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Screening for syphilis during pregnancy in Ghana: the role of new rapid point-of-care diagnostic tests

Key Points

- Globally, the annual number of foetal and perinatal deaths from maternal syphilis is greater than the number of deaths of children <15 years from HIV/AIDS. Many babies also suffer serious permanent defects due to congenital syphilis.
- Ghana has experienced a large rise in maternal syphilis prevalence in recent years.
- The existing syphilis screening policy for pregnant women in Ghana has not been widely implemented.
- New rapid point-of-care diagnostic tests for syphilis, which are easy to use with minimal training and equipment, should facilitate implementation of the screening policy.
- Research is needed on the impact, cost-effectiveness and operational aspects of rolling out rapid point-of-care tests in Ghana.

Background

Untreated maternal syphilis caused by infection with the bacterium *Treponema pallidum* is responsible for an estimated annual 360,000 foetal and perinatal deaths worldwide. A further 270,000 babies suffer serious permanent defects because of congenital syphilis. This annual mortality level is greater than that for HIV/AIDS among children (age ≤15 years). In addition, syphilis is associated with increased transmission of HIV to sexual partners. Adverse pregnancy outcomes due to syphilis would be entirely preventable if pregnant women were screened and treated with the cheapest available antibiotic, penicillin. This would contribute to addressing the Millennium Development Goals (MDGs) 4, 5, and 6.

Among pregnant women in developing countries, between 1% and 19% test positive for syphilis. In Ghana, the National HIV/STI Sentinel Surveillance has reported a dramatic increase in mean syphilis seroprevalence from 0.4% in 2003 to 6.5% in 2008, with site prevalence ranging from 0% to 30.5% across 40 clinics involving 18,366 antenatal attenders. This large increase in maternal syphilis prevalence is worrying and may be due to an unfolding epidemic of venereal syphilis or the resurgence of yaws (endemic syphilis) in parts of Ghana or could have been artificially caused by a recent change in the surveillance testing algorithms.

Syphilis screening and treatment policy

Prenatal syphilis screening policies have been adopted in many African countries, but these are rarely scaled up and sustained for implementation. In Ghana, a policy was developed over 10 years ago to provide routine screening for syphilis to all pregnant women attending antenatal clinics, with those found positive being treated with penicillin, a safe, cheap and widely available drug. However, syphilis screening coverage of pregnant women is still very low in antenatal clinics across Ghana. A study of 210 health facilities in the Ashanti Region found that only 3.3% offered routine prenatal syphilis screening. It is therefore important to identify the barriers and challenges to the implementation of the antenatal syphilis screening policy in the field.

Reasons for poor implementation may include: (i) lack of awareness of the policy among service providers; (ii) lack of training, logistical support, guidelines and protocols; (iii) screening tests requiring refrigeration and skilled laboratory personnel; (iv) late booking of visits to antenatal clinics; and (v) lack of clear monitoring and evaluation indicators and insufficient research to inform programmatic action. Typically, adequate education and training, continuity of screening test kit supplies, consumables and drugs, supervision and quality control are essential for a successful and sustainable maternal syphilis screening programme.

Diagnostic tests for syphilis

Most individuals with syphilis are asymptomatic or have transient lesions, so serological (blood serum) tests are the preferred method for detection. Simple and cheap RPR (rapid plasma reagin) or VDRL (Venereal Diseases Research Laboratory) tests that detect cardiolipin antibodies, which are found in cases of acute or recent syphilis, are used for screening and diagnosis. However, these tests are not

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specific for *Treponema pallidum* and are referred to as non-treponemal tests. They can lead to false-positive diagnoses of pregnant women and unnecessary treatment. In addition, while easy to perform in principle, RPR and VDRL tests require basic facilities (refrigeration and electricity) and some training because of problems with subjective interpretation of test reaction, and should be performed in batches for economic reasons.

As a second step, non-treponemal tests should be confirmed with tests that can detect *Treponema*-specific antigens such as the *T. pallidum* haemagglutination assay (TPHA) or *T. pallidum* particle-agglutination assay (TPPA). These specific tests are not widely available in developing countries since they are laboratory-dependent and require trained personnel, refrigeration for storage of reagents and electricity to run equipment such as a refrigerator, centrifuge and shaker. Generally, health facilities in rural areas are not equipped to handle blood samples so these are transported to regional or central facilities for testing, or patients are referred to such facilities. Test results are therefore only available days or weeks later and specimens can be lost in the process, so it is common that patients do not return for or get their results in time for treatment. This may lead to adverse clinical outcomes, continued transmission of infection and wasted resources. The testing algorithm for surveillance in Ghana prior to 2004 was to screen with RPR or VDRL and confirm with TPHA. However, this was recently changed to use a simpler and rapid *Treponema*-specific diagnostic point-of-care (POC) test, which however cannot distinguish between Treponema species causing syphilis or yaws.

New approaches to syphilis screening

The new generation of rapid POC tests can be performed outside the laboratory and do not require equipment or electricity. They present as individual plastic cassettes, are simple to use and more objective to read, with minimal training. In addition, they can use whole blood from a finger prick as well as serum or plasma, and results are available within 15 minutes. POC tests use specific treponemal antibody detection methods to screen for syphilis. These tests have been shown to be highly sensitive and specific, giving reliable and reproducible results, even when performed by health personnel with minimal training in a range of clinical settings. POC tests offer an unprecedented opportunity to provide screening to pregnant women at all levels of the health service, as well as the chance to increase screening coverage and reduce pregnancy losses and infant mortality due to untreated syphilis.

However, in comparison to non-treponemal tests, POC tests cannot distinguish between active and past-treated infections, which may limit their usefulness in areas with high syphilis or yaws prevalence (such as some areas in the Central, Eastern and Ashanti regions), or when patients need to be screened repeatedly, as in successive pregnancies. Therefore, assessment of their impact and cost-effectiveness in eliminating congenital syphilis through scale-up programmes is recommended by the World Health Organization's STD Diagnostics Initiative (SDI). Research is warranted in Ghana, where the Ghana Health Service has embarked on a revamped programme to control maternal syphilis using POC tests, but where endemic treponemal infections also coexist.

Research needs

In order to strengthen the maternal syphilis screening programme in Ghana, the following research needs are highlighted.

Epidemiology

- Describe the local epidemiology of syphilis in Ghana such as syphilis seroprevalence and its associated morbidities;
- Determine whether variations in syphilis prevalence are associated with syphilis-related adverse pregnancy outcomes; and
- Measure the impact of maternal syphilis on pregnancy outcomes.

Maternal screening

- Identify and understand the barriers to maternal syphilis screening, from policy to service provision, including experience from service providers and clients;
- Evaluate the operational performance of current maternal syphilis screening and treatment strategies;
- Evaluate screening and treatment coverage of maternal syphilis using new point-of-care diagnostic tests compared to current screening strategies at the primary care level;
- Determine the cost-effectiveness of using point-of-care diagnostic tests; and
- Monitor long-term reduction of infant mortality and other adverse pregnancy outcomes.

Useful resources

Ministry of Health, Ghana. National Reproductive Tract Infections Policy Guidelines. Ghana Health Service, Accra, Ghana, 2004.

National Yaws Control Programme. Annual Reports. Ghana Health Service, Accra, Ghana, 2007 and 2008.

National AIDS Control Programme/Ghana Health Service. HIV Sentinel Survey Reports. Accra, Ghana, 2003-2008.

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WHO/TDR Sexually Transmitted Diseases Diagnostics Initiative. Evaluation of rapid diagnostic tests: syphilis. *Nature Reviews Microbiology*, 2006; S33-40.

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