 5. Hypertension is a common modifiable risk factor associated with diabetes mellitus 1-5. The use of HBA1c as a cardiovascular risk factor has not been substantiated. This is so because of the inconsistencies found in studies. While some studies strongly associate HBA1c with severity of hypertension 7, some other studies do not support this idea. For instance, while Julie et al 8 showed that pre-diabetic adults with HBA1c 5.7-6.4% were independently associated with incident self-reported hypertension (hazard ratio 1.14) and visit-detected hypertension (hazard ratio 1.17) compared to non-diabetics, Shirin et al 9 showed that the level of HBA1c did not vary between diabetic patients with and without hypertension.

Though HBA1c is a measure of long standing glucose state it has no added advantage over the marker of short term glycemic control like fasting blood glucose when it comes to cardiovascular

risk assessment and treatment modification [1- 6].

The use of Hba1c as a monitor for diabetes mellitus control is not new to the developed world. It is however not an easy test to come across in the rural areas of the developing countries mainly due to cost, availability and presence of other glucose tests [10].

This work was an observation made when a six-month record of requested HBA1c was reviewed. Subjects where mainly type 2 diabetes mellitus patient attending clinics at the Plateau Specialist Hospital.

### Subjects and methods

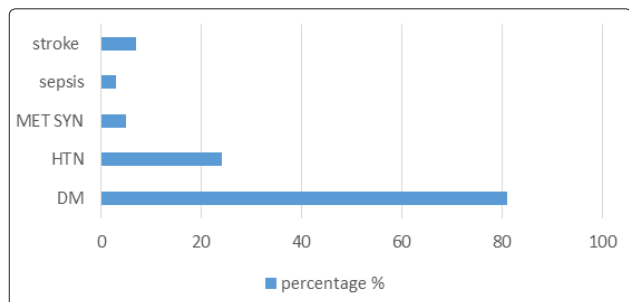
A retrospective record of HBA1c of all test done between October 2019 to March 2020 in the recently setup “point-of-care” side-lab of Plateau Specialist Hospital was analyzed. Record included age, sex, diagnosis, HBA1c.

HBA1c was determine using STANDARD TM A1cCare analyzer. An immunoassay and reflectometry technology based in-vivo test on capillary blood. Both fractions and an algorithm HBA1c measures are done which is then converted into percentage HBA1c in the sample.

Data was analyzed using Epi-info 7.2.1.0. Categorical variables are recorded as mean +/- standard deviations. ANOVA was determined between non-diabetics, normotensive diabetics and diabetic hypertensive. A GraphPad (internet software) was used to determine the difference in means between non-hypertensive and hypertensive diabetic patients. (Unpaired t-test) p-value of <0.005 was considered a significant difference in the means. Ethical approval for the analysis of records was obtained the research and ethics committee of the Plateau Specialist Hospital.

**Results**

Study consisted of 264 subjects who were tested over a six-month period with 149 (56.4%) female and 115 (43.6%). Diagnosis recorded were not mutually exclusive.



DM – diabetes mellitus, HTN – hypertension, MET SYN – metabolic syndrome

**Table1: Characteristics of the subject**

	OTHERS	DIABETES MELLITUS	
		DM	HTN
N	51	175	38
%	19.3	66.3	14.4
MEAN AGE (SD) YEARS	54.9 (17.9)	54.5 (13.9)	58.4(12.0)
HBA1C (SD) %	6.79 (2.2)	8.54 (2.9)	8.8 (3.7)

DM – diabetes mellitus, HTN – hypertension, SD standard deviation

**Table 2: Characteristics of diabetes patients**

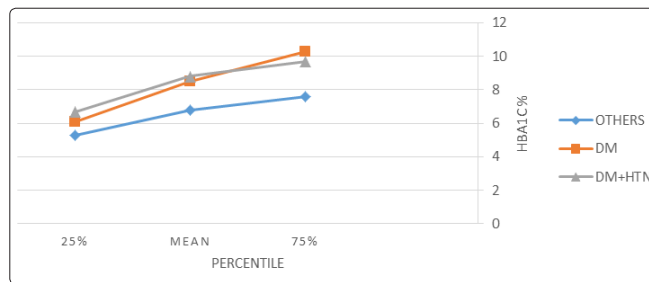
	OTHERS	DIABETES MELLITUS		Unpaired t-test
		DM	HTN	
N	175	38		
%	66.3	14.4		
MEAN AGE (SD) YEARS	54.5 (13.9)	58.4(12.0)		0.11*
HBA1C (SD) %	8.54 (2.9)	8.8 (3.7)		0.66*

\*unpaired t-test between non-hypertensive and hypertensive diabetics, SD standard deviation, DM – diabetes mellitus, HTN – hypertension,

Majority of the subjects (80.7%) were diabetics, 66.3% diabetics and 14.4% diabetic hypertensive. The remaining 19.3 non-diabetics consist of a heterogenous group (hypertensive, sepsis. Metabolic syndrome, stroke).

Other unpaired t-test not shown on the tables were; i. Mean

age between non-diabetic (others) group and diabetic (non-hypertensive) p=0.87. ii. Mean HBA1c between non-diabetic (others) group and diabetic (non-hypertensive) p=0.0001.



DM – diabetes mellitus, HTN – hypertension,

**Discussions**

The use of HBA1c for diagnosis and monitoring of diabetes mellitus is gradually gaining momentum. Rapid test methods of various kinds available help in making early diagnosis of diabetes. however, at a slightly higher cost to the patient. More female patients were seen to have done this test attributed to the fact that women present to hospital more readily than the male counterpart.

We observed that age and gender were not associated with HBA1c level. By comparing the mean age of diabetes and non-diabetes patients (Table 2). Age being considered a strong cardiovascular risk factor 1-3 was in no way related with HBA1c in both diabetic and non-diabetic patients, though seen to be insignificantly higher in hypertensive diabetics.

Majority (80%) of the patients seen were diabetic not surprising because is a test done to asses glycemic control. The specific types of diabetes were not recorded neither was their treatment modality, however based on local studies 8,9 majority could be said to be type 2. The patients with diagnosis other than diabetes mellitus were about 20% of the study group, making inference from their records will not hold water. We however found an average HBA1c in non-diabetic patients to be at a pre-diabetic range. This was not surprising considering the constituent of the group. Metabolic syndrome hypertension and their therapy have effect on glycemic control. Incidentally Mustapha et al 11 in Zaria had a similar observation were non-diabetic patients being managed for other ailments had HBA1c in the pre-diabetic range as defined by the American Diabetic Association 1.

HBA1c seen in all diabetic patients was on the average within the diabetic range which was expected. It would have been worrisome if the patients were only follow-up patients, then one would have presumed a general poor control of glucose in diabetes patients. Newly diagnose Diabetes patient were also part of the overall records where some of them actually had HBA1c records high beyond that which the test could record (un-recordably high). We noticed a slightly higher mean HBA1c in those with hypertension within the diabetic group, though not statistically significant (Figure 2). This supports the researchers that believe hypertension is related to increase HBA1c, statistically however, it is not significant. Looking further at the inter-quartile ranges figure 3 of the different groups. The impression is that diabetes generally had a higher HBA1c. The effect of hypertension could not be well substantiated scientifically.

Population size is one big drawback in this study, though 264 patients in six months was not bad considering the COVID19 pandemic and relative high cost of test. Other cardiovascular

factors like electrolyte, urea, creatinine, serum lipids and so forth were not assessed in the study. Patients were neither examined for anthropometry measurement or blood pressure records. All these would have related cardiovascular risks with HBA1c.

### Conclusions

HBA1c level in patients was in agreement with findings in North East Nigeria (Zaria) where patients generally have HBA1c in the pre-diabetic range. Though HBA1c in diabetic was as recommended by ADA (American Daibetic Association), its level is not significantly raised in hypertensive.

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