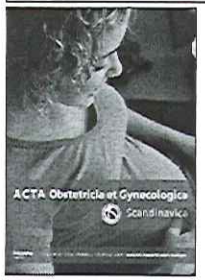
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Acta Obstetricia et Gynecologica Scandinavica

Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t716100748

Chlamydia trachomatis infection in patients attending an Early Pregnancy Unit: Prevalence, symptoms, pregnancy location and viability

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First Published: 2008

To cite this Article: Kirk, Emma, Bora, Shabana, Van Calster, Ben, Condous, George, Van Huffel, Sabine, Timmerman, Dirk and Bourne, Tom (2008) '**Chlamydia trachomatis** infection in patients attending an Early Pregnancy Unit: Prevalence, symptoms, pregnancy location and viability', Acta Obstetricia et Gynecologica Scandinavica, 87:6, 601 — 607

To link to this article: DOI: 10.1080/00016340802056095
URL: http://dx.doi.org/10.1080/00016340802056095

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Acta Obstetricia et Gynecologica. 2008; 87: 601–607

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ORIGINAL ARTICLE

Chlamydia trachomatis infection in patients attending an Early Pregnancy Unit: Prevalence, symptoms, pregnancy location and viability

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Abstract

Objective. To assess the prevalence of *Chlamydia trachomatis* and its relationship to age, ethnicity, symptomatology, pregnancy location and viability in women attending an Early Pregnancy Unit. *Method.* Women were offered screening for Chlamydia over a 4-month period. Presenting complaints, maternal age, ethnic origin, gestational age, pregnancy location, pregnancy viability and swab results were recorded. *Results.* One thousand, one hundred and one women were offered screening. Nine hundred and sixteen (83.2%) agreed to participate. Eight hundred and six (88.0%) had readable swabs. The prevalence of Chlamydia was 2.2% (95% CI: 1.4–3.5) (18/806). The prevalence in those <25 years of age was 8.7% (95% CI: 5.1–14.3). Prevalence was higher in black women compared to Asian or Caucasian women. The prevalence of Chlamydia in symptomatic and asymptomatic women was 2.3% (12/521) and 2.1% (6/285), respectively, $p > 0.166$. There was no significant difference in the final early pregnancy outcome in women with or without Chlamydia. *Conclusion.* Currently Chlamydia screening is not advised in Early Pregnancy Units as the women are thought to be of low risk; however, there are subgroups that are at relatively high risk. Screening this population is therefore important. There is, however, no difference in pregnancy location and viability in women with or without Chlamydia.

Key words: *Early Pregnancy Unit, Chlamydia trachomatis, ectopic pregnancy, miscarriage*

Introduction

Chlamydia trachomatis is one of the most commonly diagnosed sexually transmitted infections. While the majority of women are asymptomatic, the classical symptoms of chlamydial infection are dysuria, abnormal vaginal discharge, intermenstrual bleeding and lower abdominal pain. While it is standard practice to screen for Chlamydia in non-pregnant women presenting with such symptoms, there are no such guidelines for testing in pregnant women attending Early Pregnancy Units. However, there are many studies that have reported on the screening of certain pregnant populations, such as those attending their general practitioner or a family planning clinic in early pregnancy, those attending for a termination of pregnancy and those attending an antenatal clinic (1–4).

There are only a limited number of studies on the screening of women in an Early Pregnancy Unit setting. Shankar et al. reported that the prevalence of Chlamydia in pregnant women attending an Early Pregnancy Unit is low (1.96%) (5). They also found that there was no significant difference in the prevalence of Chlamydia in women with a miscarriage or an ongoing viable pregnancy. While the ethnic origins of the women screened were recorded, prevalence rates were not stratified by ethnicity.

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(Received 27 November 2007; accepted 14 March 2008)

ISSN 0001-6349 print/ISSN 1600-0412 online © 2008 Informa UK Ltd.
DOI: 10.1080/00016340802056095

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Stratification by maternal age showed no significant difference in prevalence rates in those less than or more than 25 years of age. A study on women with bleeding in early pregnancy attending an Early Pregnancy Unit showed a prevalence of Chlamydia of 3.9% but did not correlate findings to pregnancy outcome (6). They did, however, find that the prevalence rate was higher in women under the age of 25 (12.2%).

While a history of previous pelvic inflammatory disease is a recognized risk factor for ectopic pregnancy there are no data on the influence of a current Chlamydia infection on pregnancy location and viability in unselected women attending an Early Pregnancy Unit (7,8). The aim was to determine the prevalence of Chlamydia in an inner city Early Pregnancy Unit, and to see if age or ethnicity had an impact. We also aimed to assess whether Chlamydia infection has an effect on symptomatology, pregnancy location and viability.

Methods

This was a prospective study on all women attending an Early Pregnancy Unit in a London teaching hospital over a 4-month period (1 July 2004–31 October 2004). The Unit is open 6 days a week and any woman less than 14 weeks gestation with a positive pregnancy test is seen there. Women can self refer or are referred to the unit by either a general practitioner, midwife, the accident and emergency department or another health care professional. Reasons for attendance include vaginal bleeding, pain, unsure dates or maternal anxiety.

Demographic details such as age, ethnic origin and gestation according to the last menstrual period were recorded. Women, if willing to disclose it, were asked to define their ethnic origin as: Asian (Bangladeshi, Pakistani or other), black (African, Caribbean or other), Caucasian (British, Irish or other white) or other (oriental, mixed race, any other ethnic origin). A previous pregnancy history was also obtained and the reason for presentation recorded. All women were offered a screening test for *Chlamydia trachomatis* and were given a written information sheet to read in the waiting area before review. Screening was in the form of a low vaginal swab, rather than a cervical swab or first void urine as women attending the unit do not routinely undergo a speculum examination or provide a urine sample. Women were offered to have swabs taken by the examining clinician or by the 'self-obtained method'. The samples were analyzed using the BD ProbeTec ET *Chlamydia trachomatis* Amplified DNA Assay (Becton, Dickinson and Company, Franklin Lakes, NJ, USA). Amplified DNA tests are the most sensitive tests available for the diagnosis of genital tract infections with Chlamydia and can be used with non-invasively collected specimens such as low vaginal swabs (9,10). Vaginal swabs have also been shown to be the specimens of choice for screening for Chlamydia infection, with similar reported sensitivities and specificities for both clinician obtained and self-obtained swabs (10,11).

After the swab had been taken, all women underwent a transvaginal scan (TVS) using a 5 MHz transducer for B mode imaging (Aloka SSD 900, 2000 or 4000, Aloka Co. Japan). The results of the TVS were recorded. On the basis of the scan findings women were diagnosed with a viable intra-uterine pregnancy (fetal heart beat visualized), an intra-uterine pregnancy of uncertain viability (empty sac mean diameter <20 mm or fetal pole <6 mm with no heart beat visualized), a delayed miscarriage (fetal pole >6 mm with no heart beat), an empty sac (mean diameter >20 mm), an incomplete miscarriage, a complete miscarriage (only if a previous TVS had shown an intra-uterine pregnancy) or an ectopic pregnancy. Women with no evidence of an intra-uterine or ectopic pregnancy on TVS were classified as having a pregnancy of unknown location (PUL). These women were followed up with serum human chorionic gonadotrophin (hCG) and progesterone levels, repeat TVS examinations and, if necessary, laparoscopy or uterine curettage, until the final location of the pregnancy was known. Women in whom the initial viability of the pregnancy was unknown were also followed up with repeat TVS examinations until the final viability of the pregnancy was known. It was not an aim of this study to examine longer-term pregnancy outcomes such as rates of pre-term rupture of membranes or pre-term delivery.

Statistical analysis

The main statistical results are percentages and differences in percentages with their 95% confidence intervals (CI), computed using Wilson's score interval (12). CI for differences in unpaired percentages were computed using method 10 of Newcombe's comparison of methods (13). This method is based on Wilson's score interval. Additionally, *p*-values were reported. For *n*-by-2 tables (e.g. comparing prevalence of Chlamydia for *n* ethnic groups, comparing a pregnancy outcome for women with and without Chlamydia), *p*-values were generated using Fisher's exact test. To compare the prevalence of Chlamydia for age groups, the Cochran-Armitage trend test was used instead of Fisher's exact test in order to test for an age-related trend in Chlamydia prevalence. As the prevalence of Chlamydia was low, logistic regression analyses for prevalence were performed using exact logistic regression (14). The low prevalence of Chlamydia also motivated the preference of the aforementioned Fisher's exact test over the traditional chi-squared tests.

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Results

A total of 1,101 women were seen and offered screening for Chlamydia of which 916 (83.2%) agreed to participate. Of the 185 women who declined screening, 50 (27.0%) reported that they had been screened recently and the other 135 (73.0%) gave no reason. Table I shows the demographic details of women undergoing screening and those who declined. The median maternal age and median gestational age according to the last menstrual period were similar in both groups. However, Asian women declined screening more than other ethnic groups. The mean gestational age of the women screened was 55 days (range 24–134 days).

Of the 916 women screened, 806 (88.0%) had readable swabs. In 106 cases (96.4%) where the swab was unreadable, the swabs were classified as inhibitory by the laboratory, due to the control mechanism of the swab not working. In the other 4 cases, 2 swabs were insufficient for analysis and 2 gave equivocal results. These 110 cases were therefore excluded from the analysis.

The overall prevalence of Chlamydia infection was 2.2% (18/806) (95% CI: 1.4–3.5). In teenagers, the prevalence was 7.5% (3/40) (95% CI: 2.6–19.9), in those under the age of 25 it was 8.7% (13/150) (95% CI: 5.1–14.3) and in those over 35 the prevalence was 0% (0/232) (95% CI: 0–1.6)(Table II). Based on exact logistic regression, the odds of Chlamydia were 12.3 higher for women younger than 25 years old than for other women (95% CI: 4.03–44.8, $p < 0.001$).

Table I. Demographic details of women undergoing and declining screening for *Chlamydia trachomatis*.

	Screened women	Non-screened women
All, *n* (row%)	916 (83.2%)	185 (16.8%)
Age (years), median (IQR)	31 (9)	31 (10)
Gestation (days), median (IQR)	51 (20)	49 (24)
Ethnic origin, *n* (%)		
Asian	68 (7.4%)	25 (13.5%)
Black	160 (17.5%)	32 (17.3%)
Caucasian	531 (58.0%)	88 (47.6%)
Other	46 (5.0%)	8 (4.3%)
Not disclosed	111 (12.1%)	32 (17.3%)
Previous ectopic pregnancy, *n* (%)	34 (3.7%)	10 (5.4%)

Table II. Age and prevalence of *Chlamydia trachomatis* infection.

Age (years)	*n* (%)	Prevalence of Chlamydia *n*, % (95% CI)
<20	40 (5.0%)	3, 7.5% (2.6–19.9)
20–24	110 (13.6%)	10, 9.1% (5.0–15.9)
25–29	153 (19.0%)	1, 0.7% (0.1–3.6)
30–34	271 (33.6%)	4, 1.5% (0.6–3.7)
>35	232 (28.8%)	0, 0% (0–1.6)

Cochran-Armitage trend test: $p<0.0001$.

Ethnicity appeared to be related to Chlamydia prevalence ($p=0.044$), with black women and 'others' having higher prevalence rates compared to Caucasian and Asian women ($p=0.044$) (Table III). Using exact logistic regression, the odds ratio for Chlamydia among black and 'other' women versus Caucasian and Asian women was 3.49 (95% CI: 1.17–10.6). When the effects of age and ethnicity were combined using exact logistic regression (Table III), the odds ratio for Chlamydia under the age of 25 years was still 10.6 (95% CI: 3.3–39.6, $p < 0.001$). The effect of ethnicity was less strong when age was taken into account ($p=0.375$), with the odds ratio for Chlamydia among black and 'other' versus Caucasian and Asian women being 2.27 (95% CI: 0.732–7.15). The cross-tabulation suggested that black women had an increased prevalence in those both less than and more than 25 years of age but there is not enough data to draw strong conclusions. The prevalence of chlamydial infection in black women under the age of 25 was 11.6% (95% CI: 5.1–24.5).

Presenting complaints

Of the 806 women screened, 65% (521/806) were symptomatic of pain and/or bleeding and 35% (285/806) were asymptomatic (presenting with unsure dates or maternal anxiety). The prevalence of Chlamydia in symptomatic women was 2.3% (12/521) and the prevalence of Chlamydia in asymptomatic women was 2.1% (6/285). There was no difference in the presenting complaints of women with or without Chlamydia infection (Table IV).

TVS findings

Table IV shows the TVS findings in women with and without Chlamydia infection. There is evidence that

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Table III. Ethnic group and prevalence of *Chlamydia trachomatis* infection in those <25 years of age and those ≥25 years of age.

Ethnic group	<25 years *n*, prevalence % (95% CI)	≥25 years *n*, prevalence % (95% CI)	All *n*, prevalence % (95% CI)
Asian	18, 5.6% (1.0–25.8)	38, 0.0% (0.0–9.2)	56, 1.8% (0.3–9.5)
Black	43, 11.6% (5.1–24.5)	98, 2.0% (0.6–7.1)	141, 5.0% (2.4–9.9)
Caucasian	64, 6.3% (2.5–15.0)	419, 0.7% (0.2–2.1)	483, 1.4% (0.7–3.0)
Other	13, 15.3% (4.3–42.2)	26, 0.0% (0.0–12.9)	39, 5.1% (1.4–16.9)
Not disclosed	12, 8.3% (1.5–35.4)	75, 0.0% (0.0–4.9)	87, 1.1% (0.2–6.2)
All	150, 8.7% (5.1–14.3)	656, 0.8% (0.3–1.8)	806, 2.2% (1.4–3.5)

women with Chlamydia were much more likely to have an intra-uterine pregnancy of uncertain viability (38.9% versus 18.5%, 95% CI for the difference 1.6–43.0%) and much less likely to have a viable intra-uterine pregnancy on TVS (22.2% versus 54.6%, 95% CI for the difference is −46.0 to −9.1%). In addition, although not significant, the CI favored a higher percentage of ectopic pregnancies among Chlamydia positive women (5.6% versus 1.3%, 95% CI for difference −0.4 to 24.5%). The confidence interval was very asymmetric toward a positive difference. However, due to the low prevalence of ectopic pregnancy and Chlamydia, no conclusions can be drawn.

Final early pregnancy outcome

In the 18 women with a positive swab: 61% (11/18) had a viable intra-uterine pregnancy, 22% (4/18) had a failed pregnancy, 5.6% (1/18) had an ectopic pregnancy and 11% (2/18) were lost to follow-up (Table IV). Of the 788 women with negative swabs: 69% (547/788) had a viable intra-uterine pregnancy, 28% (218/788) had a failed pregnancy, 2.2% (17/788) had an ectopic pregnancy and 0.7% (6/788) were lost to follow-up (Table IV). Even though the Fisher's exact test was significant, there was no clear difference in the final early pregnancy outcome in women with or without active Chlamydia infection.

Table IV. Reasons for presentation, initial TVS findings and final early pregnancy outcomes in women with and without Chlamydia.

	Chlamydia positive		Chlamydia negative			
Variable	*n*	%	*n*	%	Difference in % (95% CI)	*p*
Reason for presentation*						
Bleeding	8	44.4	342	43.4	1.0 (−19.1; 23.2)	–
Pain	7	38.9	310	39.3	−0.5 (−19.4; 22.3)	
Previous miscarriage	0	0.0	27	3.4	−3.4 (−4.9; 14.2)	
Previous ectopic	0	0.0	16	2.0	−2.0 (−3.3; 15.6)	
Unsure dates	3	16.7	148	18.8	−2.1 (−13.3; 20.6)	
Anxiety	1	5.6	32	4.1	1.5 (−3.4; 21.7)	
Initial TVS findings						
IUP	4	22.2	430	54.6	−32.3 (−46.0; −9.1)	
IPUV	7	38.9	146	18.5	20.4 (1.6; 43.0)	
Miscarriage	2	11.1	80	10.2	1.0 (−7.4; 22.7)	
Delayed miscarriage	0	0.0	32	4.1		
Empty sac	0	0.0	16	2.0		0.015
Incomplete miscarriage	1	5.6	19	2.4		
Complete miscarriage	1	5.6	13	1.6		
PUL	4	22.2	122	15.5	6.7 (−6.8; 29.9)	
Ectopic pregnancy	1	5.6	10	1.3	4.3 (−0.4; 24.5)	
Final early pregnancy outcome						
Viable IUP	11	61.1	547	69.4	−8.3 (−31.0; 10.6)	
Failed pregnancy	4	22.2	218	27.7	−5.4 (−19.1; 17.8)	0.014
Ectopic pregnancy	1	5.6	17	2.2	3.4 (−1.3; 23.6)	
Lost to follow-up	2	11.1	6	0.8	10.4 (2.3; 32.0)	

Abbreviations: IUP, intra-uterine pregnancy; IPUV, intra-uterine pregnancy of uncertain viability; PUL, pregnancy of unknown location.
*Patients presenting for other reasons are not listed. Patients presenting with bleeding and pain are listed in both groups. Therefore, the Fisher's exact test was not performed.

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However, more women with Chlamydia were lost to follow-up and the final early pregnancy outcome unknown, compared to women without Chlamydia, but the numbers were small (11.1% versus 0.8%, 95% CI for the difference is 2.3–32.0%). The tentative result of increased prevalence of ectopic pregnancy among Chlamydia positive women that was observed for the TVS findings was also apparent for the final early pregnancy outcome since both outcomes are related.

Discussion

This study has shown that the overall prevalence of *Chlamydia trachomatis* infection in unselected women attending an Early Pregnancy Unit is low (2.2%) and confirms the findings of the study by Shankar et al., who screened women in a similar setting (5). In another study on screening women at less than 10 weeks gestation attending the general practitioner or a family planning clinic, the prevalence of Chlamydia was equally low at 2.4% (1). However, it is important to look at the prevalence data more closely to examine the influence of factors such as age and ethnicity, as these have been previously shown to be of significance in non-pregnant populations. Interestingly, the prevalence of Chlamydia in women attending for a termination of pregnancy has been found to be much higher, 6.8–8.5% is quoted in some studies (3,15).

In non-pregnant women, the prevalence of Chlamydia is known to be higher in those <25 years of age (16). Our study and the majority of studies on women in early pregnancy also show a higher prevalence in women age <25 years (1,3,6,15). It is also recognized in non-pregnant populations that there are ethnic variations in the prevalence of Chlamydia infection, for example, black women are known to be disproportionately infected (17). In no previous study was the prevalence of Chlamydia stratified in women attending an Early Pregnancy Unit by ethnicity. We have shown that pregnant black women have a higher prevalence of chlamydial infection compared to Caucasian or Asian women. The uptake of screening was similar among black and Caucasian women (~85%), but as more Asian women declined screening, our results showing a lower prevalence in Asian women should be interpreted with caution. Black women under the age of 25 had an even higher prevalence of Chlamydia, but the effects of age appeared stronger than ethnicity.

Symptomatology in pregnant women with and without Chlamydia infection has also not been previously investigated in detail. A study on women with bleeding in pregnancy attending an Early Pregnancy Unit has shown a prevalence of Chlamydia of 3.9% (6), which is higher than that in screening studies on unselected women attending an Early Pregnancy Unit (5). However, that study did not have a control group of women without bleeding to allow statistical comparisons. We had hypothesized that while it is already known that the overall prevalence of Chlamydia in women attending the Early Pregnancy Unit is low, it may be higher in women with pain or bleeding, meaning that there may be a sub-population of women who would still benefit from screening. As mentioned previously, our study has shown this not to be the case.

Ectopic pregnancy is considered to be a late sequel of pelvic inflammatory disease with the risk increasing with multiple episodes of infection (18,19). This would help explain why the incidence of ectopic pregnancy increases with maternal age (20). In a case–control study of risk factors for ectopic pregnancy in women with symptomatic pregnancies of unknown location it was found that current chlamydial infection was not associated with an increased risk of ectopic pregnancy (8). The presence of current infection was protective for the diagnosis of ectopic pregnancy in the population studied and the authors suggested that women were therefore presenting as a result of bleeding and pain from the infection rather than as a result of the ectopic pregnancy. In our study, we have also shown that there is no significant association between current infection with Chlamydia and pregnancy location. We did not find a relation between symptoms and presence of Chlamydia, but we were screening unselected women attending an Early Pregnancy Unit rather than women with symptomatic pregnancies of unknown location.

As well as assessing a possible relation between Chlamydia infection and pregnancy location we also wanted to assess the effects of Chlamydia infection on pregnancy viability. In a previous study, designed to look at the effect of Chlamydia on the incidence of miscarriage at less than 16 weeks gestation, the prevalence of *Chlamydia trachomatis* infection in early pregnancy was too low to evaluate any relation between infection and miscarriage (1). In our study, we were able to show that there was no significant difference in final early pregnancy viability in women with or without Chlamydia infection. A limitation of our study was that we only followed women up until they had been confirmed as having 1 of 3 final early pregnancy outcomes: viable intra-uterine pregnancy, failed pregnancy or ectopic pregnancy. We therefore do not know the effect of Chlamydia infection on pregnancy outcome after 12 weeks gestation. However, some studies have shown that chlamydial

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infection in the first or second trimester of pregnancy may be associated with pre-term delivery (21,22). More women with Chlamydia were lost to follow-up than women without Chlamydia. However as women were non-selected, we do not feel that this made a difference. Twelve percent of women had inhibitory swabs. Other studies have reported inhibition in up to 25.3% of samples tested by the same BD ProbeTec Assay (23–25).

Conclusion

The results of this study show that the overall prevalence of Chlamydia in both symptomatic and asymptomatic women attending an Early Pregnancy Unit is low and current infection does not appear to have an immediate effect on pregnancy location or viability. Currently, Chlamydia screening is not advised in Early Pregnancy Units as the women are thought to be of low risk, yet our data show that there are subgroups that are in fact at relatively high risk. Screening this population is therefore important.

Acknowledgements

This research was supported by Research Council KUL: GOA-AMBioRICS, CoE EF/05/006 Optimization in Engineering (OPTEC); Belgian Federal Science Policy Office IUAP P6/04 (DYSCO, 'Dynamical systems, control and optimization', 2007-2011); EU: BIOPATTERN (FP6-2002-IST 508803), ETUMOUR (FP6-2002-LIFESCI-HEALTH 503094), Healthagents (IST–2004–27214), FAST (FP6-MC-RTN-035801).

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