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Improved rapid diagnostic tests to detect syphilis and yaws: a systematic review and meta-analysis

MSHC
MELBOURNE SEXUAL HEALTH CENTRE

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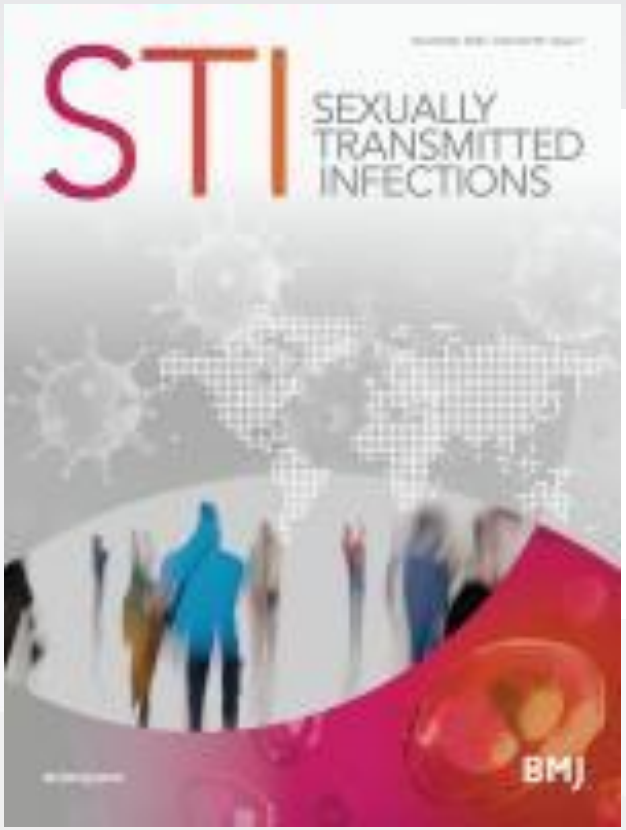

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Improved rapid diagnostic tests to detect syphilis and yaws: a systematic review and meta-analysis

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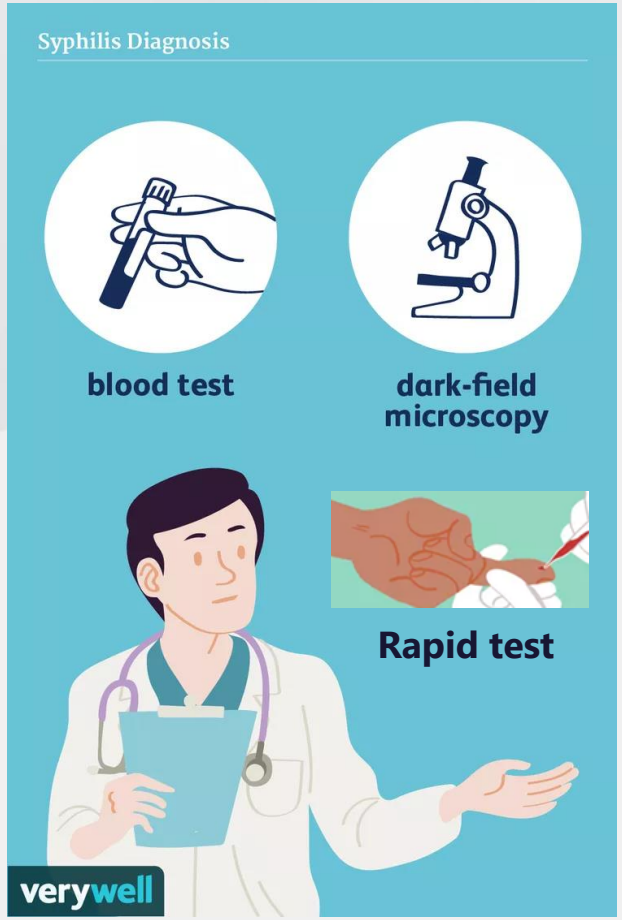
World Health Organization

BACKGROUND

- Syphilis is an STI caused by the bacteria *Treponema pallidum*
  - Several testing options for syphilis
- No single test for active syphilis due to its complexity
- Treponemal-only antibody RDTs are unable to differentiate between active and past infection
- Overtreatment is a challenge because
  - Inappropriate resource use
  - Antibiotic stewardship
  - Opportunity cost for patients

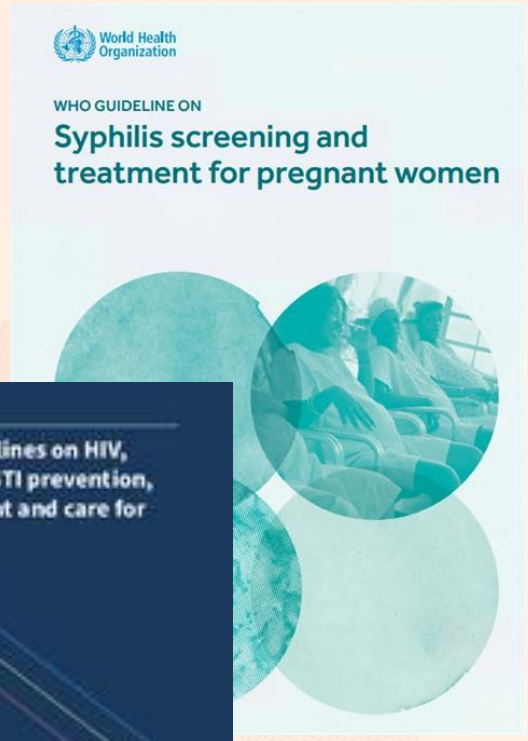


WHO recommendations for syphilis testing

- WHO recommends syphilis testing – particularly for pregnant women and key populations

- WHO has prequalified products
  - Dual HIV/syphilis RDTs (3)
  - Syphilis RDT (1) (& 2 in pipeline)

- Should dual treponemal/non-treponemal rapid diagnostic tests be used as part of testing strategies for syphilis?



The PICO question

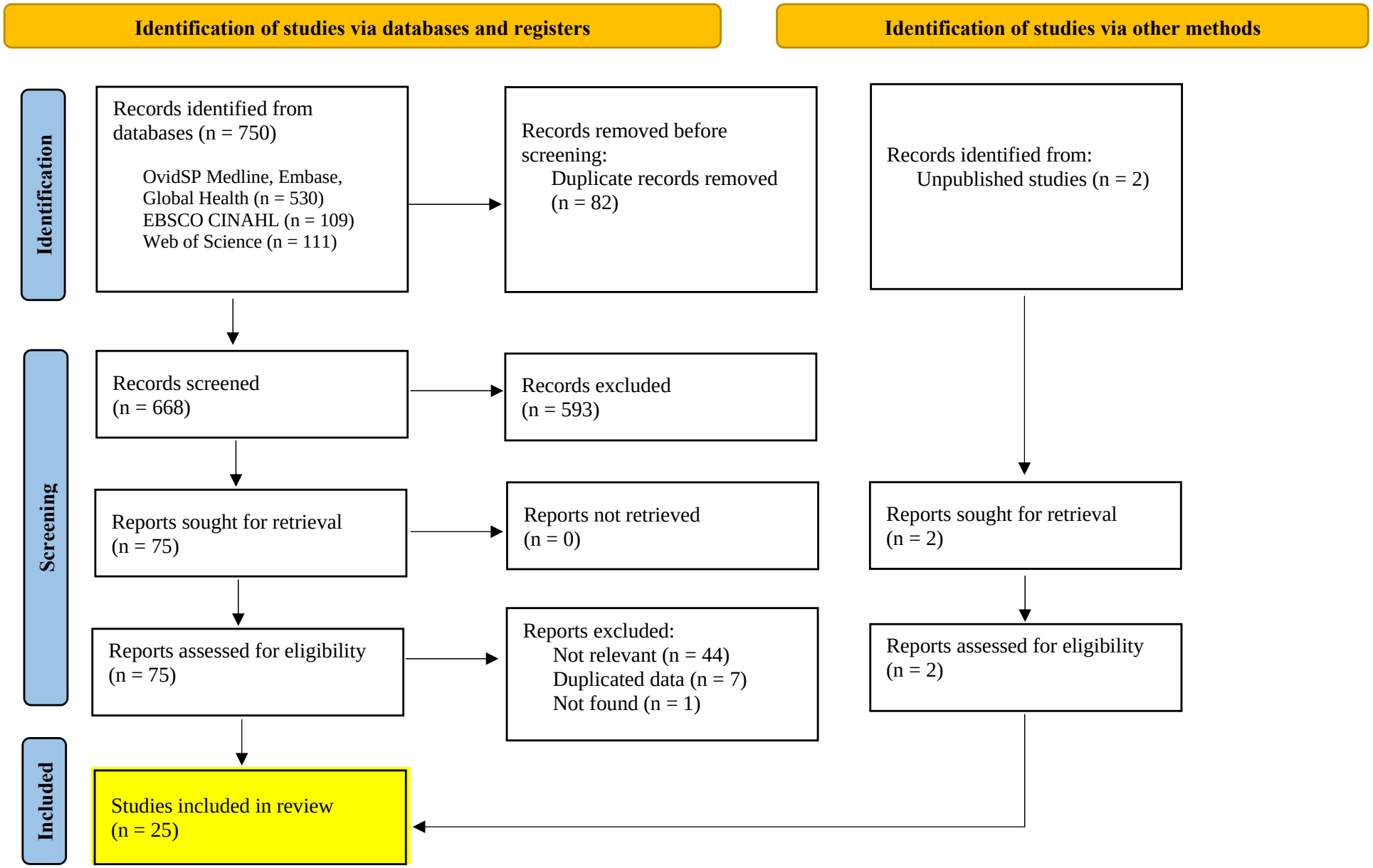
P	People at risk for acquiring *Treponema pallidum* infection (syphilis/yaws)
I	Rapid diagnostic test with the ability to discriminate between active vs. treated/resolved syphilis
C	Laboratory referenced TP and non-TP serology Direct detection methods (e.g., dark field microscopy, PCR testing) Clinical diagnosis Combination of any of the above
O	Accuracy & Test performance (e.g., sensitivity, specificity, concordance) Acceptability / Feasibility / Appropriate Treatment / Time to treatment / Social harm / Uptake of testing

METHODS

- Systematic review following recommendations from the Cochrane Handbook for Systematic Reviews of Diagnostic Test Accuracy and the PRISMA-DTA guidelines

- *1 January 2010 – 11 October 2021*, updated in *October 2022*

- Five databases
  Medline, Embase, Global Health, CINAHL, Web of Science


Identification of studies via databases and registers
Identification of studies via other methods
Identification
Screening
Included
Records identified from databases (n = 750)
OvidSP Medline, Embase, Global Health (n = 530)
EBSCO CINAHL (n = 109)
Web of Science (n = 111)
Records removed before screening:
Duplicate records removed (n = 82)
Records identified from:
Unpublished studies (n = 2)
Records screened (n = 668)
Records excluded (n = 593)
Reports sought for retrieval (n = 75)
Reports not retrieved (n = 0)
Reports sought for retrieval (n = 2)
Reports assessed for eligibility (n = 75)
Reports excluded:
Not relevant (n = 44)
Duplicated data (n = 7)
Not found (n = 1)
Reports assessed for eligibility (n = 2)
Studies included in review (n = 25)

RESULTS

Syphilis

Treponemal

Sensitivity= **0·93 (95% CI: 0·86–0·97)**

Specificity= **0·98 (95% CI: 0·96–0·99)**

I^2= 96·9%, 94·7%

Non-treponemal

Sensitivity= **0·90 (95% CI: 0·82–0·95)**

Specificity= **0·97 (95% CI: 0·92–0·99)**

I^2= 98·3%, 99·3%

Yaws

Treponemal

Sensitivity= **0·86 (95% CI: 0·66–0·95)**

Specificity= **0·97 (95% CI: 0·94–0·99)**

I^2= 96·5%, 84·2%

Non-treponemal

Sensitivity= **0·80 (95% CI: 0·55–0·93)**

Specificity= **0·96 (95% CI: 0·92–0·98)**

I^2= 97·8%, 88·5%

META-REGRESSION

- Serum samples performed better than whole blood samples in both treponemal and non-treponemal sensitivity, but not for specificity.
- Studies conducted in laboratories had better sensitivity for both treponemal and non-treponemal test components compared with studies from clinical facilities.
- Although the use of digital readers to analyse RDT results resulted in greater specificity than the human eye, it only had slightly better sensitivity for the treponemal component and added to the cost of the test.

SECONDARY OUTCOMES

Acceptability

- Healthcare workers: In the Solomon Islands found the RDT reliable and easy to perform.
- Clients: Almost all (95%) in the Rwandan study preferred the RDT testing over conventional venepuncture because it was less painful (98%), takes shorter time (60%) and requires less blood (42%).

Feasibility

- Healthcare workers in the Solomon Islands found the DPP-RDT improved access to testing in settings as distance and cost of getting to hospital were deemed to be barriers

SECONDARY OUTCOMES

Usability

- 4 studies compared digital and visual reading of the DPP RDT for syphilis or yaws
  - High level of concordance for treponemal and non-treponemal tests
  - Botswana study for PLWH found visual reading missed 3/5 active syphilis infections, suggesting digital readers should be used

MAIN TAKEAWAYS

- RDTs that can differentiate between active and previously treated infections could optimise management by providing same-day treatment and reducing unnecessary treatment.
- Current RDTs for syphilis and yaws had slightly lower sensitivity but a very high specificity than laboratory-based testing.
- If distributed widely with appropriate training, these tests can potentially decrease the incidence of both adult and congenital syphilis and contribute to the global eradication of yaws.

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