

Risk assessment and other screening options for gonorrhoea and chlamydial infections in women attending rural Tanzanian antenatal clinics

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Sexually transmitted diseases (STDs) are a major cause of morbidity and mortality in developing countries and may play a key role in enhancing the heterosexual transmission of human immunodeficiency virus (HIV). Treatment of STDs is one of the most cost-effective of all public health interventions in developing countries; however, STDs among women in rural populations have received little attention. In this study, we report the prevalences of STDs among 964 women attending antenatal clinics in a rural area of the United Republic of Tanzania. A total of 378 (39%) of these women were infected with at least one STD pathogen, 97 (10%) had syphilis, and 81 (8%) had Neisseria gonorrhoeae (NG) and/or Chlamydia trachomatis (CT) infection.

The recommended syndromic approach to screening for NG/CT infection, based on reported genital symptoms, had a low sensitivity (43%) and failed to discriminate between infected and uninfected women. A risk score approach that we developed, based on sociodemographic and other factors associated with NG/CT infection, had a higher sensitivity and lower cost per true case treated than other approaches, although its positive predictive value was only about 20%.

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Introduction

Sexually transmitted diseases (STDs) are among the commonest conditions observed in adult medical outpatients in Africa (1). High prevalences of *Neisseria gonorrhoeae* (NG) infection, syphilis, *Trichomonas vaginalis* (TV) infection and *Chlamydia trachomatis* (CT) infection have been documented among urban antenatal clinic attendees in several African countries (2), and attention has been drawn to the public health consequences of this situation in terms of pregnancy wastage, neonatal morbidity, infertility and ectopic pregnancy (3, 4).

Little is known about the prevalence of STDs and other reproductive tract infections (RTIs) among rural African women. Arya et al. (5) found a high prevalence of gonorrhoea in the Teso district of Uganda, whereas a small study in the Gambia found that the prevalences of NG, CT, and TV infections were somewhat lower in a rural than those in an urban population (6). A population-based survey in the Mwanza Region of the United Republic of Tanzania showed that the prevalence of untreated syphilis among rural women was 7.9% (7).

The diagnosis and treatment of STDs among antenatal clinic attendees is likely to have a substantial public health impact in developing countries. In addition to preventing the direct effects of such infections on mothers and infants, it may also reduce the incidence of human immunodeficiency virus (HIV) infection, since there is increasing evidence that STDs may facilitate the heterosexual transmission of HIV (8–11). Treatment of syphilis, and of NG and CT infections is one of the most cost-effective health interventions available in developing countries in terms of cost per healthy life-year saved (12).

Because similar signs and symptoms are induced by several organisms, the etiological diagnosis of RTIs depends on the use of laboratory tests that are not available in most rural areas of developing countries. For this reason, WHO recommends a syndromic approach to the management of RTIs in developing countries in which, for example, patients complaining of genital discharge are treated with drugs effective against all organisms commonly responsible for such symptoms (13). More recently it has been suggested that the management of vaginal discharge could be rationalized by restricting treatment for gonorrhoea and chlamydial infection to individuals with risk factors for these infections (14).

Such a syndromic approach fails to identify and treat women with these infections who do not complain of discharge, and will therefore have a limited public health impact if asymptomatic infection is common. For this reason, we determined the prevalence of RTIs in 964 randomly selected rural Tanzanian antenatal clinic attendees, and evaluated various approaches for the identification of those infected with *N. gonorrhoeae* and *C. trachomatis*.

Methods

The study was conducted in 1992–93 in 12 rural health centres in Mwanza Region, whose geographical and demographic characteristics have been described previously (15). The 12 health centres took part in an intervention trial to assess the impact of improved STD treatment on the incidence of HIV and other STDs. The study included a baseline survey of antenatal clinic attendees to determine the prevalence of STDs prior to implementing the intervention programme.

Patients

Approximately 100 consecutive antenatal clinic attendees were enrolled over a 2-week period at each health centre. After obtaining their informed consent, subjects were interviewed about their marital, educa-

tional, and occupational status in Kiswahili, the local language, using a standard questionnaire. A full sexual, obstetric, and gynaecological history was also elicited for each patient, and details of any current symptoms relating to the genital tract were noted.

Each patient received a limited general examination (skin, mucous membranes, lymph nodes) followed by a full gynaecological investigation, including speculum examination and bimanual palpation. Endocervical swabs were taken for Gram staining, NG isolation, CT antigen detection, and vaginal swabs for wet preparation and potassium hydroxide testing. The colour of the endocervical swab was noted, and if it was yellow the "swab test" was considered positive, indicating the presence of muco-pus (16). Urethral swabs were also taken for NG isolation. A 5-ml sample of venous blood was drawn for syphilis serology. All infections that were diagnosed were treated according to Tanzanian Ministry of Health guidelines, either on the spot, for TV and *Candida albicans* (CA) infections and genital ulcers, or at a follow-up visit, for NG and CT infections and serological syphilis.

Laboratory methods

In the field, saline wet mounts were examined for the presence of motile TV and for the presence of pseudohyphae and/or budding yeast cells indicative of CA. Smears for Gram stain were heat-fixed, and swabs for NG isolation were inoculated directly onto modified Thayer–Martin medium (MTM) and incubated under an atmosphere containing 5% CO₂. At the first five health centres, MTM plates were made up locally, placed in candle extinction jars after inoculation, and returned to the laboratory for incubation. This method resulted in a high proportion of contaminated plates. In the remaining seven centres a commercial kit with its own CO₂-generating device was used (Gonoline, Merieux SA, France), and plates were incubated in a portable incubator at 35 °C in the field.

In the laboratory, endocervical smears were Gram stained, examined for the presence of Gram-negative intracellular diplococci, and the number of polymorphonuclear leukocytes per high-power field (PMN/HPE) counted. A definitive diagnosis of NG infection was established by culture and confirmed using the Phadebact agglutination test (KaroBio Diagnostics, Huddinge, Sweden).

Swabs for CT antigen detection were placed in cryotubes containing transport medium supplied by the manufacturer, and stored at 4 °C for a maximum of 5 days before being transported to the laboratory. The swabs were tested using an antigen-detection

enzyme immunoassay (IDEIA, NovoNordisk Diagnostics, Cambridge, England), employing an additional confirmatory blocking antibody assay for positive and "grey-zone" specimens.

Venous blood samples were centrifuged in the field, and stored at 4 °C for a maximum of 5 days. Rapid plasma reagin (RPR) (VD 25, Murex Diagnostics, Dartford, England) and *Treponema pallidum* haemagglutination tests (Fujirebio Inc, Tokyo, Japan) were performed on all samples for the serological diagnosis of syphilis.

Derivation of risk scores

Risk scores were derived by analysing variables that were associated with NG and/or CT infection; these scores were based on sociodemographic variables reported by the women (R1) or on these variables together with reported symptoms (R2). In each case, an "optimal" score (R1_{opt}, R2_{opt}) was obtained from the logistic regression coefficients (×10) of those factors that were still significant on multivariate analysis (14). To provide a more practical procedure for field implementation by staff with limited training, we determined also "simplified" risk scores (R1_{sim}, R2_{sim}) by counting a score of one for the presence of each characteristic represented in the "optimal" score. The cut-off for each score was chosen to maximize the sum of the sensitivity and specificity.

Evaluation of diagnostic algorithms

We defined and evaluated various algorithms for the diagnosis and treatment of NG/CT infection, as indicated below.

Syndromic treatment:

- S1: Women reporting vaginal discharge and/or genital itching.
- S2: Women reporting any symptom related to the genital tract (vaginal discharge, genital itching, lower abdominal pain, dysuria, or dyspareunia).

Risk scores:

- R1: Score based on sociodemographic factors equals or exceeds the cut-off value.
- R2: Score based on sociodemographic factors and reported symptoms equals or exceeds the cut-off value.

Combined algorithms:

- S1 + E: Women reporting symptoms (S1) are examined, and treated only if abnormal vagi-

nal discharge is seen (traditional medical approach).

- S1 + R1: Women reporting symptoms (S1) are questioned, and treated only if their risk score (R1_{sim}) equals or exceeds the cut-off (similar to an approach suggested by WHO).^a

- R1 + E: Women with a risk score (R1_{sim}) that equals or exceeds the cut-off value are examined and treated only if abnormal vaginal discharge is seen (using the risk score to screen for full examination).

The above-mentioned strategies were compared in terms of sensitivity, specificity, positive predictive value (PPV), and cost per true case treated. For purposes of comparison, these indicators were also calculated for "mass treatment" (all women treated). The drug cost per true case treated was calculated as the total cost of drugs in European Currency Units (ECU); (1 ECU = (US\$ 1.20)) for the treatment of all patients identified by the algorithm (1.5 ECU (US\$ 1.80) per patient), divided by the number of patients who were true cases of NG/CT infection.^a

Results

Sociodemographic factors and prevalence of STD/RTI

A total of 1149 women were enrolled in the study; eight (0.7%) refused to be examined and were excluded from the analysis. The average age of the women was 25.0 ± 6.2 years; 983 (86%) were married, 215 (19%) in polygamous marriages. More than 97% of the women were employed only in domestic duties or farming, and 34% had not attended school. Only 56 (4.9%) had ever used any form of contraception, and 31 (2.7%) had ever used condoms. Primigravida pregnancies accounted for 217 (19%) of the women seen, and of the remaining 924, a total of 342 (37%) had previously experienced either spontaneous abortion (233 (25%)) or stillbirth (146 (16%)).

Symptoms (vaginal discharge, genital itching, lower abdominal pain, dysuria, dyspareunia) relating to genital tract infection were reported by 752/1141 (66%) of the women. On examination, an abnormal vaginal discharge was observed in 422/1141 (37%)

^a Informal technical working group meeting on STD activities in GPA. The evaluation of algorithms for the diagnosis and treatment of vaginal discharge; agenda item No. IV. Background paper No. 5. Unpublished WHO document, 1993.

women, 305 (72%) of whom had reported a symptom relating to genital infection.

Further analysis was restricted to the 964 women for whom uncontaminated NG cultures were performed. Gram-stain results for intracellular diplococci were similar for this group and for those with contaminated cultures (data not shown), suggesting this was a representative subgroup of women.

The prevalences of laboratory-diagnosed STDs and RTIs are shown in Table 1. A total of 378 women (39%) had an STD infection, the prevalence ranging from 33% (77/237) in those aged ≥ 30 years to 45% (137/307) in those aged 20–24 years. RTI infections (including CA infections) were present in 473 women (49%), the prevalence ranging from 41% (97/237) in those aged ≥ 30 years to 54% (165/307) in those aged 20–24 years.

A total of 8.4% (81/964) of the women had NG/CT infections. Age-specific prevalences were 7.2% (15/209) for those aged 15–19 years, 11.7% (36/307) for those aged 20–24 years, 7.6% (16/211) for those aged 25–29 years, and 5.9% (14/237) for those aged ≥ 30 years (χ^2 test = 6.9, 3 degrees of freedom, $P < 0.02$).

Gonococcal and chlamydial infections

Demographic, behavioural and obstetric factors, current symptoms, signs on examination and simple laboratory tests were examined for their association with NG/CT infection (Table 2). Factors significantly associated on univariate analysis included the following: age < 25 years ($P = 0.08$); 1–3 previous pregnancies; unmarried (single, separated, widowed or divorced) or in a polygamous marriage; previous child delivered > 5 years previously; more than one

reported sexual partner in the previous year; and the partner responsible for present pregnancy did not live with the mother. Symptoms of dysuria and dyspareunia were significantly associated with infection, but vaginal discharge and lower abdominal pain were not. On examination, significant associations were noted with abnormal vaginal discharge, cervical discharge, and > 10 PMN/HPF on cervical Gram staining.

In a multivariate model adjusting for other significant factors, the following sociodemographic factors were significantly associated with NG/CT infection: age < 25 years (odds ratio (OR) = 2.2, $P < 0.003$); unmarried (OR = 3.2, $P < 0.001$) or in a polygamous marriage (OR = 2.3, $P < 0.003$); previous child delivered > 5 years previously (OR = 3.2, $P < 0.01$) or no previous child (OR = 0.35, $P < 0.004$); and $> one$ sexual partner over the previous year (OR = 1.7, $P < 0.06$). After adjusting for these factors, none of the signs, symptoms or simple laboratory tests were significantly associated with NG/CT infection, except dyspareunia (OR = 2.1, $P < 0.02$) and cervical discharge (OR = 3.2, $P < 0.06$).

Evaluation of the diagnostic algorithms

The syndromic approach based on reported vaginal discharge and/or genital itching (S1) had a sensitivity of 43% and specificity of 58% (Table 3; Fig. 1), and thus failed to discriminate between infected and uninfected women. An alternative syndromic approach (S2), which included other symptoms related to the genital tract but not usually regarded as indicative of NG/CT infection in pregnancy (e.g., dyspareunia, dysuria, or lower abdominal pain), had a higher sensitivity (72%) than the S1 approach and a comparable cost per true case treated, but required treatment of 66% of the women.

The risk scores (R1 and R2) were the most cost-effective algorithms studied, although the highest sensitivity obtained was 69% (R2sim). The weightings used to derive the risk score are shown in Table 4. Scores incorporating symptoms (R2) showed little improvement over those based on sociodemographic factors alone (R1). The performance of the "simplified" score (R1sim) was close to that of the "optimal" score (R1opt).

Of the combined algorithms investigated, the traditional medical approach (S1+E), based on confirmation of reported symptoms by clinical examination for abnormal vaginal discharge, had a sensitivity of only 27%. A new approach proposed by WHO, which consists of applying a risk score based on sociodemographic factors to women presenting with the symptom of vaginal discharge (S1+R1), was less satisfactory than the risk score applied alone. A fur-

Table 1: Prevalence of sexually transmitted diseases (STD) and reproductive tract infections (RTI) among 964 women attending rural antenatal clinics in Mwanza Region, United Republic of Tanzania

STD/RTI	No. of cases (n = 964)	% Prevalence
<i>Neisseria gonorrhoeae</i>	20	2.1
<i>Chlamydia trachomatis</i>	64	6.6
<i>Trichomonas vaginalis</i>	264	27.4
<i>Candida albicans</i>	138	14.3
Syphilis ^a	97	10.1
<i>N. gonorrhoeae</i> and/or <i>C. trachomatis</i>	81	8.4
Any STD ^b	378	39.2
Any RTI ^c	473	49.1

^a *Treponema pallidum* haemagglutination +ve / rapid plasma reagin +ve.

^b *N. gonorrhoeae*, *C. trachomatis*, *T. vaginalis*, and *T. pallidum*.

^c Any RTI = any STD or *C. albicans*.

Screening for gonorrhoea and chlamydial infections in Tanzanian antenatal clinics

Table 2: Associations between risk factors, symptoms, signs and simple tests and infection with *Neisseria gonorrhoeae* (NG) or *Chlamydia trachomatis* (CT) among 964 rural antenatal clinic attendees in Mwanza Region, United Republic of Tanzania

Risk factor	NG/CT infection		Univariate association	
	% +ve (n = 81)	% -ve (n = 883)	Odds ratio	P-value
Age <25 years	63	53	1.53 (0.96–2.44) ^a	0.08
No. of previous pregnancies:				
0	14	19	1	
1–3	65	43	2.17 (1.10–4.25)	0.03
≥4	21	38	0.78 (0.36–1.71)	0.7
<i>Marital status:</i>				
Monogamous	48	69	1	
Polygamous	30	18	2.31 (1.35–3.95)	0.003
Unmarried	22	12	2.62 (1.44–4.74)	0.003
<i>Previous child born:</i>				
<5 years ago	77	76	1	
>5 years ago	9	3	1.77 (1.07–2.93)	0.03
None	15	21	0.86 (0.43–1.73)	0.7
More than 1 sexual partner in last year	25	15	1.81 (1.06–3.11)	0.03
Father lives apart	28	17	1.87 (1.12–3.13)	0.02
<i>Symptoms:</i>				
Dysuria	32	22	1.72 (1.05–2.82)	0.03
Dyspareunia	22	12	1.94 (1.09–3.44)	0.03
Vaginal discharge	16	16	1.01 (0.54–1.87)	0.99
Lower abdominal pain	54	47	1.34 (0.85–2.12)	0.2
Genital itch	38	34	1.22 (0.76–1.95)	0.5
Any symptom	78	65	1.68 (0.98–2.88)	0.06
<i>Signs:</i>				
Vaginal discharge	48	35	1.70 (1.08–2.69)	0.02
Cervical discharge	10	4	2.65 (1.19–5.92)	0.02
Swab test	15	10	1.63 (0.80–3.27)	0.14
<i>Trichomonas vaginalis</i> on wet preparation				
>10 PMN/HPF ^b	58	42	1.98 (1.21–3.25)	0.004

^a Figures in parentheses are the 95% confidence intervals.

^b PMN/HPF = polymorphonuclear leukocytes per high-power field.

ther approach, in which women with a high risk score were examined for abnormal vaginal discharge (R1+E), had a sensitivity of only 31%.

Discussion

Prevalence of STDs in the study population

In the United Republic of Tanzania, most pregnant women attend at least one antenatal clinic and the high proportion of such women who had an STD in the study population (39%) is cause for considerable concern. A history of abortion or stillbirth was noted in 37% of all the women enrolled. NG/CT infections

as well as syphilis are associated with adverse pregnancy outcome (stillbirth, abortion, premature rupture of membranes and low birth weight) in a high proportion of infected women (4, 17–19). Gonococcal ophthalmia neonatorum, a potentially blinding disease, occurs in approximately one third of infants born to infected mothers (20). CT infection is an important cause of neonatal pneumonia as well as ophthalmia (21); both NG and CT infections are associated with increased risk of puerperal sepsis and may be responsible for long-term sequelae such as pelvic inflammatory disease and infertility (3, 22–24). In our study setting there is an urgent need for public health measures to improve STD control during pregnancy.

Table 3: Sensitivity, specificity, positive predictive value (PPV), and total cost of drugs per true case of infection with *Neisseria gonorrhoeae*/*Chlamydia trachomatis* treated for different diagnostic algorithms evaluated in 964 rural antenatal clinic attendees in Mwanza Region, United Republic of Tanzania

Algorithm ^a	% positive on algorithm:	Sensitivity (%)	Specificity (%)	PPV (%)	Cost per true case treated (ECU) ^b
<i>Syndromic:</i>					
S1 vaginal discharge genital itching	42	43	58	8.6	17.4
S2 vaginal discharge genital itching lower abdominal pain dysuria dyspareunia	66	72	34	9.1	16.5
<i>Risk score:</i>					
R1opt, sociodemography	22	53	81	20.2	7.4
R1sim, sociodemography	18	46	84	21.1	7.1
R2opt, sociodemography + symptoms	24	54	78	18.6	8.0
R2sim, sociodemography + symptoms	48	69	54	12.1	12.4
<i>Combined algorithm:</i>					
S1+E syndrome + examination	18	27	82	12.4	12.1
R1+E risk score + examination	12	31	88	18.7	8.0
S1+R1 symptoms + risk score	19	36	83	16.5	9.1
Mass treatment	100	100	0	8.4	17.8

^a See text for details.

^b 1 ECU = US\$ 1.20.

Current STD control strategies

STD control programmes in most developing countries are still in their infancy. Only in the past few years, with the realization that STD control may provide one of the few effective interventions against the spread of HIV and acquired immunodeficiency syndrome (AIDS), have they been given any priority by health planners, ministries of health, and donors. The approach advocated by WHO is to integrate STD treatment, based on a syndromic approach, into the existing primary health care structure.^{b-d} This new syndromic approach for the diagnosis and treatment of vaginal discharge costs between one-third

and one-half of that of traditional clinical and laboratory diagnosis.^e

Our findings suggest that the WHO approach may be unsuitable for detecting NG/CT infections in an apparently low-risk population (rural antenatal clinic attendees) because the entry points for the interview algorithm (vaginal discharge or genital itching) are too insensitive and lack specificity. The reasons for this include the following: the failure, for cultural or educational reasons, of rural Tanzanian women to perceive their symptoms as STD-related, added to the problem of terminology for STDs in Kiswahili; the poor correlation of vaginal discharge with NG/CT infection, in general and during pregnancy, in particular (vaginal discharge is associated more often with TV or CA infection); and the problem of truly asymptomatic NG/CT infections (25–27). We included genital itching in the syndrom-

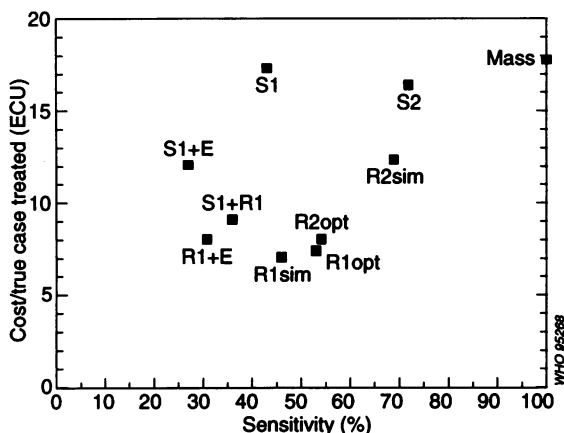
^b See footnote a, p. 623.

^c Policies and principles for national programmes for control of STD in developing countries. Unpublished WHO document, 1993.

^d Provision of STD services in maternal and child health and family planning settings. Informal technical working group meeting on STD activities in GPA. Agenda item No. IV. Background paper No. 7. Unpublished WHO document, 1993.

^e Analysis of the cost-effectiveness of approaches to STD. Informal technical working group meeting on STD activities in GPA. Agenda item No. IV. Background paper No. 4. Unpublished WHO document, 1993.

Fig. 1. Comparison of the total drug cost per true case of *Neisseria gonorrhoeae* and/or *Chlamydia trachomatis* treated and the sensitivity of different diagnostic algorithms in rural antenatal clinics, Mwanza Region, United Republic of Tanzania (see text for details).



ic algorithm S1 because women in the study population often use this term to report vaginal discharge. An algorithm based only on reported vaginal discharge would have had a sensitivity of only 16%.

Algorithms based on a combination of interview and clinical examination (the classical medical approach) were even less sensitive, and therefore cannot be considered for case-finding purposes. Even speculum examination of all pregnant women, although not practical in our setting, would not have achieved better results. In the United Republic of Tanzania, STD care in rural clinics generally suffers from severe limitations of funds, expertise, time and

other resources, and simple screening methods for STDs are therefore needed along with cost-effective treatment regimens.

Risk scores

The risk score method avoids some of the weaknesses of other approaches by considering risk factors for NG/CT infection. Studies using this method in industrialized countries have shown satisfactory results for CT infection (25, 27). Only one previous study to our knowledge has evaluated risk scores for NG/CT infection in pregnant African women (14), and concluded that in an urban setting it was a useful diagnostic approach. In that study, the risk score was based on age, marital status, more than one sexual partner, reported symptoms and the result of the leukocyte esterase dipstick (LED) test on urine, but excluded clinical examination.

The risk scores in our study in a rural setting used a similar set of risk factors, with the exception of LED testing, and the inclusion of additional scores for "previous child born >5 years ago" (presumably related to subfertility owing to STDs) and "any previous child" (the absence of which for younger women suggests recent initiation of sexual activity). The risk score approach again proved a more cost-effective method of screening for NG/CT infection, the sensitivity and positive predictive value exceeding those of syndromic approaches in both studies. The risk scores were based on variables plausibly related to risk of infection, and required asking only a few simple questions that could easily be carried out in a busy antenatal clinic. A similar approach might be used to screen women in other settings; for example, those attending maternal and child health or family planning clinics, but this requires further evaluation.

Table 4: Weightings used to calculate risk scores for diagnosis of infection with *Neisseria gonorrhoea*/*Chlamydia trachomatis* among rural antenatal clinic attendees in Mwanza Region, United Republic of Tanzania

Characteristic	Weighting for algorithm:			
	R1opt	R1sim	R2opt	R2sim
Age <25 years	8	1	8	1
Polygamous marriage	8	1	8	1
Unmarried	11	1	11	1
Any previous child born	10	1	10	1
Previous child born >5 years ago	11	1	11	1
More than one sexual partner over last year	5	1	5	1
Any symptom related to genital infection	N/A ^a	N/A	2	1
Cut-off ^b	21	3	21	3

^a N/A = not available.

^b *N. gonorrhoea*/*C. trachomatis* infection was treated if score equalled or exceeded cut-off.

A new approach proposed by WHO,^f in which reported vaginal discharge is the starting point and a risk score is used to identify women for treatment (S1+R1), performed poorly in our study. However, the WHO approach was intended for use on nonpregnant women for whom the symptom of vaginal discharge may be more predictive of NG/CT infection.

In our study the risk score was defined and evaluated on the same data set, and the numbers of NG/CT infections were too few to attempt cross-validation. Moreover risk factors for infection may vary in different populations and the approach needs further validation in other antenatal clinics, both in our setting and elsewhere. To maximize the feasibility of the approach in routine practice, we suggest the use of "simplified" scores, which performed almost as well as the more complex "optimal" scores.

Screening for RTIs during pregnancy

Universal serological screening of antenatal clinic attendees for syphilis is recommended by WHO. The RPR test is extremely cheap and simple to perform,^g and the treatment of syphilis in pregnancy is one of the most cost-effective health interventions available (28).

TV and CA can readily be identified in wet preparations, but in the absence of microscopy the new WHO syndromic approach recommends that all nonpregnant women reporting "vaginal discharge" should be treated for TV/CA infections. A recent study carried out in Kinshasa, Zaire, suggests that TV infection is a risk factor for HIV transmission (11), so that identification and treatment of women with this infection should perhaps be given higher priority.

Currently, laboratory screening for NG/CT infections is more complex and considerably more expensive. Of the approaches considered in this study, only mass treatment of all pregnant women achieved high levels of sensitivity, but only 8.4% of women were infected, and the total cost of this strategy (17.8 ECU (US\$ 21.40) per true case treated) is high. There is an urgent need for simple methods of identifying women with these infections in antenatal, family planning, and maternal and child health clinics in developing countries (29).^h The social and behavioural factors that we found to be associated with infection in our study population offer a pos-

sible method of identifying women at higher risk of infection. A combination of case management using the WHO syndromic approach for women presenting to health facilities with self-recognized RTIs, together with screening for NG/CT infections using a score-driven approach among those attending antenatal and maternal and child health clinics, may currently represent the most cost-effective approach to diagnosing and treating these STDs. Further studies are needed to define the added value provided by cheap and simple bedside tests such as the LED test for urine (14). However, since none of the approaches considered in this study yielded a positive predictive value much in excess of 20%, there is an urgent need to develop more sensitive and specific diagnostic tests that can be used simply and cheaply in rural health facilities

The control of RTIs in developing countries will only be achieved through innovative approaches to the screening of asymptomatic populations, particularly women. The potential gains, in terms of healthy life-years saved, are enormous (28).

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Résumé

Evaluation des risques et autres possibilités de dépistage des gonococcies et infections à *Chlamydia* dans les dispensaires prénatals ruraux de Tanzanie

Les maladies sexuellement transmissibles (MST) sont une cause importante de morbidité et de mortalité dans les pays en développement et jouent peut-être un rôle clé en favorisant la transmission hétérosexuelle du virus de l'immunodéficience humaine (VIH). De toutes les interventions de santé publique dans les pays en développement, le traitement des MST est l'une de celles dont le rapport coût/efficacité est le plus favorable. Pourtant, le problème des MST chez les femmes

^f See footnote a, p. 623.

^g Van Dyck E, Piot P, Meheus A. *Bench-level laboratory manual for sexually transmitted diseases*. Unpublished document WHO/VDT/89.443, 1989.

^h See footnote d, p. 626.

des populations rurales n'a guère retenu l'attention jusqu'ici. Dans cette étude, nous avons déterminé la prévalence des MST chez 964 consultantes des dispensaires prénatals d'une région rurale de la République-Unie de Tanzanie. Au total, 378 femmes (39%) avaient au moins une infection sexuellement transmissible, 97 (10%) avaient la syphilis et 81 (8%) une infection à *Neisseria gonorrhoeae* (NG) et/ou à *Chlamydia trachomatis* (CT).

Nous avons comparé plusieurs méthodes de dépistage des infections à NG. L'approche syndromique recommandée, fondée sur les déclarations des patientes qui se plaignent de symptômes génitaux, se caractérise par une faible sensibilité (43%) dans la population étudiée et ne permet pas de distinguer les femmes infectées de celles qui ne le sont pas. Nous avons mis au point une méthode d'évaluation des risques fondée sur des considérations sociodémographiques et d'autres facteurs associés aux infections à NG/CT. Cette méthode offre une plus grande sensibilité et un coût plus faible par cas réel traité, même si sa valeur prédictive positive ne dépasse pas 20% environ.

Il est urgent de mettre au point des stratégies innovantes de dépistage des MST ainsi que des épreuves de diagnostic sensibles et spécifiques, applicables de façon simple et économique dans les dispensaires ruraux des pays en développement.

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