Utility of Glycated haemoglobin (HbA1c) in the screening and diagnosis of type 2 Diabetes Mellitus in black African population

Mansur A Ramalan

Endocrinology, Diabetes and Metabolic Unit, Aminu Kano Teaching Hospital, Kano, Nigeria

Background

- Glycated Haemoglobin (HbA1c) has been recommended for use as a diagnostic tool for diabetes mellitus (DM), but has not been adequately validated in the African population.

Objective

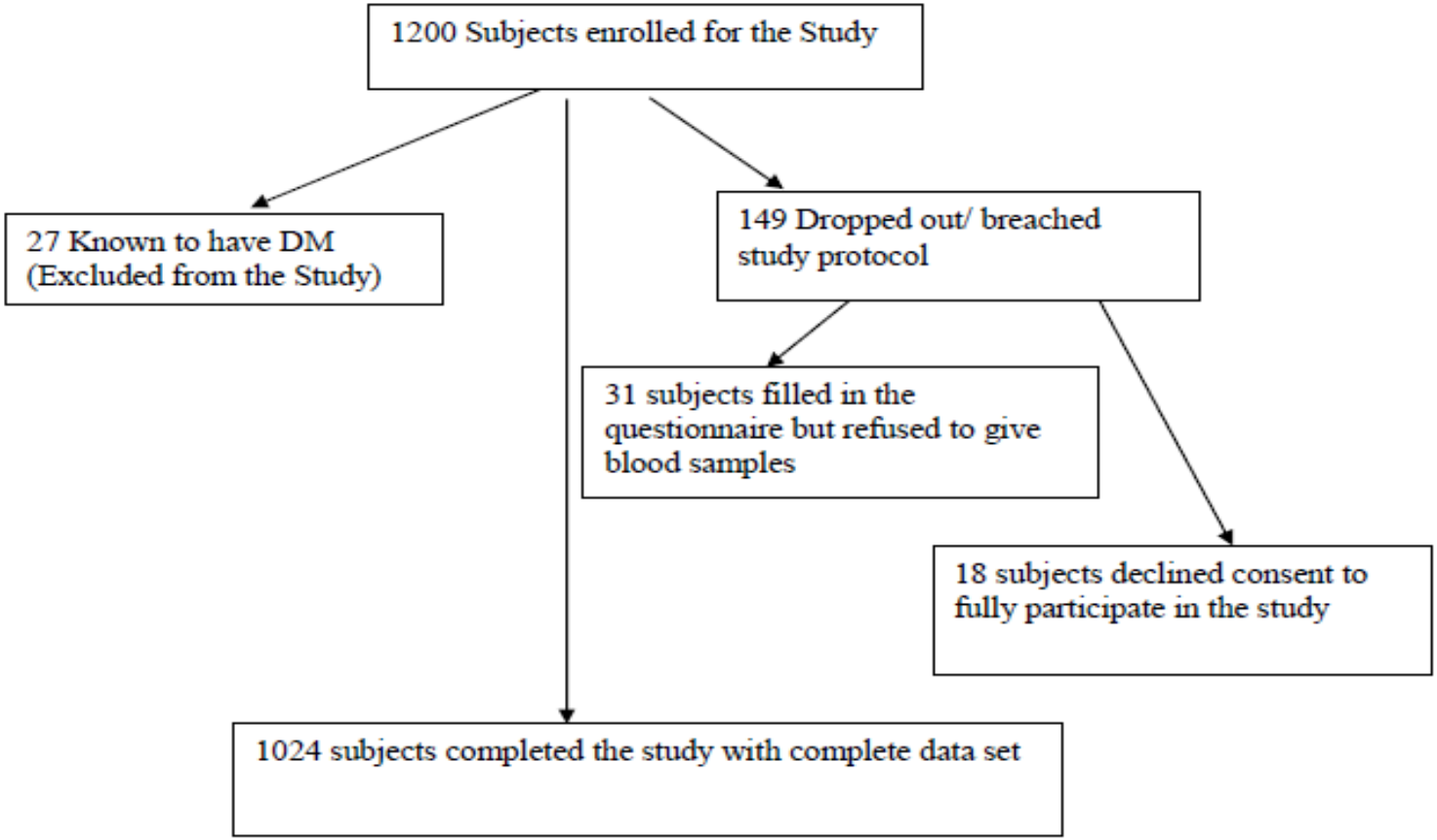
- We aimed to compare HbA1c and the OGTT in the diagnosis of type 2 DM, and to establish the optimal diagnostic cut-off value of HbA1c for diabetes Mellitus among black African Population.

Method

- A cross-sectional population-based screening of apparently healthy adults was performed using the WHO STEP wise method.
- Multistage cluster random sampling technique was employed.
- The FPG was performed on subjects who observed the standard protocol (8 – 12 hour overnight fast) and CPG estimation was performed on the remaining subjects.

- HbA1c assay and oral glucose tolerance test (OGTT) were also performed on all subjects who had FPG between 6.1 – 6.9mmol/l or CPG between 7.8 – 11.0 mmol/l.

- The validity of the HbA1c was calculated while the receiver operator characteristics curve was used to establish the optimum diagnostic cut-off value for the HbA1c.



A flow chart showing subjects enrolment

Results

- HbA1c 5.7- 6.4% identified 2.28% subjects as pre-diabetes.

- In subjects at high risk of diabetes, the OGTT identified newly diagnosed diabetes in 14 (1.37%) subjects, HbA1c 10 (0.98%) subjects.

- The diagnostic cut-off value of the HbA1c test in this study was found to be lower (6.2%) than the ADA recommended cut off value of ≥ 6.5%.

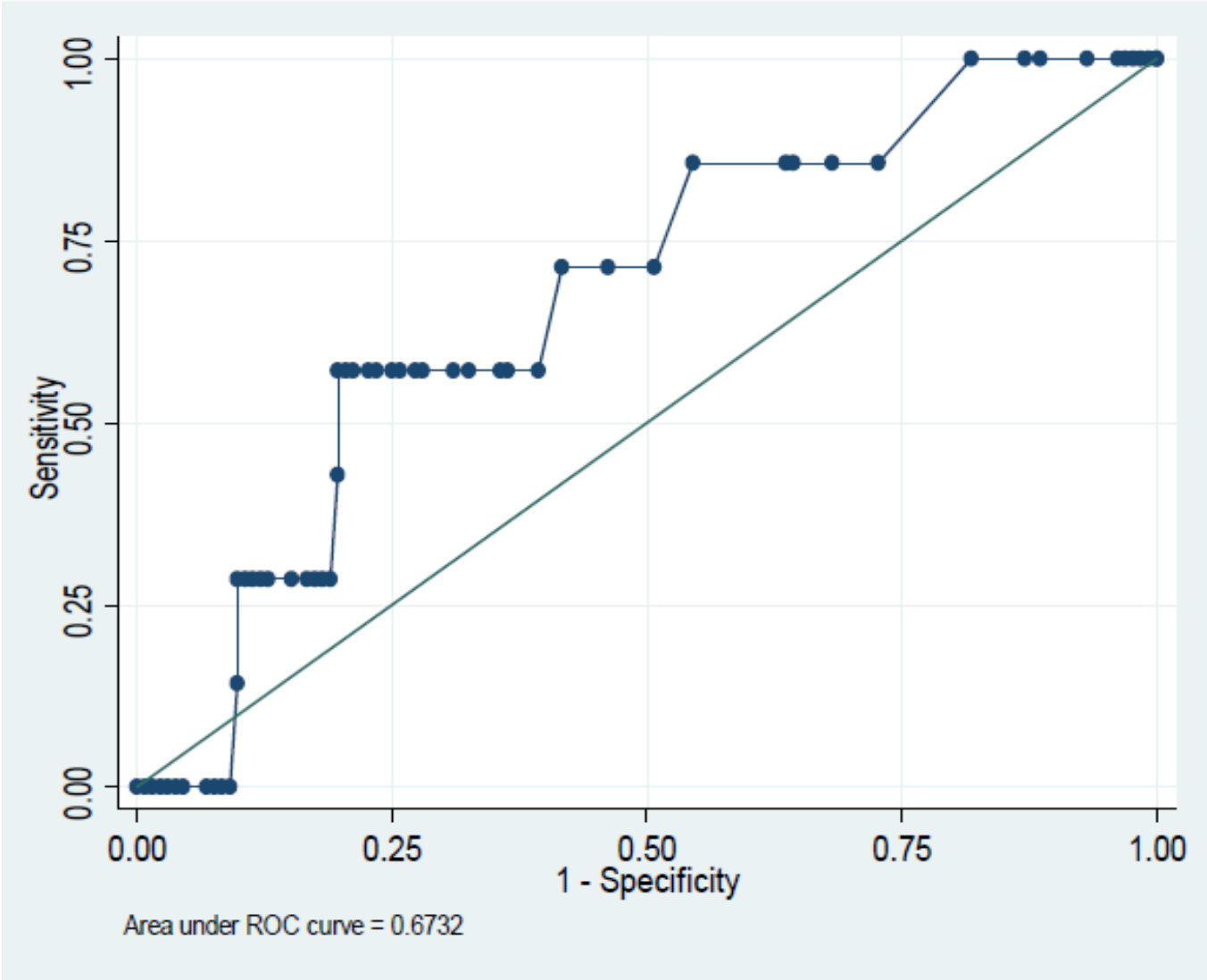


Figure 1. Receiver Operator Characteristic Curve of OGTT

The ROC curve of the HbA1c and OGTT.

Area Under the curve (0.7); 95% CI 0.5-0.9.

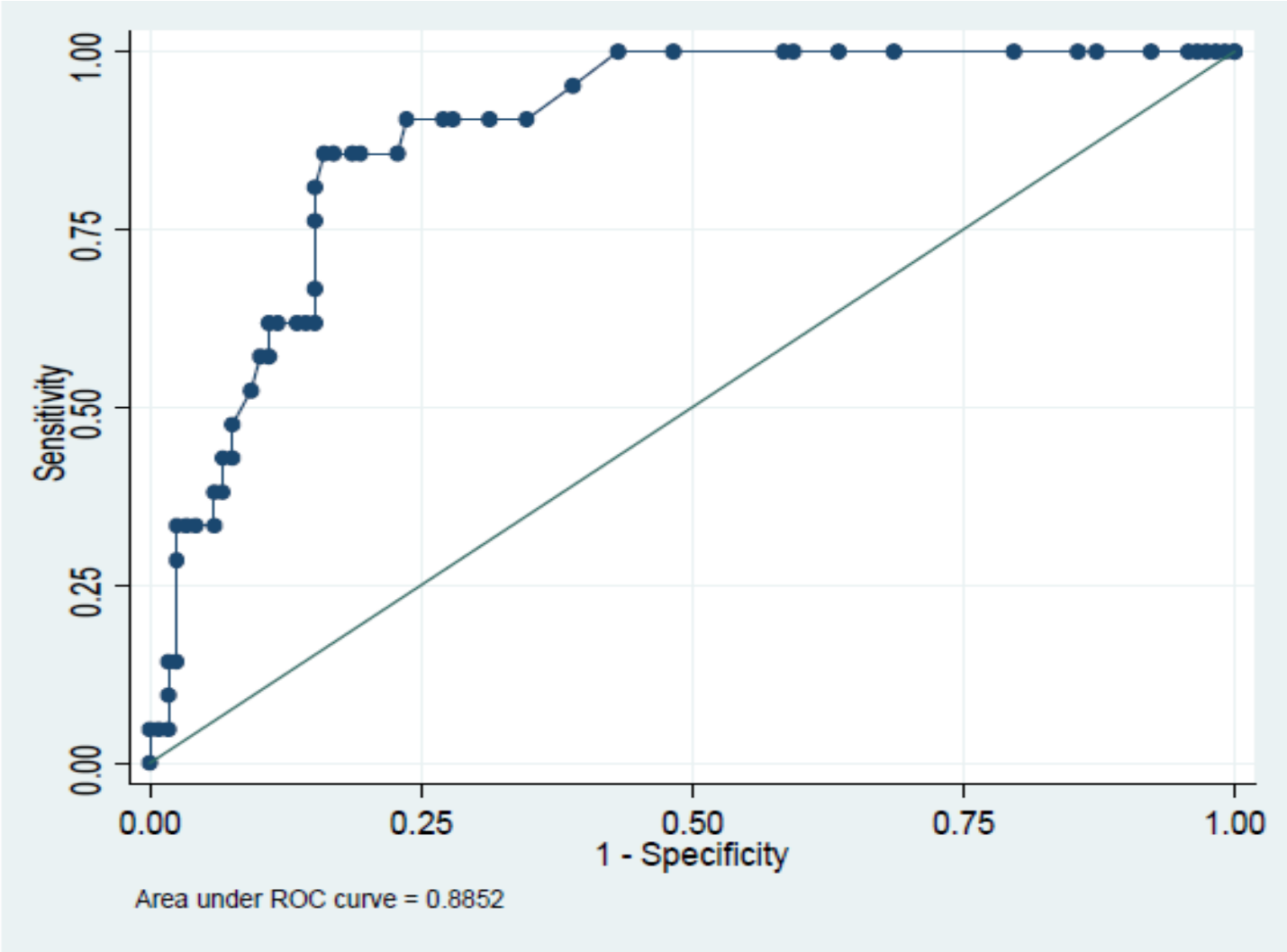


Figure 2. Receiver Operator Characteristic Curve of FPG

The ROC curve of FPG. Area Under the curve (0.89); 95% CI 0.82-0.95. This observation suggests that FPG in this study is better than OGTT in identifying subjects with or without DM.

Validity of the HbA1c test compared to OGTT and FPG

Gold Standard	Sensitivity	Specificity	PPV	NPV
2 Hour Post 75g OGTT	57.1%	96.5%	80.0%	90.2%
FPG	63.6%	98.9%	70.0%	98.2%

PPV=Positive Predictive Value; NPV=Negative Predictive Value; FPG = Fasting Plasma Glucose

Discussion

- The differences in the diagnostic cut-off values may not be unrelated to racial differences in the two groups of subjects (Asian vs. Black Africans) (NHANES study).

- Several Other factors like nutrition and Hemoglobinopathies, which unfortunately is commoner in the black population, may also contribute to the differences noted in the two groups.

- The diagnostic cut-off value of the HbA1c test in this study was found to be lower (6.2%) than the ADA recommended cut off value of ≥ 6.5%.
- Adamu *et al* in Nigeria reported a cut off value of (6.7%) higher than the index study.
- A systematic review of literature on the subject by Benet et al showed that most studies favoured the diagnostic threshold value of 6.1%. (Bennet et al).

Conclusion

- The use of glycated haemoglobin as a potential screening and diagnostic approach for T2DM in black African population at high risk of DM may be useful because of its convenience.

- HbA1c cut-off value of 6.5% may not be appropriate for the black African population.
- Further studies in the subject area is needed to make appropriate conclusion.

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- Thank you