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Chlamydia trachomatis infection during pregnancy: Knowledge, test practices, and attitudes of Dutch midwives

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ABSTRACT

Background: Chlamydia trachomatis infection in pregnancy may lead to adverse pregnancy outcomes. In the Netherlands, testing for C. trachomatis is based on risk assessment. We assessed midwives' knowledge, test practices, assessment of risk behavior, and attitudes regarding testing for C. trachomatis infection during pregnancy. We evaluated the association between midwives' characteristics and their knowledge of C. trachomatis infection in terms of symptomatology and outcomes. *Methods:* This was a cross-sectional study among primary care midwives in the Netherlands. Between September and November 2011, midwives from all Dutch primary care midwifery practices were invited to complete a questionnaire about C. trachomatis infection. *Results:* Of the 518 midwives invited to participate in this study, 331 (63.9%) responded. The overall median knowledge score for questions about symptomatology and outcomes was 10 out of a maximum score of 15. The median knowledge score was higher among midwives in urban areas. In total, 239 (72.2%) midwives reported testing pregnant women for C. trachomatis. The primary reason for testing was a request by the woman herself (96.2%), followed by symptoms of

infection (89.1%), risk behavior (59.3%), and risk factors for infection (7.3%). Almost 25% of midwives showed positive attitudes towards universal screening for C. trachomatis. *Conclusions:* Midwives were knowledgeable about symptoms of infection, but less about outcomes. Midwives test pregnant women for C. trachomatis mainly on the women's request. Otherwise, testing is based on symptoms of infection rather than on known risk factors. This may contribute to under-diagnosis and under-treatment, leading to maternal, perinatal, and neonatal morbidity.

INTRODUCTION

Chlamydia trachomatis infection in pregnant women may lead to maternal disease, adverse pregnancy outcomes such as preterm labor and perinatal mortality, and may result in vertical transmission or subsequent neonatal disease (conjunctivitis or neonatal pneumonia) [1–7]. International studies in industrialized countries have reported high prevalence rates of C. trachomatis in pregnant women varying from 3.2% to 5.9% [1,8–11]. Among pregnant teenagers, prevalence rates vary from 6.4% in Australia to 13.5% in the Netherlands [1,10].

International guidelines recommend C. trachomatis screening during pregnancy in women less than 25 y of age, or universal screening during antenatal care [12–16]. In 2004 The Dutch Health Council recommended screening for C. trachomatis based on risk assessment. Risk factors are young age, Surinam or Antillean ethnic origin, persons with sexually transmitted infections, persons with multiple sexual partners, partners to C. trachomatis-positive persons, mothers to C. trachomatis-positive newborns, and other risk factors in combination with sexual behavior or risk factors associated with symptoms. No recommendations specific to pregnant women exist [17].

For effective management of prenatal C. trachomatis screening using a risk assessment approach, healthcare providers need to be knowledgeable about the symptoms and consequences of the infection and the risk and behavioral factors associated with infection. Insufficient knowledge may influence screening practices, and prenatal health care providers with insufficient knowledge should receive training [18]. However, not many studies have evaluated the knowledge of prenatal health care professionals regarding C. trachomatis infection [19,20]. In addition to knowledge, the characteristics of the health care professionals, such as gender, age, work experience, practice location, practice size, and place of graduation, may influence screening practices [21]. Health care professionals' attitudes towards testing may also influence screening practices. A review on interventions to increase C. trachomatis screening reported that providers with a positive attitude towards screening were more likely to screen [22]. In the Netherlands, approximately 80% of pregnant women start prenatal care within primary midwifery practices [23]. Hence, midwives have the best opportunity to offer prenatal C. trachomatis testing in early pregnancy in order to prevent adverse pregnancy outcomes and neonatal and maternal disease.

We undertook this study to assess midwives' knowledge in terms of symptomatology and outcomes, test practices, risk assessment behavior, and attitudes regarding C. trachomatis testing during pregnancy. In addition, we evaluated the association

between midwives' demographic and professional characteristics and their knowledge of the infection in terms of symptomatology and outcomes.

MATERIALS AND METHODS

Study design and population

We conducted a national cross-sectional study. Midwives from each of the 518 primary midwifery care practices across the Netherlands were invited to participate in the study between September and November 2011. We sent a questionnaire regarding C. trachomatis and other infections to all practices, accompanied by a cover letter with information about the study and a postage paid return envelope. We obtained addresses of midwifery practices from the Royal Dutch Organisation of Midwives. Because the questionnaire contained questions about policies of midwifery care practices, it was requested that only 1 midwife per practice complete the questionnaire. We excluded questionnaires completed by midwifery students (identified by work experience) and questionnaires without any answers to the questions on C. trachomatis. Four weeks after the initial invitation, we sent a reminder to all non-responding practices.
The Medical Ethics Committee of the VU University Medical Center Amsterdam approved the design of this study.

Data collection

We developed a questionnaire with questions based on previous studies and the literature [1–9,19,24–28]. Information was collected on the midwives' demographic and professional characteristics, including age, gender, years of experience, place of graduation, type of practice (solo practice, duel practice, or group practice), and whether the practice location was urban or rural. Urban was defined as more than 2500 addresses per square kilometer.
In total, 15 questions covered midwives' knowledge about C. trachomatis infection in pregnant women and newborns. We asked midwives to indicate whether symptoms and adverse pregnancy and neonatal outcomes associated with infection were 'true', 'false', or whether they did not know. We presented midwives with a list of 7 symptoms with 6 true answers and 1 false answer, and with a list of 8 adverse pregnancy and neonatal outcomes with 7 true answers and 1 false answer. Each correct answer ('true' or 'false') contributed to the knowledge score (1 point for each correct answer). Because not many studies have evaluated knowledge of C. trachomatis infection among prenatal health care professionals and no validated knowledge scale was available, we did not define a minimum score for knowledge about symptoms or consequences of infection.
We obtained information on test practices by asking the midwives if they tested pregnant women for C. trachomatis, and if so, in what situations. We provided a 10-item list of symptoms, risk factors, and risk behaviors, as well as a statement: "If a pregnant woman asks for a test herself". Midwives could select items from this list, allowing multiple answers.
To establish the assessment of risk behavior, we presented 2 questions on the frequency (always, usually, sometimes, or never) with which they assessed behavioral risks. We also asked how difficult they felt it was to ask these questions (difficult, somewhat difficult, or not difficult).

We asked midwives whether they agreed with 1 of 4 statements about their attitudes towards C. trachomatis testing in pregnant women: (1) all women should be tested, (2) only women at increased risk should be tested, (3) only women who want to be tested should be tested, and (4) testing during pregnancy is not necessary.

Statistical analyses

We calculated frequency distributions for questionnaire items on knowledge, screening practices, and attitudes. We used non-parametric tests (Mann–Whitney *U*-test and Kruskal–Wallis test) to test for differences in median knowledge scores between subgroups of midwives based on their demographic and professional characteristics. We used non- parametric tests because knowledge scores were not normally distributed. We considered *p*-values of < 0.05 as statistically significant and used the statistical software package SPSS 20.0 (SPSS Inc., Chicago, IL, USA) for all analyses.

RESULTS

In total, 345 (66.6%) midwives from the 518 practices returned the questionnaire. Fourteen midwives were excluded: 6 midwives did not practice midwifery anymore, 1 was a student at the time of enrolment, and 7 midwives did not complete the questions about C. trachomatis. We included the data of the remaining 331 midwives in the analyses, representing a net response rate of 63.9%.

Demographic and professional characteristics

Most midwives were female (98.2%). The median age was 34 y (25th percentile 28.0 y, 75th percentile 44.0 y), with a range of 21 to 65 y. The majority of midwives graduated in the Netherlands (83.5%), worked in rural areas (81.9%) and in a group practice (71.6%). They had practiced up to 41 y, with a median experience of 8 y (25th percentile 4 y, 75th percentile 16 y) (Table I).

[TABLE 1]

Knowledge

Table I shows the median knowledge scores by demographic and professional characteristics. No midwife answered all 15 questions regarding symptoms and pregnancy and neonatal outcomes of C. trachomatis correctly; 1 midwife (0.3%) answered 14 questions correctly; 2 midwives (0.6%) answered no question correctly. The overall median knowledge score was 10.0 out of a maximum score of 15.0 (8.7% answered 0–5 questions correctly; 54% answered 6–10 questions correctly; 37.3% answered 11–15 questions correctly). Midwives who worked in urban areas had a significantly higher score than midwives who worked in rural areas, but no other association was found between knowledge and midwives' demographic or professional characteristics (Table I).

Regarding questions about symptoms of C. trachomatis, 90 (27.7%) midwives answered all 7 questions correctly; 3 (0.9%) midwives answered none of the questions correctly. The median knowledge score for the 7 symptoms was 6.0 (34.8% answered 0–5 of the questions correctly; 65.2% answered 6–10 questions correctly).

Regarding questions about pregnancy and neonatal outcomes, no midwife answered all 8 questions correctly; 8 (2.5%) midwives answered 7 questions correctly; 27

(8.3%) midwives answered none of the questions correctly. The median knowledge score for the total of 8 pregnancy and neonatal outcomes was 4.0 (27.0% answered 0–2 questions correctly; 61.3% answered 3–5 questions correctly; 11.7% answered 6–8 questions correctly).
More detailed information about the scores on the knowledge items regarding symptoms and consequences of C. trachomatis infection during pregnancy are shown in Table II. The majority of midwives correctly identified symptoms of infection, with correct answers varying from 74.2% for burning micturition to 91.8% for pelvic inflammatory disease. In total, 19.8% of the midwives wrongly indicated skin rash as a symptom. Regarding pregnancy and neonatal outcomes, the knowledge was less accurate, varying from correct identification by 23.8% of midwives for perinatal mortality to 73.2% for neonatal conjunctivitis. A minority of midwives (0.9%) wrongly indicated clubfoot as a neonatal outcome.

[TABLE 2]

Test practices and risk assessment

Midwives were asked whether they tested women for C. trachomatis at the time of the study. More than half of the midwives (55.8%) reported testing women based on symptoms of infection and only 17.1% reported testing based on risk factors for infection. None of the midwives reported testing all pregnant women. In total, 89 (27.1%) midwives reported never testing pregnant women for C. trachomatis. Of the 239 (72.2%) midwives who reported testing some pregnant women for chlamydial infection, the primary reason was ‘on request of the woman herself’ (96.2%), followed by symptoms of infection (89.1%) and ‘risk behavior’ (59.3%). Only 7.3% indicated risk factors for infection such as younger age, lower educational level, or certain ethnic origins as reasons to test. Detailed information on the reasons for testing is given in Table III.

[TABLE 3]

Regarding risk behavior assessment, most midwives reported always asking about previous sexually transmitted infections (94.8%) and that they did not find it difficult to ask (Table IV). A minority reported asking about multiple sexual partners in the previous 12 months (2.7%), which they find ‘somewhat difficult’ or ‘difficult’ to ask.

[TABLE 4]

Attitudes towards testing

According to 24.8% of the midwives, all pregnant women should be tested for C. trachomatis; 38.2% answered that only women at increased risk should be tested, 14.1% reported that pregnant women should only be tested if they want to be tested, 4.9% reported that testing of pregnant women is not necessary, and 18.0% of the midwives had no opinion.

DISCUSSION

This study showed that midwives were knowledgeable about symptoms of C. trachomatis infection, but that they had less knowledge about adverse pregnancy outcomes and subsequent neonatal disease associated with the infection. The main

reason midwives tested for C. trachomatis infection during pregnancy was 'at the woman's own request'. Otherwise, testing was based on symptoms of infection followed by risk behavior, but rarely based on demographic risk factors for infection. The study revealed that almost a quarter of midwives had positive attitudes towards universal C. trachomatis screening in pregnancy, but none tested all pregnant women.

Few studies have been conducted about the knowledge of prenatal health care providers regarding C. trachomatis infection during pregnancy. In contrast to our study, a study among Greek midwives showed a low level of knowledge about maternal complications associated with the infection [19]. In accordance with our findings, a study of American nurse practitioners showed that while they were generally knowledgeable about C. trachomatis, they demonstrated inadequate screening and treatment practices in pregnant women [20]. In this study, midwives had less knowledge about outcomes due to C. trachomatis infection. This might possibly be due to conflicting evidence on pregnancy outcomes associated with infection [1–5,9,25,27–29]. A meta- analysis evaluated the effect of C. trachomatis infection in pregnancy on perinatal outcomes and found an increased risk of preterm labor, low birth weight, and perinatal mortality [30]. However, a more recent non-intervention Dutch study confirmed only preterm labor as a consequence of C. trachomatis infection, and the majority of midwives in this study indicated preterm labor as a consequence of infection [1]. We found lower knowledge scores for midwives who worked in rural areas compared to those who worked in urban areas. A possible explanation may be that midwives working in larger cities are more familiar with C. trachomatis due to the higher prevalence rates in larger cities compared to smaller cities or villages [21,31].

Despite the recommendation of the Dutch Health Council to use risk factor-based screening for C. trachomatis infection [17], the majority of Dutch midwives reported using symptoms as an indication for testing. C. trachomatis infects the cervix and urethra, which can result in altered vaginal discharge, burning micturition, vaginal bleeding, bleeding after sexual intercourse, or lower abdominal pain [26]. These symptoms are infrequent and too mild to be mentioned spontaneously [32] and are often mistaken for general pregnancy symptoms or discomforts. Further, almost all midwives in our study indicated that the reason for testing a pregnant woman was the woman's own request. Hence, these approaches are likely to under-diagnose cases because infections are often asymptomatic with only 20% of women exhibiting symptoms [33], and testing should not be based on women's self-perceived risk, as most pregnant women who are infected do not perceive themselves or their sexual partner as being infected or at risk of infection [8,34]. Furthermore, targeted screening as recommended by the Dutch Health Council has the potential to stigmatize women and may be hampered by health care professionals' discomfort of speaking openly with patients about sexual behavior [35,36]. This is confirmed by our study, as the majority of midwives stated that they do not ask questions about multiple sexual partners during the past 12 months and more than half of them indicated that they find this question difficult to ask.

The attitudes of health care providers may influence their management of C. trachomatis screening and testing [37,38]. This study revealed that almost a quarter of the midwives felt that all pregnant women should be screened for C. trachomatis, and the majority of midwives reported positive attitudes towards universal or

selective screening for C. trachomatis in pregnant women. A study that estimated the cost-effectiveness of C. trachomatis screening among Dutch women revealed that antenatal testing is cost-effective in the Netherlands [39]. This fact, together with the findings from our study, which indicate that inconsistent screening approaches are used during pregnancy by midwives in primary care, indicates that testing for C. trachomatis should be considered as standard in antenatal care.

This is the first study conducted in the Netherlands to assess the knowledge of midwives about the symptoms and consequences of C. trachomatis infection during pregnancy and subsequent neonatal disease, screening practices, and attitudes towards testing. A strength of this study is its rather high response rate. The background and professional characteristics of the midwives in our study are consistent with those of the overall population of midwives working in the Netherlands, regarding age and working experience, with the exception of the type of practice; participating midwives were more likely to work in a group practice than in a solo practice [23]. However, we found no association between practice type and the median knowledge score for symptoms and consequences of C. trachomatis infection. A study limitation is that we did not ask if midwives knew that C. trachomatis infection is often asymptomatic. Midwives might think that the infection is often symptomatic and therefore base their risk assessment on symptoms. In addition, it is difficult to assess knowledge regarding pregnancy outcomes, as there are several uncertainties about the consequences of infection. Further, the question regarding reasons to offer screening for C. trachomatis infection was not an open question; instead midwives could choose multiple answers from several given risk factors, behavioral factors, and symptoms. Hence, midwives may have reported symptoms, behavioral, or other risk factors they know, but not actually use these when deciding to test pregnant women. Another limitation is that study participation was voluntary and only 1 midwife per midwifery practice was invited to participate in this study. Therefore, it is possible that the midwife who chose to complete the questionnaire had more knowledge and a more positive attitude towards screening.

This study reveals a gap in midwives' knowledge regarding the consequences of C. trachomatis infection. In addition, the majority of midwives based their decision to test a woman for C. trachomatis on symptoms and not on risk factors, despite the recommendation of the Dutch Health Council. This may result in under-diagnosis and under-treatment of infections in pregnant women. This omission may contribute to an increased risk of maternal, perinatal, and neonatal morbidity. In order to increase knowledge levels, and indirectly test practices, it is important that midwives receive additional training and educational materials. In addition, education about the infection should be implemented in midwifery education programs. Hence, as midwives have positive attitudes towards testing, we believe that increasing midwives' knowledge levels and, following the practice of other countries, national guidelines promoting universal antenatal screening for C. trachomatis in the Netherlands, may help to reduce the complications associated with this infection.

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TABLES

Table I. Characteristics of midwives and median overall knowledge scores.

Characteristics	n[a] (%)	Median knowledge score[b]	p-Value[c]; differences in knowledge scores per sub-group
Gender			0.76
Male	6 (1.8)	10.0	
Female	323 (98.2)	10.0	
Age, y			0.84
≤25	44 (13.7)	10.0	
26–39	163 (50.8)	10.0	
40–54	93 (29.0)	9.0	
≥55	21 (6.5)	10.0	
Place of graduation			0.15
Netherlands	273 (83.5)	10.0	
Abroad	54 (16.5)	10.0	
Work experience, y			0.44
≤1	24 (7.4)	9.0	
2–9	150 (46.3)	10.0	
10–19	88 (27.2)	9.0	
≥20	62 (19.1)	10.0	
Practice location			0.002
Rural	271 (81.9)	9.0	
Urban	60 (18.1)	11.0	
Type of practice			0.92
Solo	32 (9.8)	10.0	
Dual	61 (18.7)	10.0	
Group	234 (71.6)	10.0	

[a]Denominator varies due to missing values (between 0 and 10 missing per variable).
[b]Maximum possible score is 15.
[c]Mann–Whitney U-test and Kruskal–Wallis test.

Table II. Midwives' knowledge concerning symptoms and outcomes of Chlamydia trachomatis infection; the number and percentages of stated 'yes' responses.

Knowledge concerning:	Correct answers, n^a (%)
Symptoms	
True answers	
Burning micturition	245 (74.2)
Different vaginal discharge	300 (91.7)
Vaginal blood loss	292 (88.8)
Pain or blood loss after sexual intercourse	297 (90.0)
Lower abdominal pain	282 (85.5)
Pelvic inflammatory disease	303 (91.8)
False answers	
Skin rash	65 (19.8)
Pregnancy and neonatal outcomes	
True answers	
Spontaneous abortion	174 (52.9)
Preterm rupture of membranes	212 (64.4)
Preterm labor	210 (63.8)
Low birth weight	112 (34.1)
Neonatal conjunctivitis	240 (73.2)
Neonatal pneumonia	167 (50.9)
Perinatal mortality	78 (23.8)
False answers	
Neonatal clubfoot	3 (0.9)

[a]Denominator varies due to missing values (between 1 and 4 missing per item).

Table III. Midwives' reasons for testing for Chlamydia trachomatis in pregnant women.[a]

Reason for testing	n^a (%)[b]
Risk factors	
Age < 25 y	6 (2.6)
Certain ethnicities	10 (4.3)
Low educational level	7 (3.0)
Risk behaviors	
Multiple sexual partners	105 (44.5)
History of sexually transmitted infection	93 (39.4)
Symptoms	
Burning micturition	75 (32.1)
Different vaginal discharge	190 (80.2)
Vaginal blood loss	115 (48.7)
Lower abdominal pain	130 (55.1)
Other	
Woman herself asks for a test	228 (96.2)

[a]Among midwives who offered Chlamydia trachomatis testing to (some) pregnant women ($n = 239$; 72.2%).
[b]Percentages do not sum to 100%, because multiple answers were possible.

Table IV. Frequency and difficulty of asking questions to identify risk behavior.

	Frequency of asking				Difficulty asking		
Questions	Always %	Usually %	Sometimes %	Never %	Yes %	Somewhat %	Not %
History of STI	94.8	2.7	1.8	0.6	1.2	5.8	93.0
Multiple sexual partners	2.1	0.6	19.5	77.8	39.3	39.0	21.7

STI, sexually transmitted infection.