

## Sexually transmitted pathogens in pregnant women in a rural South African community

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**SUMMARY** One hundred and ninety three consecutive pregnant women attending peripheral antenatal clinics attached to Ngwelezana Hospital, Empangeni, Kwa-Zulu, were examined for evidence of sexually transmitted pathogens. The following incidences were found: *Trichomonas vaginalis* 49.2% (95), *Candida* spp 38.3% (74), *Chlamydia trachomatis* 11.4% (22), *Gardnerella vaginalis* 6.2% (12), *Neisseria gonorrhoeae* 5.7% (11), positive syphilis serology results 11.9% (23), hepatitis B surface antigen 4.1% (eight). No woman had antibody to human immunodeficiency virus (HIV). Dyskaryotic smears were found in 20 (10.4%). Human papillomavirus (HPV) was detected cytologically in 11 (5.7%).

The range of sexually transmitted pathogens found in this rural community was similar to that found in urban groups studied in South Africa.

In rural areas where government resources and health budgets are limited, services for sexually transmitted diseases (STDs) are generally integrated into the primary health care system with problem cases being referred to outpatient departments of peripheral hospitals. Laboratory facilities are limited, and microbiological investigation of individual patients is therefore rarely possible. For correct management, particularly in cases where a clinical diagnosis is not obviously apparent, local studies may provide epidemiological and microbiological data regarding current disease patterns. Recent major changes in Africa include an increase in penicillinase producing *Neisseria gonorrhoeae* to 87% south of the Sahara and the emergence of tetracycline resistant *Haemophilus ducreyi*.<sup>1</sup>

Specialised centres have been suggested for providing expertise in clinical, laboratory, epidemiological, and social science skills related to control. Treatment protocols may be developed and updated for rural health care providers. Treatment schedules may, however, be resistant to change. In many rural areas STDs have been regarded as virtually one disease entity and uniformly treated with penicillin injections and tetracycline tablets. The widespread belief that

parenteral treatment is still the best is often reinforced by paramedical and nursing staff.

Antenatal attenders are well established as patients providing comparative STD data. Few rural studies have been performed in Africa and none in South Africa. In this study we investigated the carriage of sexually transmitted pathogens in antenatal attenders at three rural health centres in Kwa-Zulu, South Africa.

### Patients and methods

Kwa-Zulu, originally part of Natal (fig), is a self governing homeland of South Africa with a population of five million. The yearly per capita expenditure on health is US\$12.<sup>2</sup> Antenatal care is undertaken at peripheral clinics by qualified midwives, rarely with a doctor in attendance.

We investigated for sexually transmitted pathogens 193 consecutive attenders at three peripheral township clinics (Enselini, Esikhawini, and Ngwelezana), who had not received antibiotics in the previous two weeks. The clinics were situated within a 50 kilometre radius of Ngwelezana Hospital, Empangeni, the main referral hospital for northern Kwa-Zulu and the study was completed in one week during June 1987.

After each pregnant woman had given informed consent and had a initial interview with a midwife who completed a questionnaire, she underwent a general antenatal examination and then a vaginal examination using a sterile unlubricated Cusco's speculum. About

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0.1 ml vaginal secretion or discharge was aspirated, using a sterile polyethylene transfer pipette, and mixed in 1 ml sterile normal saline. A few drops of the mixture were used to prepare a wet mount, and about 0.5 ml was inoculated into a modified Diamond's medium<sup>3</sup> for the cultivation of *Trichomonas vaginalis*.

Cotton tipped swabs were used to collect secretions from the posterior fornix, which were inoculated at the bedside on Sabouraud's agar to cultivate yeasts, and on human blood agar to isolate *Gardnerella vaginalis*.<sup>4</sup>

Endocervical swabs were collected for inoculation on Modified New York City (MNYC) medium<sup>5</sup> for the isolation of *N gonorrhoeae* and to prepare slides for direct immunofluorescence according to the manufacturer's instruction (Microtrak, Syva) to detect *Chlamydia trachomatis*. An endocervical Papanicolaou smear was also prepared. Swabs were taken from the urethra and rectum and plated at the bedside on MNYC medium. About 10 ml venous blood was collected from each patient for serological testing for syphilis and infection with hepatitis B, and human immunodeficiency virus (HIV).

#### PROCESSING SPECIMENS

The wet mount preparation was examined by microscope at the bedside within 10 minutes of collection. MNYC medium agar, human blood agar, and modified Diamond's medium tubes were placed immediately into candle extinction jars. These and the

Sabouraud's agar plates were transferred to an incubator at the local hospital within 4–6 hours of collection and incubated overnight at 36°C after which they were transferred to the microbiology laboratory in Durban, 160 kilometres away, where further investigations were performed.

*N gonorrhoeae*, *Candida* spp and *G vaginalis* were identified by conventional laboratory methods. The modified Diamond's medium was examined daily for seven days for motile trichomonads.

#### SEROLOGY

Serum samples were tested for syphilis by the rapid plasma reagin (RPR) test (Macrovue RPR card test, BBL Microbiology Systems, Maryland, USA) and the *T pallidum* haemagglutination assay (TPHA) (Fujirebio, Tokyo, Japan), for hepatitis B surface antigen (HB<sub>s</sub>Ag) by a radioimmunoassay (Ausria kit, Abbott) and for antibody to human immunodeficiency virus (HIV) by a recombinant HIV I enzyme linked immunosorbent assay (ELISA) kit (Abbott Diagnostics, Weisbaden-Delkenheim, West Germany).

#### Results

All 193 participants were Zulus. Their average age was 25.6 (range 15–42) and most (133, 69%) were unmarried. Their average age at first pregnancy was 19.2 (range 15–41). Sixty nine were primigravid women, 41 were pregnant for the second time, 30 for the third, 20 for the fourth, and 33 for the fifth time or more.

On questioning, 102 women stated that they currently had a vaginal discharge and 17 that they had had an episode of genital ulceration in the past. On examination, however, only one had a clinically apparent genital ulcer, and no genital warts were detected.

#### SEXUAL BEHAVIOUR QUESTIONNAIRE

The average age at first sexual intercourse was 16.7 (range 13–28). Most (190) of the women had had one to five, and three had had six to 10, lifetime sexual partners. Only three had engaged in oral sex practices.

#### CONTRACEPTION

The most common form of contraception used had been the depot injection of progesterone (49 women), the oral contraceptive pill had been used by 27, four had used an intrauterine contraceptive device, and four stated that their partners had used condoms. Most (125, 65%) had never used any form of contraception.

#### MICROBIOLOGY

Table 1 shows the incidences of the various micro-

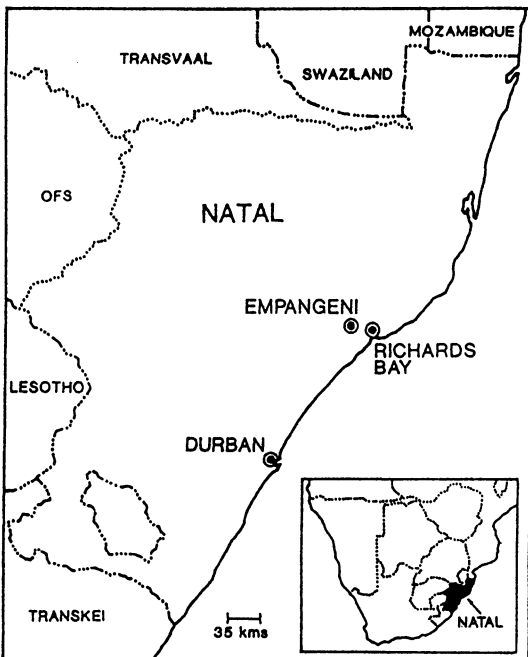


Figure Map of Natal and neighbouring areas.

Table 1 *Micro-organisms identified in genital specimens from 193 pregnant women*

Organisms	No	% Positive
<i>Trichomonas vaginalis</i>	95	(49.2)
<i>Candida</i> spp:	74	(38.3)
<i>C. albicans</i>	52	(26.9)
<i>C. glabrata</i>	14	(7.3)
Other <i>Candida</i> spp	8	(4.2)
<i>Saccharomyces cerevisiae</i>	11	(5.7)
<i>Gardnerella vaginalis</i>	12	(6.2)
<i>Neisseria gonorrhoeae</i>	11	(5.7)
<i>Chlamydia trachomatis</i>	22	(11.4)

organisms that were sought by lower genital tract sampling.

*T vaginalis* was detected in about half (95) of the women examined. In 71, the parasite was identified by its characteristic morphology and movement in wet smear preparations, and in 24 the organism was detected by culture only.

*Candida* spp were cultured from high vaginal swab specimens for 74 women. The most common was *C. albicans* (from 52), *C. glabrata* was isolated from 14, and other *Candida* species from eight. The remaining 11 yeast isolates were identified as *Saccharomyces cerevisiae*.

*G vaginalis* was cultured from high vaginal swab specimens from 12 women.

*N gonorrhoeae* was isolated from 11 women. The site of isolation was the cervix in nine women, the urethra in five, and the rectum in four. In two women the rectum was the sole site of isolation. Of the 11 women with *gonorrhoea*, three were infected with penicillinase producing (PPNG) strains.

*C trachomatis* was detected by direct immunofluorescence in 22 women.

Of the 102 women who complained of a vaginal discharge, 82 yielded at least one recognised vaginal pathogen, 39 yielded no pathogen, and 76 harboured more than one recognised vaginal pathogen.

## Discussion

Rural communities are generally more conservative than their urban counterparts, and in Kwa-Zulu this is probably due in part to the influence exerted by missionary teaching; in some areas mission hospitals still provide the only available medical expertise. Premarital sexual intercourse is strongly discouraged, particularly by heads of families who may realise higher bride prices (lobola) for virgin daughters. Among engaged couples, however, the practice of intracultural intercourse (ukosoma) is accepted. Marriage may take place when a traditional lobola of eleven head of cattle is paid to the bride's father.

Polygamy is practiced by older wealthier men who are able to afford further lobola payments.

The relatively low numbers of lifetime sexual partners in our patients (98.5% having had 1-5 sexual partners in their lifetime) and the high incidence of sexually transmitted pathogens isolated in this study suggest that male migrant workers returning from urban areas act as the main source contacts for STD in this community.

The incidence of 5.7% for gonorrhoea was lower than the finding of 10% in a previous local urban study.<sup>6</sup> Incidence of gonorrhoea in other rural African antenatal clinic studies range from 1% in the Gambia<sup>7</sup> to 40% in Uganda,<sup>8</sup> with 22% in Cameroon.<sup>9</sup> Urban incidence range from 3.9% in Ghana<sup>10</sup> to 17.8% in Zimbabwe,<sup>11</sup> and 11% elsewhere in South Africa.<sup>12</sup> The incidence of (27%, 3/11) PPNG strains recorded in this study was in keeping with figures of 16-25% for *N gonorrhoeae* isolates from STD patients in Durban (KD Coetzee *et al* infectious diseases and STD congress, Durban 1987).<sup>13</sup> First line treatment against PPNG strains has been recommended when levels reach 5%,<sup>14</sup> and our figures would justify changing the treatment for a rural environment at the same time as the urban area.

The importance of *C trachomatis* in Africa is now well established, with urban antenatal incidences of 6.9% in the Gambia,<sup>15</sup> 10.3% in Nigeria,<sup>16</sup> 29% in Kenya,<sup>17</sup> and 7-10% in South Africa (AA Hoosen *et al* and HG Fehler *et al* infectious diseases and STD congress, Durban 1987). In the Gambia chlamydial infection has been found in 3% of rural antenatal clinic patients.<sup>7</sup> *C trachomatis* was isolated in 73% of patients with pelvic inflammatory disease (PID) in Bloemfontein,<sup>18</sup> but gonorrhoea is more often implicated locally. *N gonorrhoeae* has been cultured in 57% of women with laparoscopically confirmed PID at Ngwelezana hospital<sup>19</sup> and 60% in Durban<sup>20</sup> when *C trachomatis* was shown in 30%, a level similar to that of a control group of family planning clinic attenders.

The incidence of *C. albicans* in this study was 27%, which is similar to the incidences recorded in antenatal clinic studies in Durban<sup>6</sup> and Harare.<sup>11</sup> The incidence of *G vaginalis* was 6.2%, lower than that of 36% found in a Durban antenatal clinic study (AA Hoosen *et al* infectious diseases and STD congress, Durban 1987) and 60% in non-pregnant rural women in Botswana,<sup>21</sup> for whom cultures were not performed.

The prevalence of syphilis in Africa remains high,<sup>22</sup> although changing trends have been recorded in some countries. A decrease has been found in Malawi,<sup>23</sup> but conversely a more recent increase was recorded in neighbouring Zambia.<sup>24</sup> Rural antenatal clinic study incidences of 1.6%-9.8% in Mozambique<sup>25</sup> and 12.5% in Zambia<sup>24</sup> were similar to our figure of 11.9% (table 2). Slightly higher levels of 15-20% have been

Table 2 Results of serological tests

	No	% Positive
Syphilis	23	(11.9)
Hepatitis B surface antigen (HBsAg)	8	(4.1)
Antibody to human immunodeficiency virus (HIV)	0	

recorded for antinatal clinic attenders in South Africa.<sup>12,26,27</sup> The absence of physical signs in our patients with positive syphilis serology results probably reflected the widespread use of benzathine penicillin by local primary health care workers as the first line treatment for any STD, including vaginal discharge. Endemic syphilis has been recognised in the Karoo, North Western Cape, and Orange Free State<sup>28</sup> areas of South Africa as recently as 1985.<sup>29</sup> Many of these cases were previously diagnosed as being yaws.<sup>30</sup> In Zambia congenital syphilis affected 8.6% of infants aged under three months who required hospital admission,<sup>24</sup> and in Durban 3.2/1000 perinatal deaths were due to syphilis.<sup>31</sup> In South Africa repeat syphilis serology testing is recommended, as infection may be acquired later in pregnancy.<sup>27</sup>

The 4.1% incidence of HB<sub>s</sub>Ag was consistent with the results from different tribal groups in South Africa, in whom horizontal transmission is implicated, and incidence range from 2.1% to 15.8%.<sup>32,33</sup>

Despite the increasing evidence of heterosexual transmission of HIV infection in local blood donors<sup>34</sup> and STD clinic attenders,<sup>35</sup> no patients with antibody to HIV were found. In sub-Saharan Africa lower incidences are found in rural areas,<sup>36</sup> an incidence of less than 1% was recorded in rural area 15 kilometres away from Nairobi,<sup>37</sup> where 52% of prostitutes had antibodies.<sup>38</sup>

The incidence of *T vaginalis* was 49.2%, one of the highest recorded in the world, similar to that in Durban, and higher than that found in the Gambia (23%),<sup>7</sup> Swaziland (23%),<sup>39</sup> and urban areas in Cameroon (21%),<sup>40</sup> Nigeria (21%),<sup>41</sup> and Zimbabwe (31%).<sup>42</sup> Vaginal trichomoniasis has not been associated with adverse perinatal outcome in Africa,<sup>43,44</sup> but low gestational age and birth weight have been found linked with it in the USA.<sup>45</sup>

Cytological evidence of human papillomavirus (HPV) infection was found in 11 (5.7%) women, five of whom had cervical dysplasia. In Zimbabwe genital warts have been found in 10.2% of antinatal clinic attenders,<sup>11</sup> and South Africa and South West Africa have the highest incidences of HPV and cervical intraepithelial neoplasia yet recorded.<sup>46</sup> Abnormal cytology results were found in 20 (10.4%) of our patients, but none had clinically detectable warts. Carcinoma of the cervix has long been recognised as a

problem in South Africa,<sup>47</sup> the incidence in Natal being the third highest in the world.<sup>48</sup>

These results show that the incidences of STDs in this rural community were similar to those in urban South African patients. Socioeconomic conditions dictate that men from rural areas seek work in the cities or are engaged in contracts further afield, but return regularly to their home districts and probably act as vectors of STD. The implications for disease control are that health education programmes in rural areas should include STD material, and antenatal clinic attenders should be a specific target group. Given the low health care budget afforded to this population, allocation of health care resources to the field of STDs has been minimal. The incidence of STDs found in this study are unacceptably high and warrant urgent action, particularly now that black heterosexuals in Natal are the group at highest risk of acquiring HIV infection in South Africa and STDs are accepted as playing a major part in the transmission of HIV.<sup>49</sup>

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