

Are We Missing People With Diabetes? Diagnostic Accuracy of HbA1c vs. the Oral Glucose Tolerance Test

Jack Nims, Immashiya Tanko, Tawanda Chivese

TBIOMD 495



Background

- Diabetes is a growing global health concern with prevalence rising fastest in Africa.
- Nearly half of people with diabetes remain undiagnosed, increasing the risk of serious complications.
- The two main screening tools for diabetes which are both widely used: HbA1c and the oral glucose tolerance test, or OGTT.
- HbA1c offers a faster and more convenient alternative, but its diagnostic accuracy in African populations remains unclear

Objective

- Compare the diagnostic accuracy of HbA1c with the oral glucose tolerance test (OGTT) for diagnosing type 2 diabetes in African adults through a systematic review and meta-analysis.

Search Results

- Zotero, Rayyan AI
- Identified 1357 studies from data bases
- 524 duplicates
- Identified 12 studies overall with 2x2 data
- 7 for HbA1c vs OGTT

Characteristics of Included Studies

- Mean age range was ~25 to ~60 years
- Sample sizes ranged from 31 to 2749 participants
- Uganda(1), South Africa(3),Mauritius(1), Ghana(1), Nigeria(1)

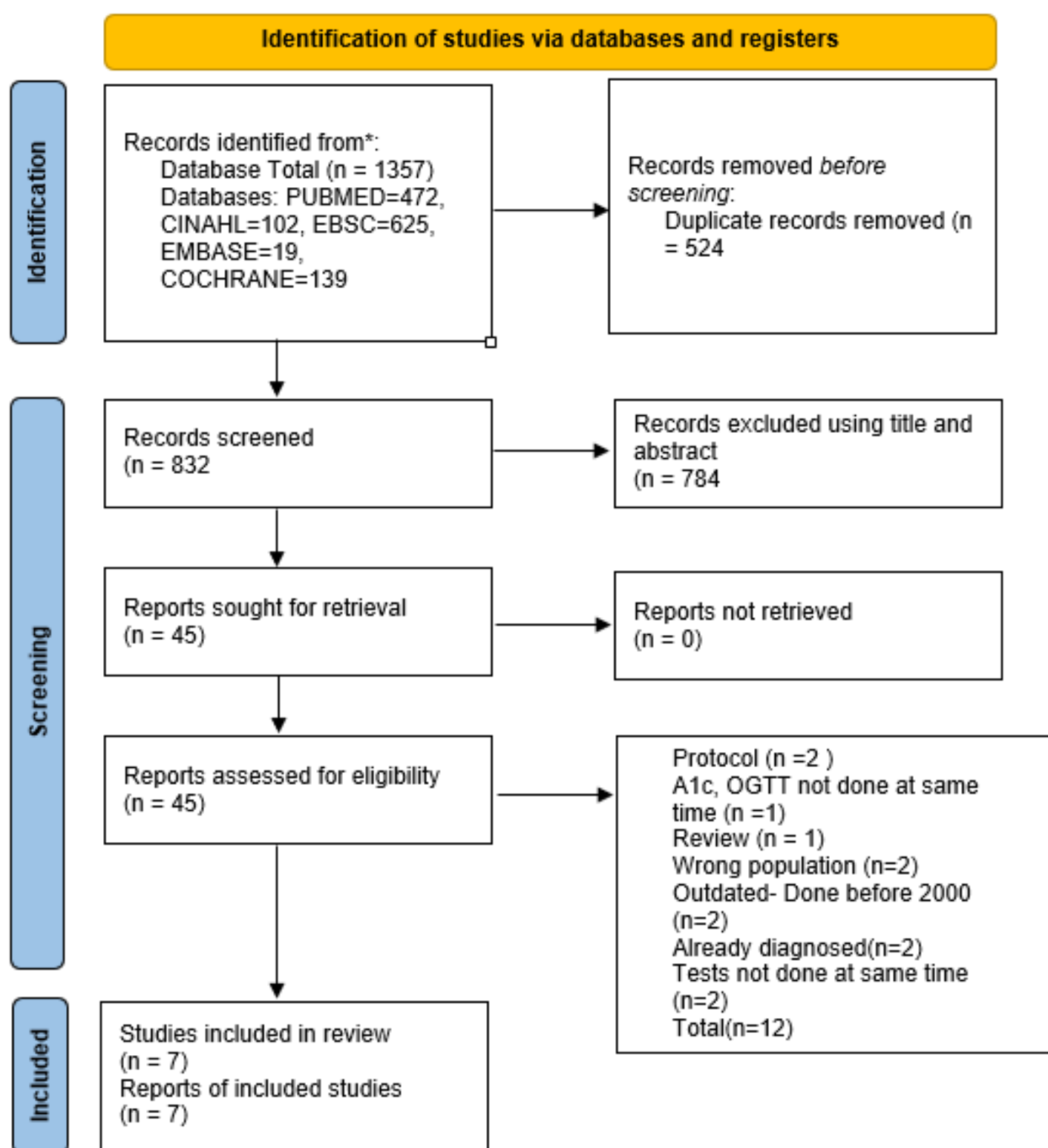


Figure 1. PRISMA flow diagram of the study selection process

Why Screen For Diabetes?

- Diabetes is a disease of complications which can lead to both microvascular and macrovascular complications.
- Microvascular complications include retinopathy, neuropathy, and nephropathy.
- Macrovascular complications include cardiovascular disease, diabetic foot, and even death.
- Because many of these complications develop silently over time, identifying diabetes early is critical

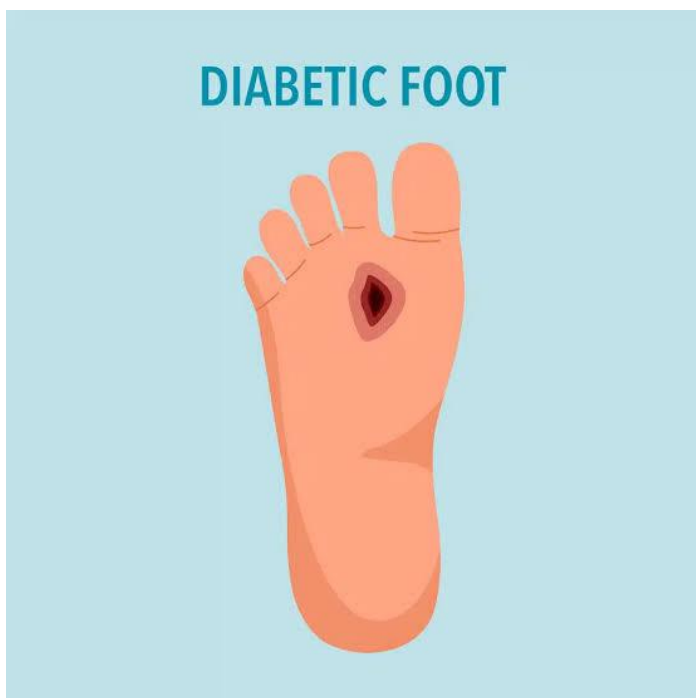


Image credit: Blueastro/Stock (2023).

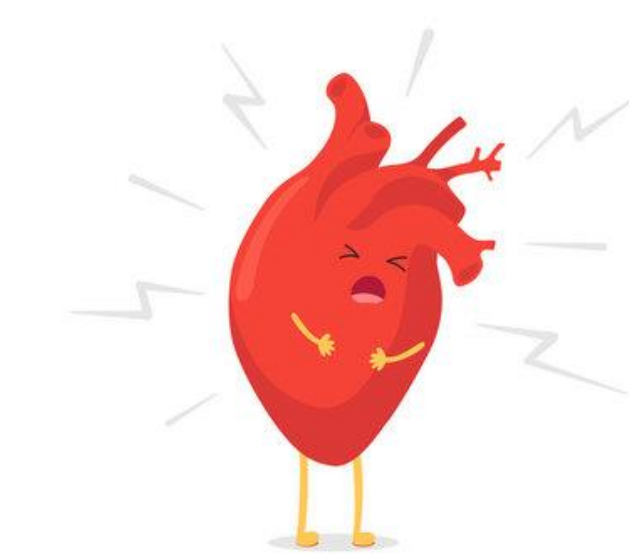


Image credit: Adobe Stock (n.d.).

Specificity of A1c at 6.5% Cut-Off

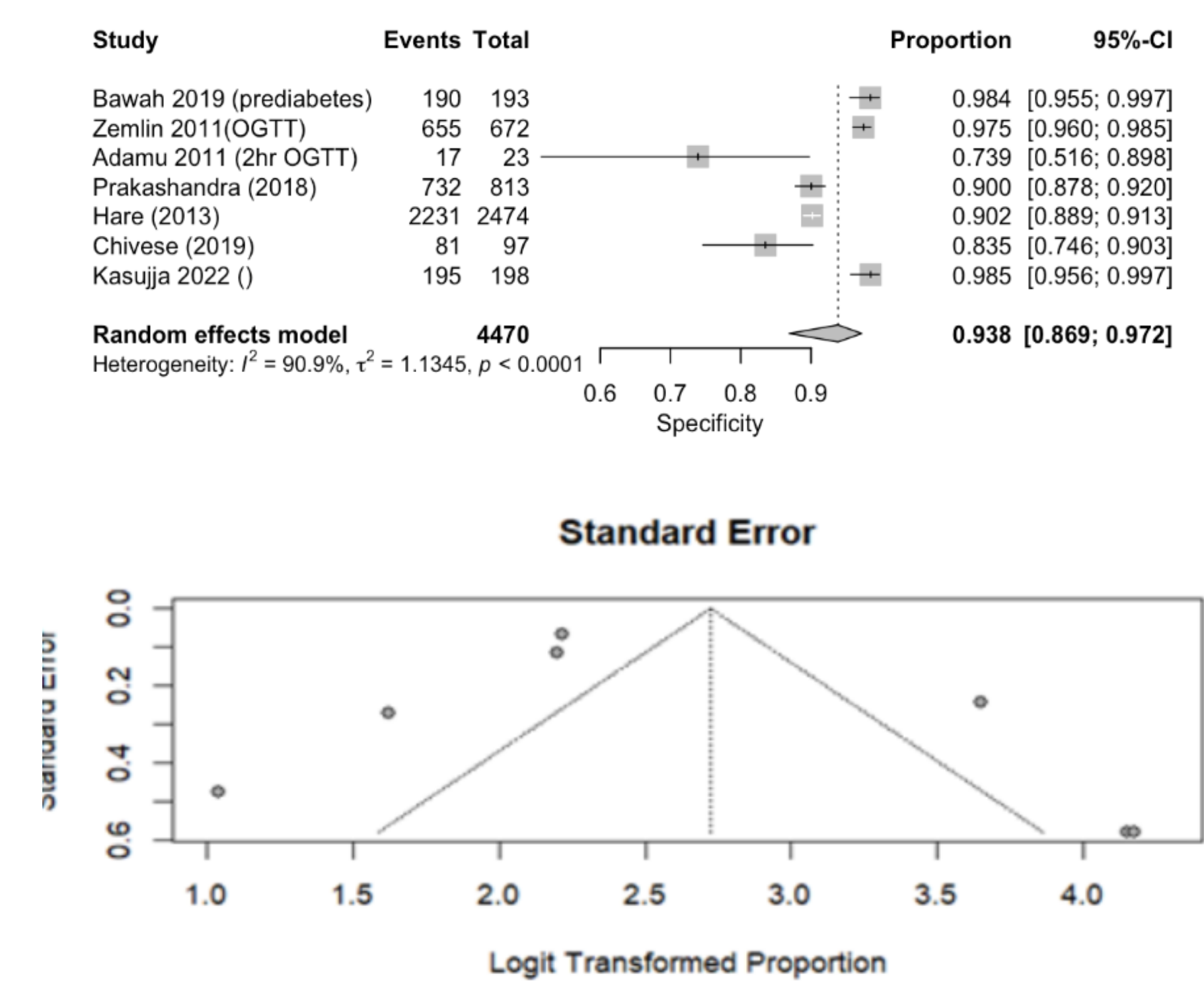


Figure 2. Forest Plot and Funnel Plot Displaying Overall Specificity of the Seven Included Studies:

- **Pooled specificity:** 0.938 (93.8%)
- **95% CI:** 0.869–0.972
- **Interpretation:** High ability to correctly rule out diabetes
- **Heterogeneity:** Moderate
- **Funnel plot:** Asymmetry suggests possible publication bias

Research Question

- How does the HbA1c compare to the oral glucose tolerance test for screening for type 2 diabetes in African adults at 6.5% (48mmol/mol) cutoff?
 - P (Population): Adult African Individuals
 - I (Intervention): HbA1c
 - C (Comparison): OGTT
 - O (Outcome): Diabetes

P	I	C	O
Patient, Population or Problem	Intervention or exposure	Comparison	Outcome
What are the characteristics of the patient or population? What is the condition or disease you are interested in?	What do you want to do with this patient (e.g. treat, diagnose, observe)?	What is the alternative to the intervention (e.g. placebo, different drug, surgery)?	What are the relevant outcomes (e.g. morbidity, death, complications)?

Image credit: [Creator/Organization] (2025).

Sensitivity of A1c at 6.5% Cut-Off

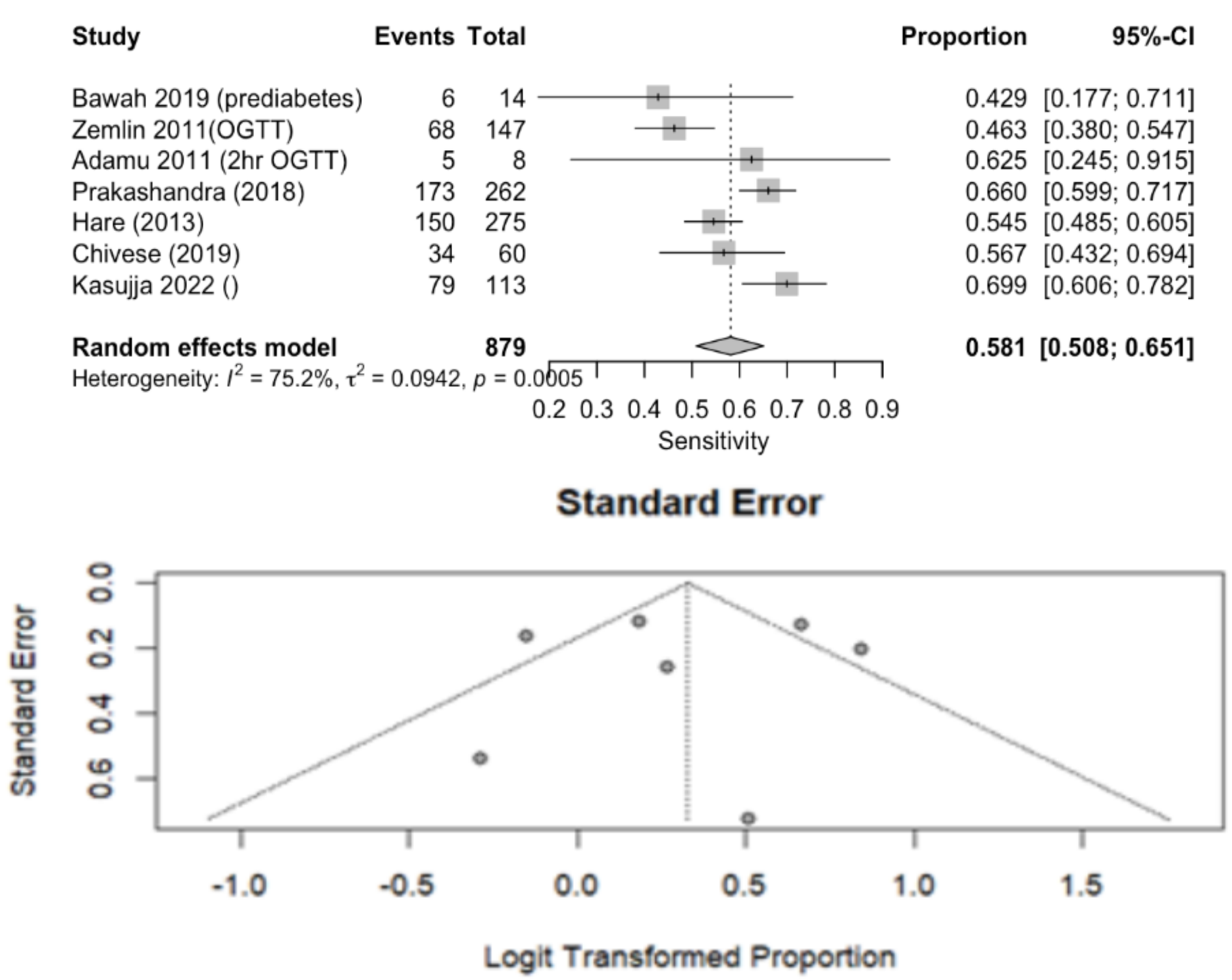


Figure 3. Forest Plot and Funnel Plot Displaying Overall Sensitivity of the Seven Included Studies:

- **Pooled sensitivity:** 0.581 (58.1%)
- **95% CI:** 0.508–0.651
- **Interpretation:** Moderate/low ability to correctly identify diabetes
- **Heterogeneity:** High; influenced by identical data from Bawah (2019) prediabetes and diabetes groups
- **Funnel plot:** Some asymmetry; possible publication bias

Methods

- Conducted a systematic search of PubMed, CINAHL, EBSCO, EMBASE, and Cochrane Central.
- Cross-sectional studies in Africa comparing OGTT and HbA1c
- Excluded studies that included individuals that had already been diagnosed with Type 2 diabetes
- Assessed study quality using QUADAS-2.
- **R Studio:** Bivariate random-effects meta-analysis was performed using R-Packages: rmeta, meta, mada, and metafor

SROC and AUC

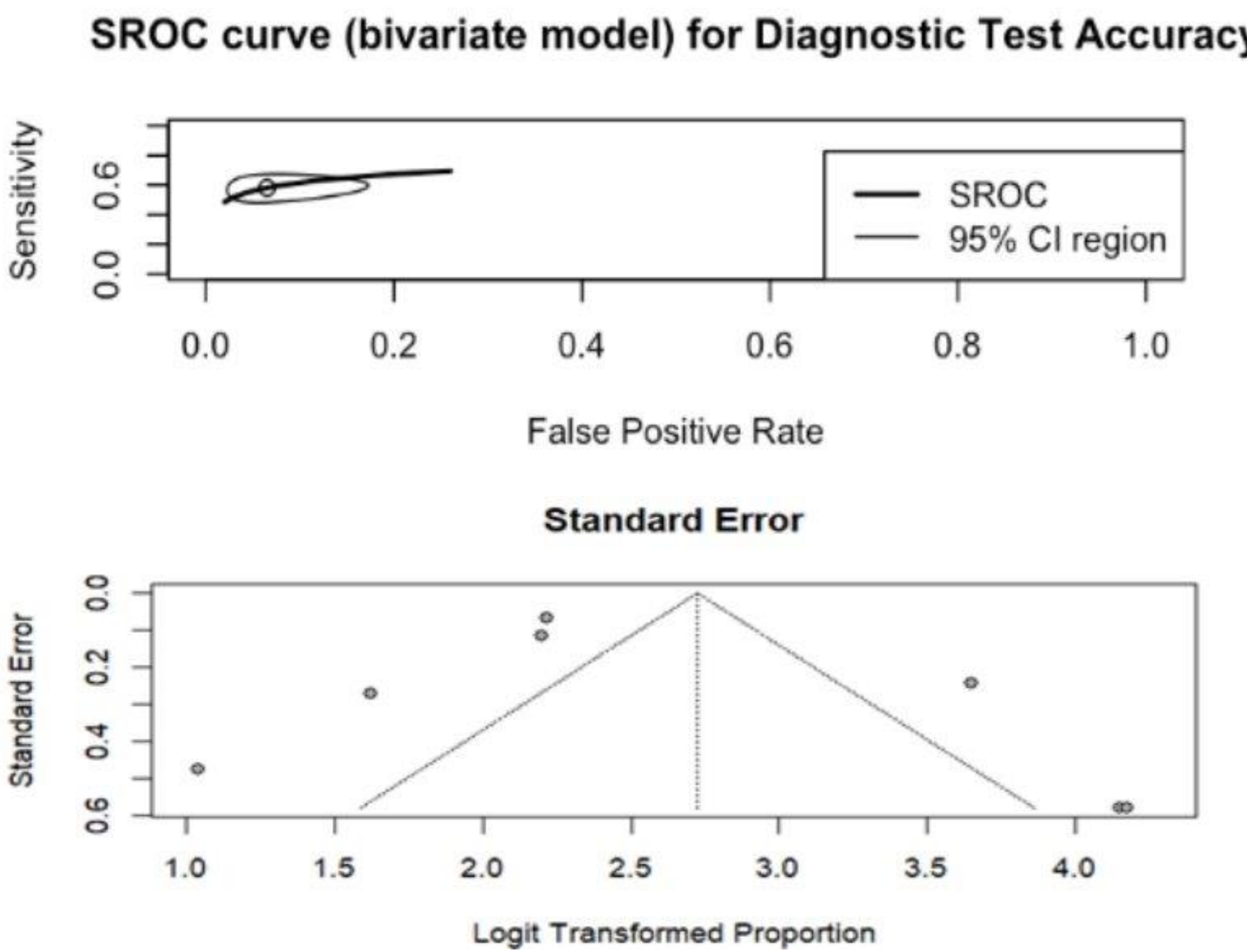


Figure 4. Summary ROC Curve and Funnel Plot:

- **Pooled DOR:** 19.8 (95% CI: 8.89–44.22)
- **Interpretation:** Positive test ~19.8× more likely in individuals with diabetes
- **AUC:** 0.741 → fair diagnostic accuracy
- **Overall:** High specificity but lower sensitivity
- **Heterogeneity:** Considerable across studies
- **Funnel plot:** Possible publication bias

Conclusion/ Take Home

- Acceptable specificity (*Low false positives, good for diagnosing*)
- Low sensitivity (*High false negatives, bad for screening*)
- Future Direction: Combine with other biomarkers:
- Glycated Albumin
- Fasting Glucose
- Micro RNA
- Consider lower cutoffs 6.0-6.5% (42-48 mmol/mol)