Unseen and Undiagnosed: A Meta-Analysis of Diabetes Detection in Africa

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Background

Diabetes is a growing global health problem, with prevalence rising fastest in Africa. Over half of people with diabetes remain undiagnosed because of a lack of screening tools and programs, increasing the risk of silent complications. Our research focused on two major screening tools: HbA1c and Fasting plasma glucose (FPG). The main benefit of the HbA1c is that it tests for glycated hemoglobin, which allows providers to monitor blood glucose levels over the course of 2-3 months without additional appointments. FPG requires patient fasting (8-12 hours) and can only capture immediate blood sugar levels.

Research Question

How does HbA1c compare to FPG for screening type 2 diabetes in African adults?

Methods

- Databases used: PubMed, EBSCOhost, EMBASE, CINAHL, Cochrane Central
- Inclusion and Exclusion criteria through Key terms
- QUADAS-2
- RStudio

PRISMA Diagram

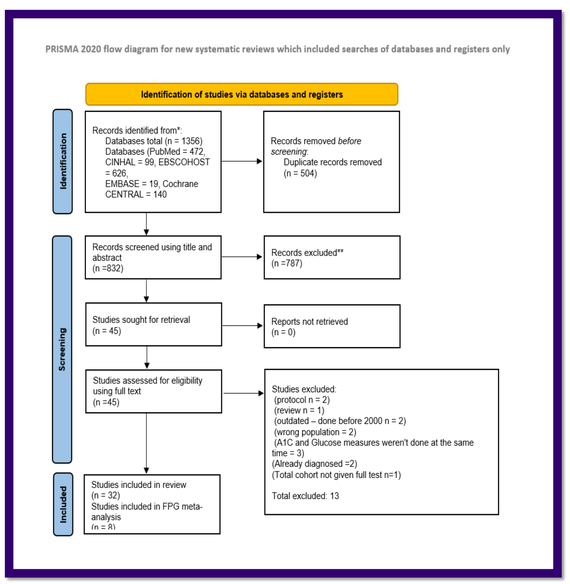


Figure 1. PRISMA flow diagram of the study selection process. Searches identified a total of 1,357 records across databases (PubMed = 472, CINAHL = 102, EBSCO = 625, EMBASE = 19, Cochrane = 139). After screening and eligibility assessment, 12 studies were included in the final review. Studies were excluded because they did not provide 2×2 diagnostic accuracy data. None of the included studies reported blinding procedures.

Results

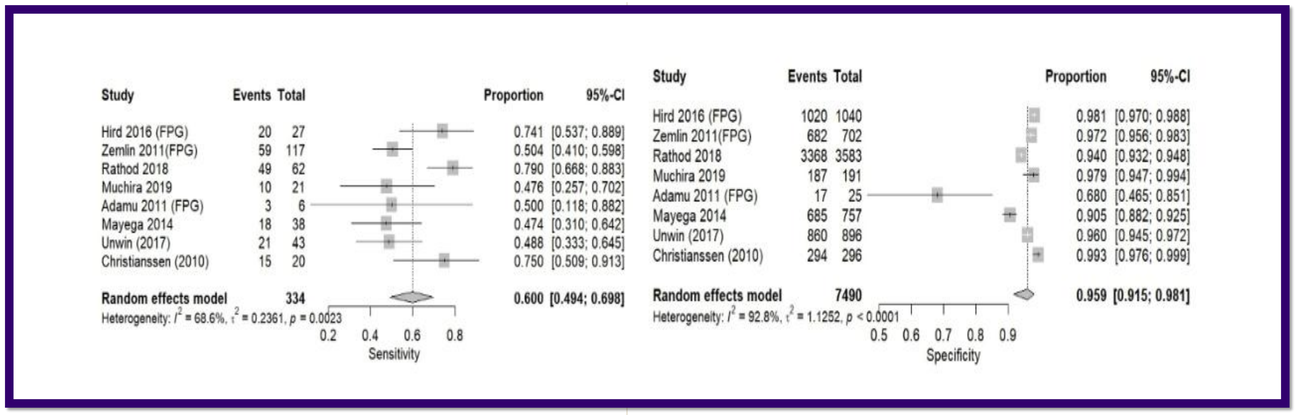
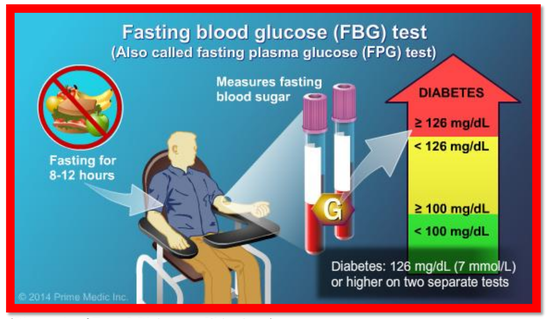
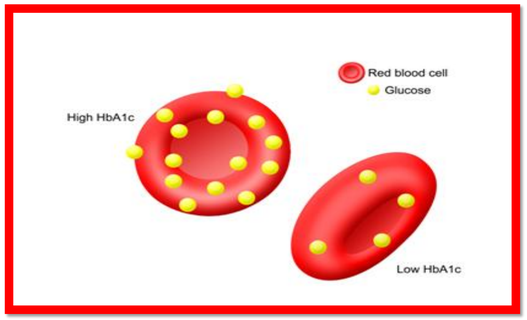


Figure 2. Sensitivity and Specificity of HbA1c for Detecting Type 2 Diabetes. Sensitivity across studies ranged from 47.4% to 79.0%, with a pooled estimate of 60% (95% CI: 49.4–69.8%). This indicates that approximately 40% of true diabetes cases were missed. Heterogeneity was moderate (I^2 = 68.6%, p = 0.0023). Specificity across studies ranged from 68.0% to 99.3%, with a pooled estimate of 95.9% (95% CI: 91.5–98.1%). This reflects a strong ability to correctly identify non-diabetic individuals. Heterogeneity was high (I^2 = 92.8%, p < 0.0001).



(Diagnosis of Type 2 Diabetes - Slide show)



(Diabetes at the RCH : HbA1c - what does this mean)

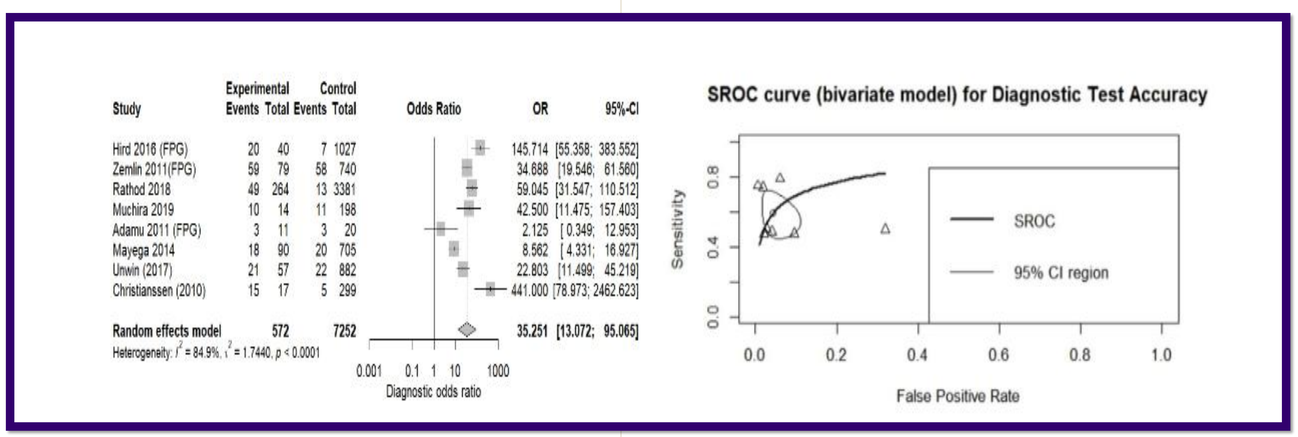
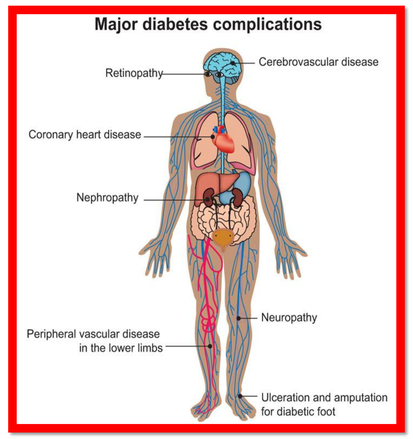


Figure 3. SROC and Diagnostic Odds Ratio for HbA1c in Type 2 Diabetes Screening. Eight studies reported diagnostic odds ratios (DORs) for HbA1c versus FPG, ranging from 2.125 (Adamu 2011) to 145.714 (Hird 2016). The pooled DOR was 35.251 (95% CI: 13.072–95.065%), indicating that individuals with type 2 diabetes were nearly 35 times more likely to be correctly identified than non-diabetic individuals. Heterogeneity was high (I^2 = 84.9%, p < 0.0001), suggesting substantial between-study variability and supporting the need for subgroup analyses. The pooled sensitivity of HbA1c was 59.3% (95% CI: 47.5–70.0%), with a false-positive rate of 4.3%, reflecting moderately low sensitivity but high specificity. The area under the ROC curve (AUC) was 0.836, consistent with good overall diagnostic accuracy.



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Conclusion

HbA1c should not replace the FPG test for diagnosing diabetes. Instead, it should be complemented by the FPG to help improve sensitivity for screening for diabetes and reduce the possible risk for false negative results.

Future Directions

•Combining HbA1c with FPG or additional biomarkers such as glycated albumin may improve overall screening accuracy. A lower HbA1c cutoff may also improve sensitivity and reduce false negatives, although this would likely increase false positives and decrease specificity.

•There is also evidence to suggest that different diabetic phenotypes and biological variation across populations may influence screening performance of HbA1c and FPG. Overall, our findings emphasize the need for more clinically applicable studies to better define effective diabetes screening strategies in African populations.

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QR code for references.