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Lost opportunity to save newborn lives: variable national antenatal screening policies for *Neisseria gonorrhoeae* and *Chlamydia trachomatis*

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Abstract

Unfavorable pregnancy outcomes caused by *Chlamydia trachomatis* or *Neisseria gonorrhoeae* infection are well known. The first step in addressing antenatal *C. trachomatis* and *N. gonorrhoeae* infection is a national policy to screen all pregnant women for *C. trachomatis* and *N. gonorrhoeae*, regardless of symptoms. The aim of this study was to inform policy makers on the presence of antenatal screening recommendations for *C. trachomatis* and *N. gonorrhoeae* infection. We conducted a three-part study from June 2015 to February 2016. We analyzed English and French language information online on Ministry of Health websites regarding *C. trachomatis* and *N. gonorrhoeae* antenatal screening. We referenced both primary official country and regional policy documents. We contacted the Ministry of Health directly if the information on the national antenatal screening was outdated or unavailable. In parallel, we sent a survey to the regional representative from the World Health Organization to help collect country-level data. Fourteen countries have current policies for antenatal screening of *C. trachomatis* and/or *N. gonorrhoeae* infection: Australia, the Bahamas, Bulgaria, Canada, Estonia, Japan, Germany, Latvia, New Zealand, Democratic People's Republic of Korea, Romania, Sweden, the United Kingdom, and the United States. Australia, New Zealand, and Latvia and the United States restricted antenatal screening to women $\leq$25 years old and those of higher risk. Several countries responded that they had policies to treat pregnant women with symptoms. This is the currently recommended WHO guideline but is not the same as universal screening. North Korea had policies in place which were not implemented due to lack of personnel and/or supplies. National level policies to support routine screening for *C. trachomatis* and *N. gonorrhoeae* infection to prevent adverse pregnancy and newborn outcomes are uncommon.

Keywords

Chlamydia (*Chlamydia trachomatis*), gonorrhea (*Neisseria gonorrhoeae*), prevention, screening, women

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Introduction

Sexually transmitted infections (STIs) are a significant public health concern with more than one million people acquiring an STI every day worldwide.[1,2] The most common sexually transmitted bacterial infection is *Chlamydia Trachomatis* (CT) with an estimated 131 million new cases each year.[1,3] CT and *Neisseria Gonorrhoeae* (NG) infections are often asymptomatic, especially in women.[4] The syndromic approach to CT and NG management currently recommended by the World Health Organization (WHO) may therefore be ineffective.[4,5] This approach uses the identification of symptoms and signs that are recognizable and consistent

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such as vaginal discharge and lower abdominal pain as a basis for CT and NG treatment.[1,6] However, only 5–30% of women with laboratory-confirmed CT and NG infection develop symptoms.[7] An alternative approach that screens all pregnant women regardless of symptoms might be beneficial when considering the extensive adverse pregnancy and newborn health outcomes that are linked to both CT and NG.[8,9]

Unfavorable pregnancy outcomes caused by CT and NG infection include spontaneous abortion, stillbirth, prematurity, low birth weight, and post-partum endometritis.[3,8,10,11] These adverse outcomes may be particularly perilous for newborns in resource constrained areas of the developing world.[8,12,13] Screening may be very important for early eradication of infection which may reduce preterm birth by reducing exposure to these pathogens during pregnancy.[14]

Untreated CT can also increase the likelihood of HIV transmission from a mother to her infant.[7,15,16] In addition, perinatal transmission of CT or NG can cause neonatal *opthalmia neonatorum* (conjunctivitis) and pneumonia.[7,17–19] Worldwide, up to 4000 newborn babies become blind every year because of eye infections attributable to untreated maternal CT and NG infections.[1] Effective means of preventing conjunctivitis and newborn blindness include screening all pregnant women for both CT and NG infection, and subsequently treating pregnant women and their partners for these infections.[9]

Universal antenatal screening refers to testing all pregnant women for CT and NG infection regardless of symptoms, age, and other risk factors. Studies in several regions have demonstrated the acceptability and feasibility of antenatal screening for CT and NG infection including Australia,[20] Africa,[21] Europe,[22] Latin America,[23] and the Middle East.[24] Another study demonstrated that antenatal CT screening of women aged 16–25 years was cost effective in Australia, even with a low estimated prevalence of 3%.[15,25] Nonetheless, screening recommendations for STIs in pregnancy while strongly supported by evidence for infections like human immunodeficiency virus and syphilis are less strong and made with less certain evidence for other curable STIs like CT and NG. For example, according to the U.S Preventative Services Task Force, there is adequate certainty that there will be a 'moderate to substantial' net benefit from screening pregnant women who are at increased risk of infection (i.e. high-risk sexual behavior or age <25 years).[26] However, for women who are not at an increased risk, evidence is considered insufficient and the net benefit of screening is considered to be small.[26]

The aim of our study was to provide additional evidence on the frequency and distribution of CT and NG screening policies in different countries worldwide to add to current literature on this topic. Our study supports updated national, regional, and global recommendations of policies for antenatal CT and NG screening and treatment.

Methods

We conducted a three-part study from June of 2015 to February 2016. First, we analyzed available data online on select English-language Ministry of Health websites regarding STI screening for pregnant women. Google was used as our primary search engine. Specific terms that were used in our online search included 'antenatal Ministry of Health guidelines,' 'STI screening recommendations,' 'chlamydia antenatal screening,' 'gonorrhea antenatal screening,' 'STI management,' and 'antenatal visit recommendations.' These terms were searched for each respective country. Official documentation from this search included documents from MOH or other government official websites that provided information on screening policies. Primary source documents other than MOH documents were accepted such as those provided from national health protection bodies such as the European Center for Disease Prevention and Control. We identified 28 countries' policies on antenatal CT or NG screening online.

Second, we contacted the country's Minister of Health when official screening recommendations for a country were not available online. If data were available online, the country MOH was not contacted unless online information was ambiguous in order to receive secondary confirmation of results. Ministries of Health were contacted to ascertain whether they had a national CT and/or NG antenatal screening policy in place. Contact was via email in English, French, or Spanish.

Third, we contacted the reproductive health representative for each WHO region and requested assistance in collecting country-level data on screening practices among pregnant women for both CT and NG. WHO regions include Africa (47 countries), the Americas (35 countries), the Eastern Mediterranean (21 countries), Europe (53 countries), South-East Asia (11 countries), and the Western Pacific (27 countries). This survey included the following four questions:

1. Is there a government policy to provide routine chlamydia screening for pregnant women in the country? (Yes/No)
2. If Yes, [are there] certain criteria for screening? (*Please list criteria, e.g. <25 years old, high risk, etc.*)
3. Is there a government policy to provide routine gonorrhea screening for pregnant women in the country? (Yes/No)
4. If Yes, [are there] certain criteria for screening? (*Please list criteria, e.g. <25 years old, high risk, etc.*)

Results

Of all 196 countries worldwide, we identified primary Ministry of Health or other primary sources of data on antenatal CT or NG screening policies for 28 countries (see online supplemental material). For the first round of surveys, we contacted an additional 98 country Ministries of Health, from which we received responses from 16 countries. Five of the 16 responses recommended other sources for screening policy information. For the second round of surveys with the WHO regional offices, we received 20 country responses from WHO representatives, which included three additional countries that have national recommendations for antenatal CT or NG screening. In total, we received 64 responses (including primary sourced documents) which provided clear policy data on 57 countries in total. Of those 57 countries, 14 countries reported to have antenatal CT or NG screening policies, 43 countries reported to not have antenatal CT or NG screening policies, while 139 countries remain unknown (Tables 1 and 2).

Our study found that 14 countries have policies for antenatal screening of CT and/or NG infection: Australia, the Bahamas, Bulgaria, Canada, Estonia, Japan, Germany, Latvia, New Zealand, Democratic People's Republic of Korea, Romania, Sweden, United Kingdom, and the United States (Figure 1). Of those countries, several restrict to either CT or NG antenatal screening to young women $\leq$25 years of age, including Australia, the United States, New Zealand, and Latvia. Several countries responded that they have policies to treat pregnant women with

Table 1. Policies for national antenatal screening of *Chlamydia trachomatis*.

No (n = 43)	Yes (n = 10)	Yes, with specific criteria (n = 3)
Austria, Bangladesh, Bhutan, Bolivia, Botswana, Cuba, Cyprus, Denmark, Egypt, Guatemala, Guyana, Haiti, Iceland, India, Indonesia, Iran, Iraq, Israel, Kenya, Malaysia, Maldives, Mexico, Morocco, Myanmar, Namibia, Nepal, Norway, Panama, Philippines, Poland, Saudi Arabia, Sierra Leone, Singapore, South Africa, South Sudan, Spain, Sri Lanka, Switzerland, Thailand, Timor-Leste, UK, Uganda, Zambia	The Bahamas, Bulgaria, Canada, Democratic People's Republic of Korea, Estonia, Germany, Japan, Romania, Sweden, the United States	Australia,[a] Latvia,[b] United States[c]

[a]Pregnant women <25 years of age and in areas where CT prevalence is high.
[b]Pregnant women up to the age of 24, pregnant women of 'social risk group,' pregnant women with sexually transmitted infection in anamnesis or clinical symptoms.
[c]Pregnant women <25 years of age and those older if at increased risk.

Table 2. Policies for national antenatal screening of *Neisseria gonorrhoeae*.

No (n = 41)	Yes (n = 5)	Yes, with specific criteria (n = 3)
Austria, Bangladesh, Bhutan, Bolivia, Botswana, Cuba, Cyprus, Denmark, Egypt, Guatemala, Guyana, Haiti, Iceland, India, Indonesia, Iran, Iraq, Israel, Kenya, Latvia, Malaysia, Maldives, Mexico, Morocco, Myanmar, Namibia, Nepal, Panama, Philippines, Poland, Saudi Arabia, Sierra Leone, Singapore, South Africa, South Sudan, Spain, Sri Lanka, Thailand, Timor-Leste, Uganda, Zambia	The Bahamas, Canada, Democratic People's Republic of Korea, Germany, the United Kingdom	Australia,[a] New Zealand,[b] United States[c]

[a]Includes known risk factors or who live in or comes from areas where prevalence is high.
[b]Includes <25 years of age, where no previous testing has been done in current relationship, in patients with partner change within previous six months or during pregnancy, in the presence of symptoms, and in patients with a history of previous NG infection.
[c]Sexually active women under 25 years of age and sexually active women aged 25 years and older if at increased risk.

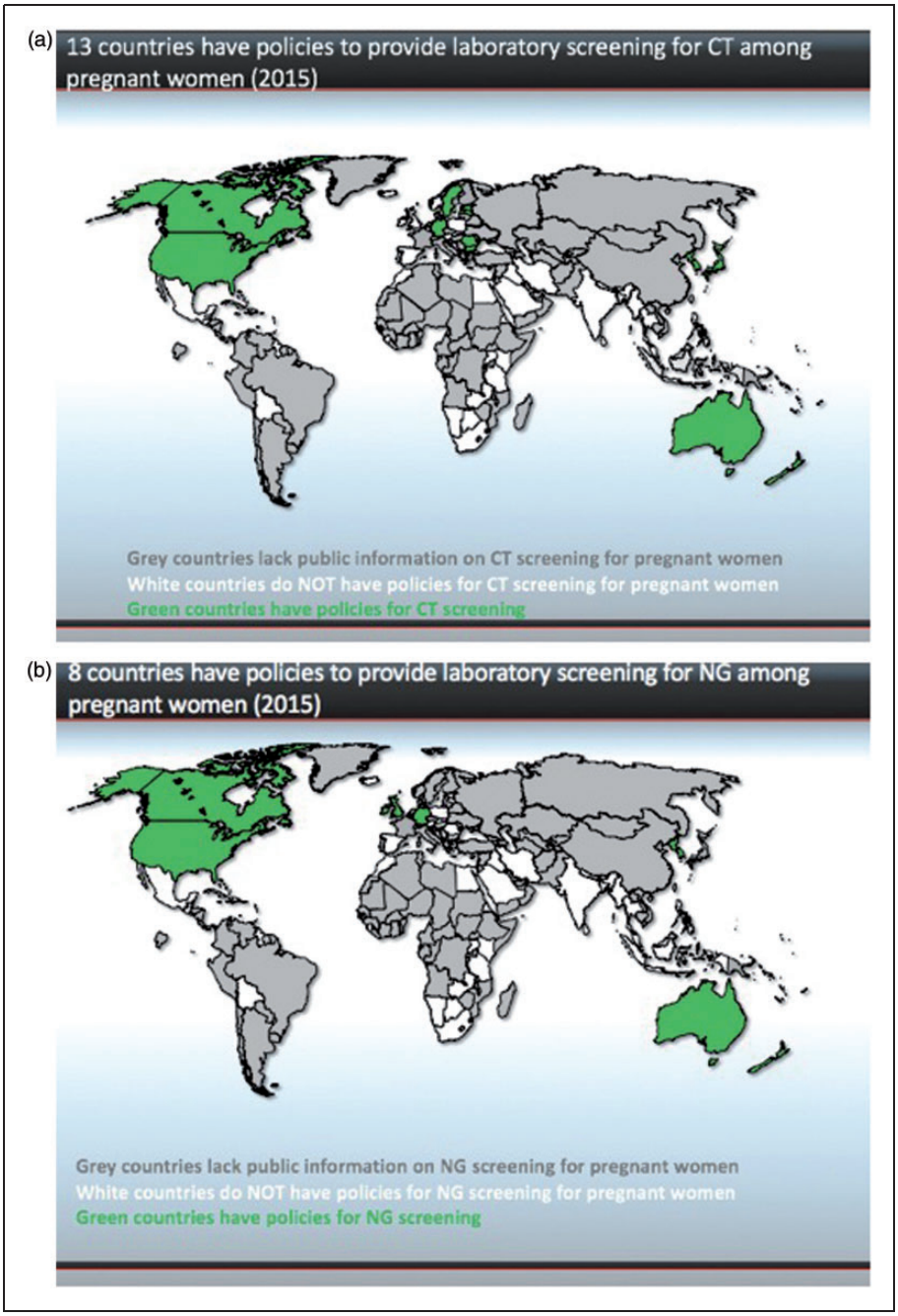

Figure 1. (a) Thirteen countries have policies to provide laboratory screening for CT among pregnant women (2015). (b) Eight countries have policies to provide laboratory screening for NG among pregnant women (2015).

symptoms, consistent with current WHO guidelines for syndromic management. North Korea had screening policies in place which were not implemented due to lack of personnel or supplies.

Discussion

This study informs public health officials of the presence of current national policies on antenatal CT and NG screening by country. Antenatal CT and NG screening policies were found in 14 countries among 57 countries (25%). Antenatal CT and NG screening policies were uncommon. Thirteen countries were found to have antenatal screening policies for CT infection and eight countries were found to have antenatal screening policies for NG infection. Further, having a national policy does not translate into providing testing to all pregnant women. For example, many women are still not tested for CT and NG infection despite screening recommendations in the US[27,28] and New

Zealand.[29] Increasing the coverage of antenatal screening for CT and NG infection could greatly improve maternal and infant health outcomes.

Previous studies have confirmed the importance of improving interventions to screen and treat CT and NG in early pregnancy.[14,30–32] Other studies demonstrated that routine antenatal CT and NG screening is the most effective intervention to prevent eye infections and pneumonia among newborns.[9] Previous studies have also indicated that antenatal CT screening can be both cost effective and highly acceptable in various global settings,[13,21,25,33] especially in areas with high CT prevalence.[34]

Recent research has shown a persistent high prevalence of antenatal CT in different settings worldwide especially in low- and middle-income countries in sub-Saharan Africa,[35] and Pacific Island countries.[36] Screening pregnant women for CT has been recommended as a result of studies analyzing antenatal CT prevalence in different settings. Antenatal CT prevalence studies worldwide have demonstrated high prevalence within specific populations in Botswana (8%),[30] Cameroon (38.4% in HIV-infected patients and 7.1% in HIV-uninfected patients),[36] China (10.1%),[28] Kenya (6%)[37]; Mozambique (8%),[38] Papua New Guinea (11.1%),[39] Peru (10%),[23] Saudi Arabia (10.5%),[25] South Africa (17.8%),[35] and Tanzania (11.4%).[40]

Integrating antenatal CT and NG screening can help identify curable infections among pregnant women and sequelae among newborns. With the advent of highly sensitive and specific nucleic acid amplification tests and point-of-care testing platforms, implementation of routine screening during antenatal care in resource limited countries is warranted.[41–43] Clinical trials, such as the one trial ongoing in Papua New Guinea, are recommended to evaluate context-specific cost–benefit of CT and NG routine screening during antenatal care in various settings.[44]

One limitation to our study included the large proportion of MOH and WHO representatives who did not provide responses. One hundred and thirty-nine countries were left unknown. The unknown policy status of a large number of countries may be due to both language and internet limitations on the part of the research group. Also, many countries remain unknown due to absence or inaccuracy of MOH contact information. Due to various challenges faced in collecting the aforementioned data, including lack of MOH contact information, language barriers, and lack of responsiveness by WHO and MOHs, we may have excluded countries with antenatal CT or NG screening policies. However, we hypothesize that the response rate was highest among countries with antenatal CT or NG screening policies. We included results for 57 countries for which we received information on antenatal CT or NG policies.

Another limitation was the discrepancy between official online documents compared to email responses received from Ministries of Health. In all cases, the Ministry of Health responses took priority over other sources. Furthermore, if CT or NG screening was not listed on primary source documents as a part of routine prenatal care, we concluded that there was no national policy for screening for these infections. However, we understand that this may be a result of a specific country deciding against screening after consideration of the evidence of that specific country or region. We also recognize that having a policy does not mean that the screening is necessarily done. Further studies should verify where screening is actually available.

Conclusion

Universal antenatal CT or NG screening policies were uncommon. Some regions (Middle East, Central and South America) did not have any country with antenatal CT or NG screening policies, despite persistently high antenatal CT and NG prevalence. There is a need for a response from international agencies to build a more robust and comprehensive database of programs to increase routine CT and NG in antenatal care. There is also a need to increase the evidence base on the impact and cost–benefit of routine screening and treatment for CT and NG infections in pregnant women in various settings. Considering the high prevalence of CT and NG, and the negative maternal and newborn sequelae of these infections, we recommend further implementation science to demonstrate the feasibility, acceptability, and cost–benefit of integrating screening for CT and NG infection into existing antenatal programs. CT and NG screening might be important in prevention of adverse maternal and newborn sequelae. Our study found that CT and NG policies supporting antenatal screening vary by region and in many countries no screening policies exist. We therefore recommend that countries consider national policies on CT and NG screening in pregnancy and make these publicly available.

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