ORIGINAL ARTICLE

Chlamydial infection: an accurate model for opportunistic screening in general practice

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Objectives: To estimate the prevalence of *Chlamydia trachomatis* in women in general practice and to assess risk factors associated with infection.

Methods: The study was carried out in 2001–2 in different general practices in Antwerp, Belgium. Sexually active women, visiting their general practitioner for routine gynaecological care (mostly pill prescription or PAP smear), were offered opportunistic screening for chlamydia. 787 participants aged 15–40 delivered a self taken vaginal sample and filled in a questionnaire which included questions on demographic variables, urogenital symptoms, sexual history, and sexual behaviour. Samples were tested for presence of chlamydial DNA by means of a ligase chain reaction (LCR) assay, and positives were confirmed by two other amplification assays (PCR and SDA).

Results: Overall prevalence was 5.0% (95% CI: 3.5 to 6.5). Determinants of infection in logistic regression analysis were age 18–27 years, >1 partner in the past year, no use of contraceptives, frequent postcoital bleeding, having a symptomatic partner, painful micturition, and living in the inner city. The area under the ROC curve in the full model was 0.88. Selective screening based on a combination of the five first determinants detects 92.3% of infections in this sample; 37.5% of the population would need to be screened.

Conclusion: Targeted screening for chlamydial infection is possible, even in a heterogeneous group of general practice attendants. Implementing this model would require considerable communication skills from healthcare providers.

In spite of raised public awareness, improved detecting methods, and effective single dose treatment, urogenital *Chlamydia trachomatis* (CT) infection continues to be a major public health problem. Although the precise burden of illness of chlamydial infection remains unclear,[1] CT is a major cause of pelvic inflammatory disease (PID), ectopic pregnancy, and infertility. The economic and human costs of managing these complications are considerable. High prevalence rates of CT are found in various settings in Europe, including in general practice attendants.[2]

Recently, an increase in sexual risk behaviours among young people[3] and a subsequent increase in CT prevalence rates[4] have been reported.

The asymptomatic and persistent nature of the chlamydial infection extends the reservoir of infection which can only be controlled through screening. However, there are still some gaps in the evidence which limit support for large scale routine screening.[5] These include aspects of screening intervals, relapse/reinfection issues, natural history of DNA amplification detected infections,[6] effects of screening on prevalence, etc. On the other hand, there is good evidence that selective screening of women reduces the incidence of PID.[7]

Opportunistic screening will detect a relatively small number of infections, but optimises cost effectiveness[8] and offers the opportunity to limit possible adverse effects of screening by carefully selecting and counselling eligible candidates. Success of screening programmes in the general population is compromised by the lack of valid selective screening criteria. Risk markers observed in selected high risk groups are not necessarily useful for screening in the general population.[9]

In this study we develop a strategy for selective, opportunistic screening of women in general practice.

METHODS

Population and specimen collection

The study was carried out in 32 general practices in Antwerp, Belgium. Forty six general practitioners (GPs) participated for variable periods of time between February 2001 and June 2002. They offered opportunistic screening for *Chlamydia* to their female patients, who attended for routine gynaecological care (mostly contraceptive pill prescription or PAP smear). Women were eligible for participation if they were under 40 years old and if they had been sexually active in the past year. Women in whom chlamydial infection or PID was clinically suspected were not eligible, and were diagnosed according to usual clinical practice. Test results of patients in the study were available 2–3 weeks after the sample was sent to the laboratory.

Participants received a package containing a polyurethane tipped swab (Culturette EZ, Becton Dickinson), an instruction form, a standardised questionnaire, and a post-free addressed envelope. The 47 item questionnaire included questions on demographic variables, urogenital symptoms, sexual history, and sexual behaviour and was available in Dutch, French, English, and Turkish.

Patients collected their own vaginal samples at home by inserting the swab into the low vagina to a distance of about 2–3 cm. The simple procedure was explained by the GP and illustrated in the instruction form. Vaginal self sampling has shown to be a sensitive and acceptable method for diagnosing chlamydial infection.[10 11] Testing materials were coded, so anonymous participation was possible. The swab and the questionnaire were returned to the university laboratory by mail. The diagnostic efficacy of samples obtained by women at home and mailed to the laboratory is as good as for samples obtained by a GP and delivered to the laboratory.[12]

The study has been approved by the medical ethics committee of Antwerp University.

Table 1 Univariate determinants of CT infection, selected for multivariate analysis

Determinant	No*	% CT +	Pearson χ^2
Age			0.249
14–17	50	2.0	
18–22	226	6.6	
23–27	256	5.9	
28–40	244	3.3	
Situation of living			0.036
With parents	231	2.2	
With partner	320	5.3	
Without partner	168	8.9	
Other	20	10.0	
Activities, occupation			0.096
"Stable": school/work/housewife	652	4.4	
"Unstable": unemployed, combinations of jobs and school	125	8.0	
Location of practice			0.005
Inner city	566	6.4	
Suburban, rural	211	1.4	
Partner having urinary complaints			0.000
No	738	4.2	
Yes	39	20.5	
Intermenstrual bleeding in past 3 months			0.023
No	568	4.1	
Yes	195	8.2	
Postcoital bleeding in past 3 months			0.000
No/sometimes	755	4.8	
Frequently	9	33.3	
Vaginal discharge			0.171
No	598	4.5	
Yes	168	7.1	
Painful or frequent micturition			0.003
No	642	4.1	
Yes	124	10.5	
Age at first coitus			0.008
≤15	150	10.0	
16–18	395	4.1	
≥19	232	3.5	
Number of partners in the past year			0.000
1	532	2.4	
2	140	8.6	
3–5	70	12.9	
≥6	28	17.9	
Start of last relationship			0.037
>6 months	499	3.8	
<6 months	185	8.7	
No relationship now	85	4.7	
Partner having another partner in the past 3 months			0.052
No	555	4.5	
Yes/don't know	149	8.7	
I have no partner right now	60	1.7	
Oral contraception (OAC) use			0.001
Yes	534	3.2	
No	243	9.1	
Contraception			0.000
Any	644	3.1	
None or coitus interruptus	133	14.3	
Condom use			0.028
Never	306	3.6	
Sometimes/regularly	411	6.8	
Always	58	0.0	
Use of MAP (emergency contraception)			0.004
Never	599	3.8	
Ever	174	9.2	
Ever been pregnant unintendedly			0.110
No	663	4.5	
Yes	111	8.1	
Marital status†			0.950
Single	504	5.4	
Married	113	4.4	
Cohabitating	133	4.5	
Separated/divorced	26	3.9	
Ethnicity†			0.375
Autochtonous Belgian	640	5.0	
Allochtonous Belgian (Turkish/Moroccan parents)	30	3.3	
West European	37	2.7	
Eastern European	19	15.8	
African	19	0.0	
Asian	13	7.7	
Other	16	6.3	
Education†			0.918
Secondary school	257	5.5	
Technical secondary school/professional training/art education	159	5.0	
Higher education (short studies)	157	3.8	
High school/university	174	5.8	
Various	30	3.3	

*The sum of the categories for each determinant varies slightly because of missing data.
†Non-significant determinant; added in multivariate analysis as possible confounder.

Diagnostics

Methods of sample preparation and processing in the laboratory have been described and validated previously.[13] Specimens were tested for the presence of chlamydial DNA by means of a ligase chain reaction (LCR) assay (LCx, Abbott Laboratories), and positives were confirmed by two other amplification assays (Roche PCR and Becton Dickinson SDA). Specimens were considered true positive for *C trachomatis* if they were positive by at least two amplification assays. The results were communicated to the GPs who counselled and treated infected patients and their partners.

Statistics

Analyses were performed with the SPSS package version 10.0.

Univariate analysis (χ^2) was used to identify candidate variables for multivariate modelling. Variables showing an influence on presence/absence of infection at a significance level of p<0.3 were selected for further analysis. Possible confounders which showed no univariate association were also included (for example, ethnicity, marital status, and education level).

In the next stage, logistic regression[14] was performed to derive a multivariate model. Backward variable selection was used, with the likelihood ratio test to select variables for removal. Calibration of the model was assessed by the Hosmer-Lemeshow goodness of fit statistic. We assessed discrimination of the model with receiver operating characteristic (ROC) curve analysis.

RESULTS

Less than 1% of approached women refused to accept the screening package from their GP; 75% of all distributed packages were returned by the patients.

We received packages from 825 patients, of which 787 were eligible for the study; 38 patients did not meet the inclusion criteria—they were not sexually active during the past year (17), males (two), age >40 (six), missing questionnaire (six), controls of treated infections (six), wrong type of swab (one). Women who had taken azithromycin or doxycycline in the month before entering the study (n=11) were counted for the prevalence, but were not considered in risk factor modelling.

Patient characteristics

Age of participants varied from 14–40 years with a mean age of 25.2 years. In all, 64.9% of the women lived with their parents or without a partner; 31.7% were married or cohabiting and 3.4% were separated, divorced, or widowed; 33.1% were in general secondary school or had a secondary school degree; 20.5% followed technical secondary school classes, or had a technical secondary school degree; 20.2% had attended or were attending higher education courses (apart from high school); 22.4% had a high school or university qualification or were getting one; and 3.9% had no qualifications or followed evening classes.

Overall prevalence of *Chlamydia trachomatis* was 5.0% (95% CI: 3.5 to 6.5). Prevalence according to age was 2.0% (1/50) for women aged 14–17, 6.6% (15/227) for women aged 18–22, 5.8% (15/260) for women aged 23–27, 3.6% (8/220) for women aged 28–35, and 0.0% (0/30) for women aged 36–40.

At least five infected patients (12.8%) had symptoms which could be related to complicated chlamydial disease: unexplained lower abdominal pain (two) or difficulties in becoming pregnant (three). One patient was diagnosed with fulminant PID, 1 week after participating in the screening. All patients returned for treatment. Notification of partners was voluntary and contact tracing was performed by most GPs through patient referral.

Table 1 shows determinants of infection in univariate analysis, which were selected for multivariate modelling

(p<0.3). In general, behavioural factors and urogenital complaints were more significant than sociodemographic characteristics.

Variables not selected for multivariate analysis were parity, sexual inclination, menarche, lower abdominal pain, vaginal douching, vaginal itching, dyspareunia, previous STI diagnosis, being sterilised, and irregular intake of contraceptive pill.

Table 2 shows determinants of chlamydial infection in a multivariate logistic regression analysis. The resulting model was not altered by introducing different combinations of non-significant variables as possible confounders. Interaction terms were taken into consideration, but were not included as they did not significantly improve the model.

In figure 1, accuracy of the regression model—that is, the ability of the model to correctly classify women with and without infection, is visualised in a receiver operating characteristic (ROC) curve. The area under the curve is 0.88, indicating excellent accuracy.

From this model, a simplified screening algorithm was derived, which is applicable in clinical practice. To evaluate the
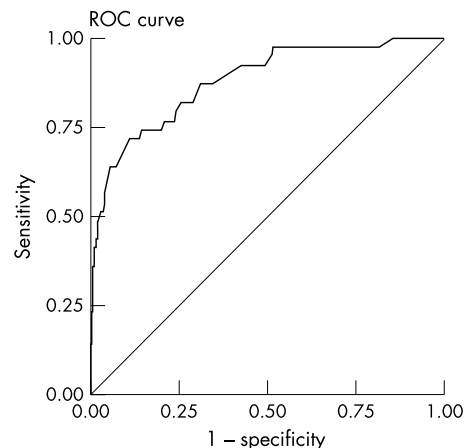
Table 2 Determinants of chlamydial infection: logistic regression model

Determinant	Coefficient (SE)	Adjusted odds ratio (95% CI)	p Value
Age			
14–17	–0.634 (1.184)	0.530 (0.052 to 5.397)	0.592
18–22	1.422 (0.537)	4.145 (1.446 to 11.879)	0.008
23–27	1.284 (0.526)	3.612 (1.289 to 10.119)	0.015
28–40		1	
Number of partners last year			
1		1	
2	1.794 (0.499)	6.013 (2.263 to 15.974)	0.000
3–5	2.178 (0.552)	8.832 (2.991 to 26.074)	0.000
≥6	2.277 (0.642)	9.748 (2.771 to 34.296)	0.000
Contraception			
Any		1	
None	2.438 (0.441)	11.452 (4.823 to 27.192)	0.000
Dysuria/frequent urination			
No		1	
Yes	0.883 (0.429)	2.418 (1.043 to 5.605)	0.040
Partner having urinary complaints			
No		1	
Yes	2.050 (0.534)	7.765 (2.726 to 22.119)	0.000
Postcoital bleeding			
No		1	
Seldom	0.214 (0.494)	1.238 (0.470 to 3.262)	0.666
Frequently	3.048 (0.984)	21.080 (3.066 to 144.951)	0.002
Location of practice			
Inner city		1	
Suburban/rural	–1.135 (0.649)	0.321 (0.090 to 1.147)	0.080
Constant	–1.979 (7.355)	0.138	0.788

Figure 1 Discriminative power of the regression model visualised in a receiver operating characteristic (ROC) curve. Area under the curve is 0.88.

Table 3 Usefulness of determinants of infection for screening purposes

Determinant	Sensitivity (%)	Percentage of population	Prevalence in population with determinant (%) (positive predictive value)
Age 18–27	76.9	62.0	6.2
>1 partner in the past year	66.6	30.6	10.9
No contraception	48.7	17.1	14.3
Dysuria/frequent urination	33.3	16.0	10.5
Partner having urinary complaints (dysuria/discharge)	20.5	5.0	20.5
Frequent postcoital bleeding	7.6	1.2	33.3
Location of practice (inner city)	92.3	72.8	6.4

usefulness of each determinant for screening, the magnitude of the odds ratio was considered by function of the prevalence of the determinant. For example, postcoital bleeding is a strong determinant of infection, but is rare, thus usefulness for screening is limited. Table 3 shows the relevance of each variable for screening purposes.

From this analysis we derived the following screening model:

* To screen all women under 35 with >1 partner in the past year

and

* To screen all women with two of the following characteristics: age 18–27 years, frequent postcoital bleeding, no contraception, a partner with urinary complaints.

In this model 92.3% of infections are detected and 37.5% of the population is screened.

Prevalence in the screened population is 12.4% in this model.

DISCUSSION

The significant burden of undiagnosed CT infection observed in this study indicates that screening should be considered.

Our data show that targeted screening on the basis of a simple, evidence based algorithm is possible, even in a heterogeneous group of general practice attendants.

In our study, not all consecutive eligible women were offered screening, mostly because of the high additional workload for the GPs. Some selection bias, because of unintended selection of patients, cannot be excluded. Furthermore, although participation rate is satisfactory and is considerably higher than in community based screening programmes,[15 16] the dropout of 25% non-participants can affect the results. However, the sociodemographic structure of our study population (as shown in table 1) reflects quite well the constitution of the general practice population in Antwerp in this age category. Behavioural characteristics are comparable to those in the recent British national survey of sexual attitudes and lifestyles (NATSAL 2000)[3 17]: mean age of first sexual intercourse was 17.5 years, versus 17 years; 8.6% (versus 12.6%) was ever diagnosed with an STI; 14.1% of women with one partner in the past year and 28.7% of women with more than one partner reported consistent condom use in the past year (v 16.8% and 24.1% of women who reported consistent condom use in the past 4 weeks in the NATSAL survey).

If the sample examined was not representative of the general population, it surely is a clinically relevant sample, representing a population that is accessible by healthcare providers and is willing to undergo screening.

A strong association between infection and very young age, as observed in the United States and in high risk populations (STD, family planning, abortion clinics) in Europe, was not found in this study. Low prevalence in the relatively small sample of participants aged 14–17 is confirmed by a recent

study in secondary schools in the same area.[18] A substantial prevalence is still found in women in their late 20s. STI surveillance data in Belgium reveal that half of diagnosed chlamydial infections are in women >25 years.[19] Similar data have been reported in other European studies in general practice, in which young age was not[15] or only slightly[20] associated with an increase in infection risk. Others reported higher prevalences in women under 25 than in those over 25, but the absolute number of diagnosed infections in the older group was equally high[21] or even higher[17] than in the younger group. This finding is important, because screening programmes traditionally focus on women under 25,[5 22] passing over a substantial group of accessible women at risk, who often have not started to form a family and become pregnant. Extending the target group would yield more health gain, not only for these women, but also on the population level, resulting in greater decline of prevalence rates.[23]

Likewise, in high risk groups, chlamydial infection was found to be linked to various sociodemographic characteristics, such as low education, nulliparity, or single status; these associations are far less significant in the general population and tend to incorrectly classify too many women at risk of chlamydial infection, thus reducing effectiveness of screening.

Urogenital symptoms are strong but infrequent determinants of CT infection. A pill check or routine gynaecology consultation is an ideal opportunity to establish whether any suggestive symptoms are present—often too mild to be mentioned spontaneously.

In this study, behavioural factors are the best determinants of infection. These are reasonably the most direct risk indicators and are probably the most constant predictors in changing times and social structures.

The performance of the model presented (measured as percentage of detected infections/screened population), which is not based on age but on the number of partners in the past year as the primary determinant for screening, is better than earlier reported models in general practice settings. The validity of the model has to be assessed. If successfully implemented, this model could be an important public health intervention for the control of STI in the general population. However, large scale implementation of this strategy will demand sustained efforts from healthcare providers, as it is far more easy for a physician to assess his female patient's age or education level than to specifically and actively ask some questions related to her sexual activities. The latter is labour intensive and requires considerable communication skills, especially since STI issues have to be raised with asymptomatic patients.[24] It is well documented that STI counselling in primary care is rarely performed and often inadequate.[25 26] However, the specific general practice setting offers unique opportunities, not only to estimate STI risk, but also to discuss sexual health in a broader context. Therefore, in order that primary care based CT control programmes have a chance to succeed, educating physicians is a preliminary condition.

CONTRIBUTORS

VV is guarantor for the study and contributed to study design, data analysis and interpretation, and drafting the manuscript; DA and PVR contributed to study conception, data analysis, and interpretation; MI, HG, SC, and CL contributed to diagnostical and organisational aspects of the study; AM contributed to data interpretation and drafting the article. All co-authors approved the final manuscript.

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PostScript

Perianal verrucous epidermal naevus mimicking perianal warts

A case of perianal verrucous epidermal naevus mimicking perianal warts in a 2 year old boy is described. Verrucous epidermal naevus should be included in the differential diagnosis of perianal warty lesions, particularly when they are present since birth or appear during childhood.

CASE REPORT

A 2 year old boy was referred by a paediatrician for the evaluation of a perianal verrucous lesion which looked like perianal warts. The condition was first noticed by the child's mother when he was 9 months old as a raised velvety area around the anal orifice. Over the next few months, multiple, small, warty elevations developed over the region. The lesions had remained stable thereafter. There was no parental report of scratching, exudations or bleeding, or difficulty in passing stools. There was no history of viral warts or any STD in the parents. The child has remained in good health since his birth and achieved the milestones normally. Examination revealed a mildly elevated, velvety, periorificial skin studded with multiple, brownish, keratotic papules (fig 1).

Figure 1 Perianal warty papules.

Detailed systemic examination failed to reveal any abnormality.

A provisional diagnosis of verrucous epidermal naevus was made and a punch biopsy specimen was obtained. Histological examination corroborated the clinical diagnosis by showing hyperkeratosis, acanthosis, and papillomatosis without any evidence of vacuolar change in the keratinocytes or any dermal pathology. Virological study for human papillomavirus (HPV) could not be done owing to lack of facilities. The parents declined any immediate treatment for the asymptomatic condition and during a follow up period of 1 year, the child has remained healthy with the lesions remaining unchanged in appearance.

COMMENT

Verrucous epidermal naevi are circumscribed hamartomatous lesions composed almost exclusively of keratinocytes.[1] Most epidermal naevi usually occur at birth or infancy but rarely their appearance may be delayed until puberty.[2] The lesions typically consist of closely set warty papules that coalesce to form well defined keratotic plaques usually in a linear fashion. Verrucous epidermal naevi may be almost of any size, may be single or multiple, and can occur at more or less any site.[1] Since these lesions closely mimic viral warts, their occurrence in the perianal region during childhood or adolescence may raise the suspicion of perianal warts as in the present case. Onset of the lesions early in life, their stable nature, typical linear configuration, and histological features may help in the differential diagnosis. Usually only of cosmetic importance, the skin lesions may be treated by cryotherapy, surgical excision, or carbon dioxide laser ablation.[1][3]

Epidermal naevi, particularly if extensive, may be associated with other developmental anomalies mainly involving the central nervous system, the skeletal system, and the eyes.[4] In a large study, one or more such abnormalities were demonstrated in 33% of cases.[2] Since patients with epidermal naevi are at significant risk of having other abnormalities, detailed systemic examination and periodic follow up is warranted in every case to exclude them.

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Investigating the microbial aetiology of pelvic inflammatory disease

An effort to elucidate a subject which is laden with difficulties is noteworthy, so that it was interesting to read the report by Simms *et al*[1] on the associations between *Mycoplasma genitalium*, *Chlamydia trachomatis*, and pelvic inflammatory disease (PID). The difficulties are at least threefold. Firstly, a diagnosis of PID based on symptoms and clinical signs, as in the study reported, is acknowledged, both generally and by the authors, to be imprecise. Clinical observations often do not tally with laparoscopic findings,[2] laparoscopy being a fundamental diagnostic requirement in research investigations. Secondly, it is obvious that specimens cannot be taken from the inflamed site in question without laparoscopy. Indeed, it is axiomatic that this should be done if there is to be any chance of unravelling the microbial aetiology. Taking specimens from the cervix is very much second best as the results of microbiological testing may bear no relation to the pathological changes in the tubes. Thirdly, and no less relevant, is the question of an adequate control group. It seems that this should not comprise women undergoing tubal ligation. Although a source of normal tubes would seem sensible, the women were not in the same cohort as those with disease and, in any event, for comparative purposes specimens were taken from the cervix. Surely, an examination of specimens from women without symptoms and signs of PID but who were otherwise comparable to those who did have symptoms and signs would have been more appropriate? In future investigations, controls should be women within a laparoscopically based study who are found not to have PID on laparoscopy. Even then, the situation may be clouded because, in one study,[3] *C trachomatis* was detected as often in the tubes of women who did not have PID visually as in those of women who did. Certainly, however, finding *M genitalium* in the cervix of women with ill defined PID significantly more often than in the cervix of women who did not have PID and who, in other ways, appeared not to be comparable may mean nothing in relating *M genitalium* to tubal pathology. It is a far cry from unravelling the role of *M genitalium* in PID, despite some strong suggestions that it might be involved.[4]

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Lack of evidence for sexual transmission of hepatitis C virus in patients attending STD clinics in Pune, India

The presence of hepatitis C virus (HCV) RNA in semen among two of six (33%) HIV negative and six of 15 (40%) HIV infected males, reported recently suggests that HIV may facilitate genital shedding and subsequent sexual transmission of HCV.[1] We determined HCV prevalence and examined evidence for its sexual transmission in a cohort of STD patients with observed HIV prevalence of 21.2%.

Consecutive serum samples (n = 9141) collected between January 1994 and December 1999 were batched, pooled, and tested for anti-HCV antibody (Ortho HCV 3.0, Ortho-clinical Diagnostic, Germany). As previously described,[2] 25 µl aliquots of five samples were pooled and 20 µl of each pool were screened. Samples from positive pools were then tested individually. Positive sera were tested by HCV RNA polymerase chain reaction (PCR) using standard primers.[3] HIV antibody status of each sample was ascertained using the algorithm described previously.[4] Data were analysed using statistical package SPSS version 10.0. This study was a part of a prospective cohort study that was approved by ethics committee/institutional review boards of the collaborating organisations and blood samples were collected after counselling and informed consent.

Overall prevalence of anti-HCV antibodies was 0.68% (62/9141, 95% CI 0.52 to 0.87). The prevalence among HIV infected individuals (1.5%, 95% CI 1.0 to 2.1) was higher (p = <0.01) than that in those not infected (0.44%, 95% CI 0.3 to 0.6). The annual anti-HCV antibody prevalence rate between 1994 and 1999 was 0.57%, 0.46%, 1.10%, 0.81%, 0.37%, and 0.61%, which did not change significantly over time (table 1). Of the 55 anti-HCV antibody positive sera tested, 27 (49%) were HCV RNA PCR positive.

Univariate analysis revealed that history of past or current STD was not associated with HCV, whereas female sex (OR = 2.07, 95% CI 1.17 to 3.66), prevalent HIV infection (OR = 3.38, 95% CI 2.05 to 5.58), history of tattoo (OR = 2.18, 95% CI 1.31 to 3.63), and being a sex worker (OR = 2.35, 95% CI 1.27 to 4.35) were significantly associated with presence of anti-HCV antibody. However, multivariate analysis revealed that prevalent HIV infection and tattooing increased the likelihood of presence of anti-HCV antibodies by 3.08-fold (AOR 3.08, 95% CI 1.86 to 5.11, p = <0.00) and 1.87-fold (AOR 1.87, 95% CI 1.12 to 3.13, p = 0.017), respectively (table 1).

A rapid spread and high HCV prevalence of 80% has been reported recently among a cohort of injecting drug users from Kolkata, India.[5] In contrast, we observed a low and stable prevalence of anti-HCV antibody among STD clinic attendees over the past 6 years in an urban setting where HIV transmission was predominantly sexual. Given that a high HIV prevalence was reported among female sex workers (FSWs) in this population[4] and about 70% of males attending STD clinic had visited FSWs in the past 3 months, stable HCV prevalence over 6 years suggests that HCV is not efficiently transmitted sexually. Additionally, no association was found between past or current STD and HCV prevalence, and a high prevalence and incidence of HBV, a known sexually transmitted infection, have been reported in this population.[6] Our analysis failed to identify any evidence that could support sexual transmission of HCV.

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Monosymptomatic hypochondriacal psychosis

Dr O'Mahony illustrates in his literary and graphic way the difficulties associated with dealing with this condition (from which his patient was almost certainly suffering).[1] It is good to know that his hospital is taking seriously the issue of actual or threatened violence to staff. Having had several similar cases over the past couple of years, including one who eventually committed suicide, I have been able to make appropriate arrangements with a psychiatrist who was unequivocal in his advice that he should be in on a subsequent consultation right from the start and be introduced to the patient as a double consultation. The ethics of this include the fact that such delusional patients are, of course, psychotic and unable to bring rational decision making processes to the problem.

Table 1 Characteristics of study participants and association with prevalent anti-HCV antibody

Variable	No	Anti-HCV antibody positive (%)	Unadjusted OR (95% CI)	p Value	Adjusted OR (95% CI)*	p Value*
1 Year screened					Not included in multivariate analysis	
1994	1901	11 (0.57)	1 (Referent)			
1995	1933	9 (0.46)	0.80 (0.33 to 1.94)	0.628		
1996	1997	22 (1.10)	1.91 (0.93 to 3.96)	0.08		
1997	1109	9 (0.81)	1.41 (0.58 to 3.40)	0.45		
1998	1064	4 (0.37)	0.65 (0.21 to 2.04)	0.459		
1999	1135	7 (0.61)	1.07 (0.41 to 2.76)	0.895		
TOTAL	9139	62 (0.67)				
2 Males who had contact with sex worker					Not included in multivariate analysis	
YES	6281	40 (0.69)	1.63 (0.69 to 3.86)	0.259		
NO	1535	6 (0.39)	1 (Referent)			
TOTAL	7816	46 (0.58)				
3 Sex						
Women	1323	16 (1.21)	2.07 (1.17 to 3.66)	0.013		0.469
Men	7816	46 (0.59)	1 (Referent)			
Total	9139	62 (0.67)				
4 Sex worker						
Yes	933	13 (1.39)	2.35 (1.27 to 4.35)	0.006		0.231
No	8206	49 (0.59)	1 (Referent)			
Total	9139	62 (0.67)				
5 HIV serostatus					3.08 (1.86 to 5.11)	<0.001
Pos	2102	31 (1.47)	3.38 (2.05 to 5.58)	<0.001		
Neg	7037	31 (0.44)	1 (Referent)		1 (Referent)	
Total	9139	62 (0.67)				
6 History of tattoo					1.87 (1.12 to 3.13)	0.017
Yes	3703	37 (0.98)	2.18 (1.31 to 3.63)	0.003		
No	5424	25 (0.46)	1 (Referent)		1 (Referent)	
Total	9127	62 (0.67)				

*Multivariate analysis was done using binary logistic regression by forward LR method.
OR = odds ratio.

Since then, I have discovered a very helpful paper on the subject, which discusses the psychodynamics of the situation with particular emphasis on prevention.[2]

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A population based dynamic approach for estimating the cost effectiveness of screening for *Chlamydia trachomatis*

We read the recent paper in *STI* on cost effectiveness for *Chlamydia trachomatis* screening by Honey *et al* with great interest.[1] We concur with their conclusion that more data derived from clinical trials are needed for policy making, particularly when considering the evidence on the subsequent risk of pelvic inflammatory disease (PID) in women who test positive for *Chlamydia trachomatis*.

Our paper[2] was included and discussed in this review. As our approach was rather complex, we note that some parts of our design and results may have been misinterpreted. Honey *et al* note that our study was focused on screening both men and women in general practice with an age range for evaluation of 15–64 years. Although this information is correct, it does not reflect that screening for women only was considered separately and that women older than 34 years were not included in the screening programme. This misinterpretation by Honey *et al* formed the basis for exclusion of our study from further systematic review.[1]

Our approach differs from others' in that we investigate cost effectiveness by employing a population based dynamic model (Monte Carlo simulation).[2] [3] This approach enables us to simulate the *C trachomatis* transmission, the impact of prevention measures on the *C trachomatis* incidence and prevalence, and the risk for *C trachomatis* infection in a population. As a result, indirect effects (for example, future partners of current partners) over a period of several years can be considered using rates of partner change, mixing patterns, and transmission probabilities. We chose to analyse the screening programme over a period of 10 years. In our baseline analysis we assessed screening of men and women aged 15–24 years. However, in the scenario analysis we evaluated several other screening strategies, including screening of women aged 15–24, 15–29, and 15–34 years.

Despite the restriction of *C trachomatis* screening to the age groups labelled as "young" women, an evaluation of the transmission dynamics of *C trachomatis* in the population as described by our dynamic model requires the inclusion of men and older women in the model. For example, it may well be that *C trachomatis* is transmitted from a young woman to a man, from this man to an older woman, etc. Such transmission chains may occur over a period of years

and may involve men and women of all ages. So, to adequately evaluate screening of women aged 15–24, a model is required that considers all sexually active age groups. Therefore, sexual activity was modelled for both men and women aged up to 64 years, using assumptions based on a Dutch Sex Survey.

Application of our model to the Netherlands showed that screening women aged 15–24, 15–29, and 15–34 years over a period of 10 years would result in net cost savings to society. When including (excluding) indirect costs, cost savings were reached after 2.8 (3.8) years, 3.1 (4.3) years and 3.3 (5.0) years, respectively. This evaluation considered the costs of screening (polymerase chain reaction testing, azithromycin treatment, GP fee) and partner referral as well as direct (medical) savings as a result of averted health care and indirect savings as a result of averted productivity loss.

We think that our dynamic approach leads to more realistic assessments of cost effectiveness in this area as it appropriately considers the highly infectious character of *C trachomatis*. At this time, our approach is being used to evaluate the cost effectiveness of *C trachomatis* screening programmes in two other European countries.

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Contamination of environmental surfaces by genital human papillomaviruses (HPV): a follow up study

In a previous study we investigated the contamination of environmental surfaces with human papillomavirus (HPV) DNA in two genitourinary medicine (GUM) clinics.[1] This study was intended to review the GUM clinic in which HPV DNA was found to be present. Cleaning with "general purpose neutral liquid detergent" (detergent) (Youngs Detergents, Lancare Ltd, UK) and water, or 2% Clearsol (disinfecting detergent, 40% VV Tar Acids; Coventry Chemicals Ltd, Coventry, UK) in 70% methylated spirits (Clearsol) was performed following the results of the previous study.

Twenty samples were collected from two treatment rooms and patients' toilets at each time of sampling. Samples were tested and typed as described previously.[1] Surfaces sampled, and accumulation of HPV DNA during a single day, are listed in table 1.

Table 1 Method of cleaning used and HPV DNA detection

	Sample 1, 16.30	Sample 2, 8.30	Sample 3, 16.30
	Detergent	Clearsol and methylated spirits	
Female treatment room			
Treatment/examination bed	11, 16	None	None
Light switch	6, 16	None	None
Examination lamp	None	None	None
Male treatment room			
Treatment/ examination bed	None	None	None
Light switch	16	None	6, 18
Examination lamp	None	None	None
Female toilet			
Light switch	None	None	None
Toilet flush handle	None	None	None
Toilet seat	None	None	None
Door handle	None	None	None
Cold tap	None	None	None
Hot tap	16	None	None
Male toilet			
Door handle	16	None	None
Hot tap	None	None	None
Cold tap	None	None	None
Light switch	None	None	None
Toilet seat	11, 16	None	None
Cryoguns			
1	6, 16, 58	Pos (6)	Pos (6, 11, 16, 18)
2	6	None	Pos (11)
3	16	None	Pos (6)

Sampling was performed at 08.30 on two consecutive days and a third set of samples was collected at 16.30, the end of the clinic hours, on day 2.

Following cleaning with detergent and water at the end of the working day (sampling 1), nine of the 20 surfaces tested were contaminated. It was decided to clean surfaces with a more stringent agent. After subsequent cleaning with Clearsol solution HPV DNA was present on one surface at the beginning of the day, and on four at the end of the day.

β Globin DNA was detected in all HPV DNA positive samples, indicating HPV was cell associated, and in a further five samples taken at the end of the day from HPV DNA negative surfaces.

Compared to our previous study a 50% reduction in surface contamination with HPV DNA was found after cleaning with detergent and the number of types detected was reduced. Only HPV types 6, 11, 16, and 58 were detected on the nine different surfaces. This is also a 73% reduction in the number of types detected in our previous study.[1] HPV types 6, 11, and 16 were still the most common types found (all types in table 1).

Three of the samples positive for β globin DNA but negative for HPV DNA were from the patients' toilets and/or the male clinic examination couch. On the examination lamp switch and the edge of the examination couch in the patients treatment room, DNA was probably from the doctors' gloves, whereas β globin DNA detected on the surfaces sampled in the patients' toilets was probably the result of cells shed naturally.

Cleaning with Clearsol was more effective then cleaning with a detergent, which was more effective than no cleaning, but not sufficient.

Early in the 20th century Ignaz Philipp Semmelweis showed that hand washing with soap/water was not as effective as washing with ethanol.[2] It has also been shown that alcohol based disinfectants have a better efficacy than antiseptic soaps.[3][4] Different antiseptics and decontaminants, whether water or alcohol based, may have different viricidal efficiencies.[5][6] There are few data on environmental decontamination; however, this study suggests cleaning with Clearsol/methylated spirit is reasonably effective at decontaminating environmental surfaces, but contamination will recur unless cleaning is performed regularly.

Contributors

The principal author SS, with the co-author HS, collected the samples, and performed the PCR and the reverse hybridisation on the environmental samples; CS supervised the sample collection in GUM clinic and was co-author; JG supervised the project and was senior author.

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Issues associated with the introduction of circumcision into a non-circumcising society

A team lead by Kebaabetswe propose the introduction of infant circumcision in Botswana, based on:

- a survey of its acceptability to Batswana (people of Botswana)
- its practice in certain Western nations, and
- its alleged value in preventing HIV infection.[1]

There are several medical, psychological, sexual, social, ethical, and legal problems with this proposal.

Medical effects

Male neonatal circumcision is not an innocuous procedure. There are many complications ranging from trivial to life threatening. Complications generally include bleeding, infection, and surgical accident, including penile necrosis and penile amputations.[2] Bleeding or infection can progress to death.[3][4] It is difficult to control complications with mass circumcisions.[5] Circumcision excises significant amounts of nerve bearing penile skin and mucosa, especially the ridged band structure near the mucocutaneous boundary.[6] The protective effects of circumcision against HIV remain controversial.[7] UNAIDS has not accepted circumcision as a useful public health measure.

In neighbouring South Africa, many children are infected with HIV.[8] This is attributed to unsafe health care.

Circumcision creates an open wound through which infection may proceed.[9] It is not clear that safe aseptic circumcisions can be delivered in Botswana. It is possible that mass circumcision may worsen the epidemic.

Psychological effects

Psychological manifestations of circumcision have been an area of study at Bond University.

Neonatal circumcision is an intensely painful, traumatic, and stressful operation.[10] General anaesthesia is unsafe in the newborn. Available methods of anaesthesia are only partially effective.[10] Circumcised infants show hypersensitivity to pain suggestive of post-traumatic stress disorder (PTSD).[11] Our study of the incidence of PTSD in the Philippines found extensive PTSD in circumcised boys.[12] PTSD secondary to neonatal circumcision has been documented in adult males.[13] Victims of trauma tend to re-enact their trauma either on themselves or others in a cycle of violence.[14] Circumcised males may rely on psychological defence mechanisms such as rationalisation and denial, and strongly avoid thoughts, feelings, or conversations about circumcision.[15]

There are additional concerns. The state of the phallus is closely related to a man's sense of wellbeing.[16] Men who were circumcised neonatally may feel unhappy about being circumcised, experience significant anger, sadness, feeling incomplete, cheated, hurt, concerned, frustrated, abnormal, and violated. In addition, circumcised men may suffer from resultant low self esteem,[16] which frequently can result in a host of disordered behaviours.

Circumcision may be difficult to eradicate from a society once it is introduced. In addition, to the re-enactment described above,[16] Goldman reports that circumcised men tend to defend the practice.[16] Circumcised doctors tend to develop intellectual arguments to support genital cutting.[17] Fathers who are circumcised may adamantly insist on a son's circumcision in an emotional defence against their own painful feelings of grief for a lost body part and reduced sexual function.[18] Kebaabetswe et al (p 217) reported that, ''Being circumcised was the only significant predictor for a man who would definitely or probably circumcise a male child.''

Sexual effects

As noted above, circumcision excises large amounts of skin and mucosa from the penis. The removal of the prepuce tightens the remaining skin and makes it relatively immobile. Since stimulation of the sex nerves normally occurs by movement of the mobile skin, this further desensitises the penis,[17] perhaps even more than the removal of the ridged band of erogenous nerves noted by Taylor.[6] Excision of sexual nerve endings necessarily reduces sensory input. A decrease in sensation may therefore decrease the sexual response.[19][20]

Male circumcision also may adversely affect female sexual response. A survey of women found that they were markedly less likely to have an orgasm with a circumcised partner.[21]

Social effects

There has been little study of social problems that may occur when entire cohorts of males are circumcised and consequently most of the men in a society bear physical and psychological wounds associated with circumcision.

We might expect more dependence on alcohol to relieve the symptoms of PTSD. Low self esteem may generate a feeling of shame. Shame may generate problems with

relationship dissatisfaction, poorer health, depression, drug use, and loneliness. Increased sexual incompatibility and marital problems in circumcised societies might be expected as a result of reduced penile sensory input, increased sexual dysfunction, PTSD, and low self esteem among circumcised men.[22]

Increased antisocial behaviour may also be expected. Thus, we might expect to see higher levels of domestic violence, rape, child sexual abuse, suicide, and theft.[22]

Human rights

The fight against HIV-AIDS requires the careful protection of human rights.[23] Among these human rights one finds the rights to security of the person and protection from degrading treatment. The unnecessary excision of normal human tissue[6] from unconsenting minor children is an obvious violation of the security of the person.

Through amputation of erogenous tissue, circumcision necessarily diminishes sexual sensation and function as described above and may constitute degrading treatment.

Ethics

Doctors have a duty of care to behave in an ethical fashion. Among other requirements, they are expected to respect the human rights of their child patients.[24] Circumcision has been shown to be a violation of the child's human rights and, clearly, many ethical doctors are unwilling to carry out destructive circumcisions on normal, healthy boys. The British Medical Association recognises the right to conscientious objection to the performance of circumcision.[24]

Law

Male circumcision is not unlawful, but valid consent must be obtained. This may be a problem in the case of circumcision performed on unconsenting minors, in the absence of any medical indication.

Cases involving the right of parents to consent to the non-therapeutic surgical sterilisation of a child have been heard in several nations.[25 26] The cases agree that, in the absence of any medical indication, parents are not empowered to consent to the non-therapeutic, irreversible, surgical alteration of their child's genitals.

In the absence of a valid consent, a circumcision may constitute an assault.[27]

Conclusion

The value of male circumcision in preventing HIV infection remains unclear. Non-sterile circumcisions may increase the risk.

The proposal by Kebaabetswe and colleagues for the introduction of circumcision into Botswana is seriously flawed, and is irresponsible in failing to place the emphasis on safe sex practices. As described here, there are many medical, sexual, psychological, social, human rights, ethical, and legal aspects that must be considered.

Reliance on circumcision to prevent HIV transmission is wishful fantasy, and can only result in a calamitous worsening of the HIV-AIDS epidemic.

Once started, circumcision tends to persist even when the need is over. Circumcision was introduced more than 100 years ago in Western nations on the grounds that it would prevent masturbation, which would prevent mental and emotional illness. That,

of course, is no longer believed, but the practice of circumcision persists and has proved difficult to eradicate although progress is being made. The incidence of circumcision is declining in Western nations. The Department of Health of the Philippines is trying to discourage circumcision (called ''tule'') in that nation where it has persisted.[28] The practice of neonatal circumcision in certain Western countries such as the United States does not constitute a valid reason for introducing neonatal circumcision in Botswana.

Extreme care must be taken in a decision to introduce circumcision into a society.

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BOOK REVIEWS

Atlas of Sexually Transmitted Diseases and AIDS

By S A Morse, R C Ballard, K K Holmes, A A Moreland. Pp 416; £125.00. Philadelphia: Elsevier, Mosby, 2002. ISBN 0723432279.

What is an atlas? My dictionary was of little help, referring only to the word in its geographical and mythical contexts. Medical atlases that come to mind are largely pictures of the common and the obscure, of varying quality, and accompanied by the minimum of text. Such books are useful when it comes to reassuring young men that pearly penile papules are common and of no clinical significance, and for showing students conditions which they are unlikely to see in real life; but otherwise they tend to sit on the bookshelf after a rash purchase at a medical conference.

The new addition of Morse, Ballard, Holmes and Moreland's atlas is hardly in this category. Perhaps it might be better described as an illustrated textbook because the text is not an insignificant part of the whole. How then does it stand up in this context? To answer this question I compared it with the genitourinary physician's bible, the 1999 edition of *Sexually Transmitted Diseases*. Initially, the reader is struck by the clear layout and larger font size, certainly an advantage for the ageing clinician. The use of colour in charts and diagrams adds to the clarity and the clinical photographs are generally of good quality, although a few require the eye of faith for interpretation.

If the authors are aiming at the test book market, however, the success of the atlas will depend on more than its visual appeal. Clearly there are many aspects of our specialty that do not easily lend themselves to a pictorial format; history, political context, service provision, behavioural data come to

mind. These are missing. But a direct comparison of the treatment of a common condition, such as vaginal discharge, between the two books points up considerable differences. Whereas *Sexually Transmitted Diseases* tackles in admirable detail the microbiology, epidemiology, diagnosis, management, and complications of the various infections, I looked in vain in the atlas to find out whether sexual partners of women with bacterial vaginosis should be treated. There are however novel aspects of the atlas that should be applauded. I especially liked the opening chapter on genital and dermatological examination that brings together the normal and the abnormal in a particularly useful way, especially for physicians with a limited knowledge of dermatology.

Clearly, the general attractiveness of this atlas will ensure its place on the bookshelves of most specialist departments. As an introduction to the specialty, it fills an important niche and might be an ideal purchase for trainees. It cannot however replace *Sexually Transmitted Diseases* as a resource for serious investigators and may eventually become redundant with the advance of electronic media. In the meantime, clinicians with an idle moment might flick though the pictures reminding themselves of rarely seen conditions. My daughter, glancing over my shoulder, shuddered and insisted that the book should not end up on the coffee table. Perhaps a tribute to the quality of the photographs!

P E Munday

Clinical Practice in Sexually Transmissible Infections

Ed by A McMillan, H Young, M M Ogilvie, G R Scott. Pp 416; £125. Philadelphia: Elsevier, Saunders, 2002. ISDN 0702025380.

This book, aimed at doctors in training in genitourinary medicine, is highly readable and manages to pack in a lot more material than one would guess from its size. It is largely successful in this goal, combining clarity of language and excellent clinical photographs where these are used.

In a book this compact the authors clearly did not intend to address comprehensively all the subjects raised, as indicated by the widespread referral to reviews and specialist books and use of up to date references for those inclined to seek further information. The length I think is more a strength than a weakness although it must have been difficult to decide what aspects of these disparate infections to include and what to leave out. However, perhaps because of the wider audience, when discussing certain pathological states some information on, or illustrations of, normal state or function would have been helpful. For the same reason legends explaining some of the abbreviations used (for example, for recently defined cytokines and cellular molecules) would not have been remiss.

It is a brave person who sets upon the task of writing a medical textbook, not least because it is such hard work, but also because the accelerating pace of change in the biomedical sciences can make an author seem more like an historian. Even in this up to date book there is information that needs revision already, in view of recent changes (for example, p 158 Management of *Pneumocystis jiroveci: Arch Intern Med* 2001;**161**:1529–33) The authors have acknowledged this to some extent, by the use of ''evolving'' references in many instances (p 151 UNAIDS website; www.aidsmap.com for HIV treatment).

Long term utility of this kind of book depends, among other things on how well it is researched and written, but also crucially on the pace of further progress in the field and thus how often it needs revision. Progress is bound to continue in many areas of STI epidemiology and clinical practice. It would seem that web based books in a state of perpetual revision (for example, www. hopkins-aids.edu/publications/book/book_toc. html) may go some way to addressing the question of whether a book survives as a useful text.

This book may not be the last word on the subject of STIs but it is certainly a good place to start.

Sylvia Ojoo

CORRECTIONS

In the STI supplement I this year, 80th MSSVD Spring Meeting held jointly with the 19th STI Congress of IUSTI Europe, the following abstract was omitted from the printed abstract book, with apologies to the authors.

Incidence and causes of peripheral eosinophilia in HIV-1 infected individuals attending a district general hospital

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Objectives: To determine the incidence of eosinophilia in a cohort of HIV-1 positive individuals and to compare the prevalence of positive parasite serology between African cases and controls.

Methods: Patients attending an inner city HIV clinic with peripheral eosinophilia ($\geq 0.5 \times 10^9$/l) on two or more occasions were identified as cases from a retrospective review of haematological records from October 1999 to August 2001. Controls (Africans without eosinophilia) were obtained from an ongoing prospective study. Demographic and clinical data were ascertained by case notes review and patient questionnaire. Investigations for parasitic infections were undertaken (schistosomal, filarial, and strongyloides serology).

Results: 295 patients had haematological tests during the observation period, of which 67 (23%) had peripheral eosinophilia. 60/67 (90%) of the cases were of African origin, the mean nadir CD4 count was 193 and 25% were stage CDC C. Controls (n = 45) were broadly similar. To date, 26/45 (58%) African cases had positive serological screens for parasites (23 schistosomal, 4 strongyloides, and 2 filarial infections), compared with 4–45 (9%) of controls (4 schistosomal infections) $p < 0.001$, χ^2 test. There was no positive serology in 3/7 non-African cases screened.

Conclusions: Although previous studies have demonstrated a low incidence of parasitic infection in HIV-1 positive patients with eosinophilia, we have identified a high number of treatable parasitic causes. No cause has been identified in 42%, suggesting that for a proportion of these HIV may be the cause. Despite this, routine screening for parasitic infection, guided by geographical exposure, is recommended in HIV-1 infected Africans with eosinophilia.