

Unrecognized sexually transmitted infections in rural South African women: a hidden epidemic

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Sexually transmitted infections (STIs) are of major public health concern in developing countries, not least because they facilitate transmission of human immunodeficiency virus (HIV). The present article presents estimates of the prevalence, on any given day, of STIs among women in rural South Africa and the proportion who are asymptomatic, symptomatic but not seeking care, and symptomatic and seeking care. The following data sources from Hlabisa district were used: clinical surveillance for STI syndromes treated in health facilities, microbiological studies among women attending antenatal and family planning clinics, and a community survey. Population census provided denominator data. Adequacy of drug treatment was determined through quality of care surveys.

Of 55 974 women aged 15–49 years, a total of 13 943 (24.9%) were infected on any given day with at least one of *Trichomonas vaginalis*, *Neisseria gonorrhoeae*, *Chlamydia trachomatis*, or *Treponema pallidum*. Of the women investigated, 6697 (48%) were asymptomatic, 6994 (50%) were symptomatic but not seeking care, 238 (1.7%) were symptomatic and would seek care, and 14 (0.3%) were seeking care on that day. Only 9 of the 14 women (65%) were adequately treated.

STIs remained untreated because either women were asymptomatic or the symptoms were not recognized and acted upon. Improved case management alone is therefore unlikely to have a major public health impact. Improving partner treatment and women's awareness of symptoms is essential, while the potential of mass STI treatment needs to be explored.

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Introduction

Not all people with a sexually transmitted infection (STI) are symptomatic; not all those who are symptomatic recognize the meaning or importance of their symptoms and seek care; and not all those who do seek care are adequately treated (1). The proportions that are asymptomatic, symptomatic but not seeking care, and symptomatic and seeking care, have important implications for disease control. If most patients are symptomatic and present for treatment, a priority is high-quality case management. If most are symptomatic, but symptom recognition and treatment-seeking behaviour is poor, health promotion becomes especially important. However, if the majority are asymptomatic, strategies such as screening and mass treatment may assume highest priority.

But where does the true burden of disease lie? It is well established that 60–70% of gonococcal and chlamydial infections in women are asymptomatic (2, 3), and recent data suggest that a similar proportion of men may have asymptomatic infections (4). A model proposed by Piot, and modified versions of it (5, 6), suggest that only a minor pro-

portion of STIs in developing countries are ever treated adequately because most cases never present for care. However, the proportion of cases that are asymptomatic, symptomatic but not seeking care, and symptomatic and seeking care has not been defined for an African population.

To design cost-effective STI control strategies, we used data from studies conducted in a rural South African health district to estimate the point prevalence of STIs among women, and the proportion who, on any given day, are asymptomatic, symptomatic but not seeking care, and symptomatic and seeking care. Clinic surveys were used to estimate further the proportion of infected women who were adequately treated.

Methods

Setting

Hlabisa health district is situated in northern KwaZulu/Natal, South Africa. The population served in 1996 was estimated at 205 463 based on the 1991 census data. Most residents are rural people living in widely scattered kraals, and are dependent on migrant labour, pension remittances, and subsistence farming for money and food. Migrant labour is a particularly strong feature of life; we estimate that in 60% of households the male head is absent most of the time (Medical Research Council, unpublished data, 1997).

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Patients with STIs are treated either in public sector primary care clinics staffed by nurses or by private sector general practitioners. Care is free in the public sector, but private practitioners charge a fee that averages R 25 (US\$ 5). The provincial health department recommends syndromic case management, and modern drugs such as quinolones are included in the treatment protocols. There are few data available on the epidemiology of STIs in rural South Africa (7), but the country is in the midst of a rapidly escalating human immunodeficiency virus (HIV) epidemic (8). Prevalence of HIV infection among women attending antenatal clinics in Hlabisa district increased from 4.2% in 1992 (8) to 22% in 1997 (Medical Research Council, unpublished data, 1997).

Data sources

In order to estimate the proportion of women with STIs who are asymptomatic, symptomatic but not seeking care, and symptomatic and seeking care on any given day, we applied data from four different studies conducted in Hlabisa to population estimates derived from the 1991 census. Definitions used are shown in Table 1.

STI syndrome surveillance. Passive surveillance for STI syndromes in all primary care settings in the district has been carried out since February 1996 (9), and in the first year 5069 female residents aged 15–49 years were treated for symptomatic STIs. This represents an average of 14 women each day (5069/365) and hence, with a mean symptom duration of 18 days (9), we estimate that on any one day there are 252 (14 x 18) women in the district with a symptomatic STI who will present at some time during that illness episode for treatment.

Symptoms and STIs in women attending antenatal clinics. A total of 327 women booking for antenatal care in four district primary care clinics were questioned about symptoms and examined for STIs using standard microbiology on vaginal and cervical specimens, and syphilis serology (Medical Research Council, unpublished data, 1996). Most women (271; 83%) reported abnormal symptoms (Table 2), and 170 (52%) were infected with at least one STI (*Trichomonas vaginalis*, *Neisseria gonorrhoeae*, *Chlamydia trachomatis*, or *Treponema pallidum*). As shown in other studies (10, 11) the association between elicited symptoms and laboratory-confirmed infection was weak.

Symptoms and STIs in women attending family planning clinics. A total of 189 women attending the Hlabisa family planning clinic were questioned and examined in the same way and for the same organisms as those attending the antenatal clinic (12). Fewer women (125; 39%) reported typical symptoms; 47 (25%) had at least one STI, and 60% of these women were asymptomatic. The association between elicited symptoms and infection was weak (12).

Community prevalence survey. A community survey (13), which included residents being ques-

tioned about symptoms, having their urine tested by ligase chain reaction for gonococcal and chlamydial infection, and being tested by serology for syphilis, was used to supplement the antenatal and family planning studies. Of 149 women examined, 23 (15%) had either active syphilis or gonococcal or chlamydial infection. Infection with *T. vaginalis* was not measured. No women reported symptoms.

Census and population data. The resident district female population aged 15–49 years for 1996 (55 974) was estimated from the 1991 census (Table 2). From antenatal clinic records and a community survey (14) we estimated that 9057 women become pregnant each year. Assuming an average number of 24.8 women (9057/365) becoming pregnant each day and an average pregnancy duration of 280 days, a total of 6948 women (12.4%) will be pregnant on any given day in Hlabisa.

Assumptions

The assumptions shown below were made.

- The Hlabisa district STI surveillance system was assumed to detect all symptomatic STIs presenting for care. The completeness of the surveillance system has not been validated; however, surveillance returns show internal consistency over time and between surveillance sites. While it is inevitable that some cases were not captured, it seems

Table 1. Definition of terms

Terms	Definition
Symptoms	Patient-reported abnormalities
Typical symptoms	Genital itch, vaginal discharge, genital ulcer, lower abdominal pain, dysuria, dyspareunia
Signs	Abnormal physical signs observed by a clinician
STI	Laboratory-confirmed infections with either <i>Trichomonas vaginalis</i> (by culture), <i>Neisseria gonorrhoeae</i> (by culture), <i>Chlamydia trachomatis</i> (by direct immunofluorescence), or <i>Treponema pallidum</i> (defined serologically as rapid plasma reagin (RPR) positivity plus <i>T. pallidum</i> haemagglutination (TPHA positivity))
STI syndrome	A combination of symptoms and signs typically associated with sexually transmitted microorganisms. Genital ulcer syndrome, which may be due to syphilis, chancroid, herpes etc; vaginal discharge syndrome, which may be due to infection with either <i>T. vaginalis</i> , <i>N. gonorrhoeae</i> , or <i>C. trachomatis</i> ; pelvic inflammatory disease, which may be due to the same organisms as those responsible for vaginal discharge syndrome
Symptomatic STI	STI syndrome in a woman with typical symptoms who presents to the health service for treatment
Symptomatic but untreated STI	Microbiologically confirmed STI in a woman with typical symptoms who does not present for treatment
Asymptomatic STI	Microbiologically confirmed STI in a woman without any symptoms

Table 2. Age-specific STI prevalence among pregnant and nonpregnant women resident in Hlabisa district, KwaZulu/Natal, South Africa^a

Age group (years)	Pregnant women			Nonpregnant women			
	No. of resident women	Age-specific STI prevalence (%) ^b	No. of pregnant women	No. with an STI	Age-specific STI prevalence (%) ^c	No. of nonpregnant women	No. with an STI
15–19	11 914	60.8	1 441	876	18.0	10 473	1 884
20–24	10 384	56.8	1 811	1 029	37.9	8 573	3 251
25–29	8 864	54.8	1 879	1 030	22.7	6 985	1 585
30–34	7 651	41.4	1 110	460	23.2	6 541	1 518
35–39	6 996	40.3	518	209	17.0	6 478	1 106
40–44	5 793	12.6	174	22	17.0	5 619	958
45–49	4 372	100	15	15	0	4 357	0
Total	55 974	—	6 948	3 641	—	49 026	10 302

^a STI refers to microbiologically confirmed infection with either *Neisseria gonorrhoeae*, *Chlamydia trachomatis*, *Trichomonas vaginalis*, or *Treponema pallidum*.

^b Data derived from cross-sectional survey of STI among women attending district antenatal clinics (Medical Research Council, unpublished data).

^c Data derived from cross-sectional survey of STI among women attending a district family planning clinic (ref. 12).

unlikely that the data are grossly inaccurate. Pregnancy status of these women was not recorded and for the purpose of this analysis, in line with the proportion of women in the district pregnant on any given day, 12.4% were assumed to be pregnant.

- The results from the antenatal study were assumed to be applicable to all pregnant women in the district. As the four clinics studied were selected to be representative of the 10 district clinics, and as 95% of pregnant women in this area receive antenatal care (14), this assumption is reasonable.
- The results from the family planning study were assumed to be applicable to all nonpregnant women in the district. We are particularly cautious about this assumption. The women studied were, by definition, sexually active. They also tended to be younger than the average for the district adult female population. It is therefore possible that STI prevalence in the nonpregnant population is overestimated. On the other hand, as women attending family planning clinics are frequently in contact with the health service and are presumably motivated about their reproductive health, STI prevalence among them might be lower than that among the wider population. It is also noteworthy that pregnant women (whose age distribution mirrors that of the population) had a much higher prevalence of STIs than did women attending the family planning clinic and that the prevalence in the community survey was similar to that measured among women attending the family planning clinic. Indeed when standardized for age (data not shown), the family planning STI prevalence was 21%, closer still to the prevalence in the community survey. It therefore seems reasonable to apply data derived from women attending the family planning clinic to all nonpregnant women in the district.

- It was assumed that the three groups of STI— asymptomatic, symptomatic but not seeking care, and symptomatic and seeking care—are distinct. The natural history of infection with STI pathogens is largely unknown. Although cross-sectional surveys show that STIs are frequently asymptomatic, it is not clear how many become symptomatic later, and at what rate. Symptoms, their recognition, and the action taken in response to them are also likely to vary over time. Thus we adopted the approach of estimating the number of infected women on any given day.

We therefore make the assumption that on any given day there are x women infected with at least one STI pathogen, of these, y are asymptomatic and z are symptomatic. Of the z symptomatic women, a do not recognize or react to their symptoms and hence do not seek care and remain untreated, while b do seek care; of the b that seek care, some will not be adequately treated.

Adequate treatment

To measure treatment adequacy we conducted health facility surveys and enquired about the drugs used to treat different STI syndromes (Medical Research Council, unpublished data, 1997). Treatment was defined as adequate if the drugs and dosages recommended by the provincial health department for each syndrome were used. Applying the findings from each facility to surveillance data, 65% of treated patients received the correct drug treatment.

Analysis

Table 2 shows the census-derived age distribution of women aged 15–49 years in the Hlabisa district. Age-specific STI prevalences from the antenatal clinic study were applied to the number of pregnant women in each age group to derive the number of

pregnant women with an STI. Similarly, age-specific STI prevalences from the family planning study were applied to the estimated number of non-pregnant women in each age group to derive the number of nonpregnant women with an STI on any given day.

Results

We estimate that on any given day 13 943 women aged 15–49 years in Hlabisa district were infected with at least one STI, a point prevalence of 24.9% of the resident female population in this age group. Of these women, 6697 (48%) were asymptomatic and 7246 (52%) symptomatic. Most symptomatic women (6994; 98%) did not seek care, while 252 (2%) were symptomatic and did seek care (Fig.1, Table 3). Only 14 of the 252 women sought care on that given day, while the rest sought it at another time during this illness episode. Furthermore, only 164 (65%) of the 252 symptomatic women who sought care were adequately treated.

Although the age-specific prevalence of infection was consistently higher among pregnant women than nonpregnant women (Table 2), most women with an STI (10 302; 74%) were not pregnant. Prevalences tended to be highest among younger women. Among pregnant women, 80% of those with an STI were aged 15–29 years, and among nonpregnant women 65% of those with an STI were in this age group.

Pregnant women were much less likely to have an asymptomatic STI than nonpregnant women (17% vs. 59%, Table 3). For individual organisms the proportions that were asymptomatic were similar among pregnant women (6–15%), reflecting the large proportion of pregnant women with symptoms. However, among nonpregnant women, both syphilis and infection with *T. vaginalis* (67% and 58%, respectively) were more likely to be asymptomatic than either infection with *N. gonorrhoeae* (37%) or *C. trachomatis* (36%).

Discussion

Our results indicate that there is a high prevalence of STI among women of reproductive age on any given day in this district, and that most STIs remained untreated. Virtually half the infected women were asymptomatic and their STI was undetected and untreated. While the remaining infected women were symptomatic, most remained untreated because

Fig. 1. Estimated numbers of women in Hlabisa health district with asymptomatic and symptomatic STI, and the number of symptomatic women who recognize their symptoms, present for treatment, and are adequately treated.

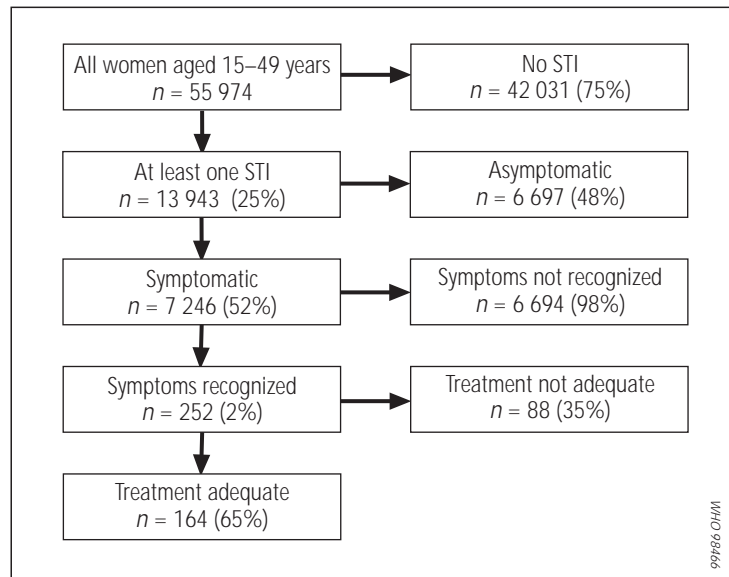


Table 3. Symptomatic and asymptomatic STIs among pregnant and nonpregnant women resident in Hlabisa district, KwaZulu/Natal, South Africa

STI ^a	Prevalence ^b (per 1000)	No. of infected women	No. asymptomatic	No. symptomatic
Pregnant women (n = 6 948)				
NG	78	542 (0.06) ^b	33	509
CT	129	896 (0.08)	72	824
Syphilis	84	584 (0.05)	29	555
TV	414	2 876 (0.15)	431	2 445
Any	520	3 641 (0.17)	619	3 022
Nonpregnant women (n = 49 026)				
NG	40	1 961 (0.37)	726	1 235
CT	80	3 922 (0.36)	1 412	2 510
Syphilis	80	3 922 (0.67)	2 627	1 295
TV	140	6 863 (0.58)	3 981	2 882
Any ^c	210	10 302 (0.59)	6 078	4 224
Total			6 697	7 246

^a NG = *Neisseria gonorrhoeae*, CT = *Chlamydia trachomatis*, TV = *Trichomonas vaginalis*.

^b Data derived from cross-sectional survey of STIs among women attending district antenatal clinics (Medical Research Council, unpublished data) and a district family planning clinic (ref. 12).

^c Age-standardized rates.

they did not seek care. Of those that did seek care, only 65% received adequate drug treatment. Thus, improved case management alone is unlikely to improve STI control significantly. Better partner notification and treatment strategies are essential. Improving women's recognition of and treatment-seeking behaviour for abnormal urogenital symptoms should increase the number treated, but a large

burden of asymptomatic infection will remain unless screening or mass treatment is considered.

The assumption that the three groups considered (symptomatic and seeking care, symptomatic but not seeking care, and asymptomatic) are distinct needs further consideration. Understanding of the natural history of STIs is not complete: for example, while many gonococcal and chlamydial infections were asymptomatic, it is not clear whether these infections were ever symptomatic or will become symptomatic or at what rate. Even if asymptomatic STIs do become symptomatic and patients present for treatment, the delay in doing so may be considerable, and this delay may allow continued transmission. It is not clear how infectious asymptomatic STIs are, and thus how relevant they are, compared with symptomatic cases. The prevalence of STIs may be even higher than we estimated, because we did not use the most sensitive microbiological tests that are available. We were unable to study men, but data from the United Republic of Tanzania suggest that asymptomatic infection is at least as frequent among men as women (4).

Whatever the temporal relationship between these groups, they are probably in equilibrium since the rates of infection that we observed are similar to those reported from neighbouring districts several years ago (15), and the prevalence of syphilis among antenatal women has not declined in recent years (Medical Research Council, unpublished data, 1990–96). Thus modelling the prevalence of STIs on any given day seems to be a reasonable way of gaining some insight into aspects of STI epidemiology.

What are the transmission dynamics that maintain this large reservoir of prevalent and untreated infection? We believe that there are three main factors.

First, case management is poor. Those women given inadequate drug treatment probably remain infectious and continue to spread disease. Furthermore, as our clinical surveillance indicates that only about 4% of patients treated for an STI are asymptomatic contacts (9), partner treatment strategies are clearly inadequate and this also perpetuates transmission.

Second, if most cases never present for treatment, transmission will continue unchecked. Few symptomatic women seem to realize that they are infected and hence they do not seek care. The correlation between infection and symptoms has been shown in many studies to be poor (9–12) and if symptoms are both common and nonspecific it is perhaps unreasonable to expect women consistently to suspect an STI. This is especially so in pregnancy when urogenital symptoms not due to infection are common. Conversely, some women may suspect an STI, but decide not to seek care because of perceived shame, cost, or unpleasant services. This issue needs further study. However, even at the risk of considerable overtreatment, improving women's recognition

of abnormal urogenital symptoms and encouraging presentation for syndromic management are potentially important for improving STI control.

The third reason for the continued high prevalence of STIs is the considerable circular migration by men between an urban workplace and a rural home (13). We have previously shown that the prevalence of HIV infection among male migrants in Hlabisa is considerably higher than that among residents (13). Female-controlled methods such as vaginal microbicides could be an important way of protecting the female partners of migrants and of interrupting STI transmission.

What are the immediate implications of our findings for STI control in African populations? Clearly, high quality case management is important for those patients who seek treatment. Other components of syndromic management (partner treatment, condom promotion, and counselling to prevent new infections) must be successfully implemented to reduce the prevalence of asymptomatic infection and the number of incident cases.

However, it is difficult to see how a substantial reduction in STI prevalence can be achieved in a reasonable time frame without some form of mass or presumptive treatment. Two options exist; presumptive treatment of the whole population of reproductive age, or the treatment of high-risk or accessible groups (16). As most STIs in our setting are found among nonpregnant women, mass treatment only of women attending antenatal clinics is unlikely to be sufficient. Surveys to define the proportion of women of reproductive age who have contact with the health service, and under what circumstances, would help further define the potential utility of presumptive treatment delivered in service settings.

There are few data on the cost-effectiveness of alternative STI control strategies and more research is needed. Mass treatment would be expensive; giving a single dose of azithromycin to all pregnant women in Hlabisa and their partners would cost R 800 000 (US\$ 200 000), equivalent to 80% of the total district pharmacy budget. However, it could be a highly cost-effective intervention as pregnancy outcome might also be improved (17), and both STI sequelae and STI and HIV transmission might be considerably reduced. Mass treatment might only be needed once, with the aim of substantially reducing STI prevalence before conventional measures are used to maintain any gain achieved (16). How sustained the effect of a single round of mass treatment would be depends on the effectiveness of supporting interventions, particularly those aimed at migrants.

If we are serious about controlling STIs there are three clear steps to follow (see Fig.1). The first is to improve the management of patients who seek care, to encourage them to seek care early, and to treat their partners. The second is to increase the

number of symptomatic people who seek care, including core groups; and the third is to develop a screening or mass treatment strategy that will reach asymptomatic people and those with symptoms who

do not seek care. Multiple strategies that operate beyond health facilities are required if a substantial and sustained reduction in community STI prevalence is to be achieved. ■

Résumé

Infections sexuellement transmissibles non détectées chez les Sud-Africaines vivant en milieu rural : une épidémie invisible

Les infections sexuellement transmissibles (IST) sont un grave problème de santé publique dans les pays en développement, notamment parce qu'elles facilitent la transmission du virus de l'immunodéficience humaine (VIH). Cet article donne des estimations de la prévalence des IST, quel que soit le jour, chez les femmes vivant dans les zones rurales d'Afrique du Sud et indique le pourcentage de sujets asymptomatiques, de sujets symptomatiques qui ne se font pas soigner et de sujets symptomatiques qui se font soigner. On a utilisé les sources suivantes dans le district de Hlabisa : surveillance clinique des syndromes d'IST soignés dans les établissements de santé, études microbiologiques chez les femmes qui consultent les services prénatals et de planification familiale, et enquête dans la communauté. Le recensement de la population a fourni les données servant de dénominateur. Des enquêtes sur la qualité des soins ont permis de déterminer si la pharmacothérapie était adaptée ou non.

Sur 55 974 femmes âgées de 15 à 49 ans, et quel que soit le jour, 13 943 au total (soit 24,9%) étaient infectées par au moins un des germes suivants : *Trichomonas vaginalis*, *Neisseria gonorrhoeae*, *Chlamydia trachomatis* et *Treponema pallidum*. Sur les femmes étudiées, 6697 (48%) n'avaient pas de symptômes, 6994 (50%) avaient des symptômes mais ne se faisaient pas soigner, 238 (1,7%) présentaient des symptômes et se feraient soigner, et 14 (0,3%) se faisaient soigner le jour même. Seules 9 de ces 14 femmes (65%) recevaient un traitement adéquat.

Les IST n'étaient pas soignées parce que les femmes n'avaient pas de symptômes ou parce que les symptômes n'étaient pas correctement identifiés et traités en conséquence. Il est donc peu probable qu'une meilleure prise en charge des cas ait à elle seule une incidence majeure sur le plan de la santé publique. Il est indispensable de mieux soigner les partenaires et d'apprendre aux femmes à reconnaître les symptômes, tout en étudiant la possibilité d'un traitement de masse contre les IST.

Resumen

Infecciones de transmisión sexual no reconocidas en las campesinas sudafricanas: una epidemia oculta

Las infecciones de transmisión sexual (ITS) son un importante problema de salud pública en los países en desarrollo, especialmente porque facilitan la transmisión del virus de la inmunodeficiencia humana (VIH). En el presente artículo se ofrecen estimaciones de la prevalencia de las ITS entre las campesinas sudafricanas en un día dado, y la proporción de las que son asintomáticas, sintomáticas que no solicitan asistencia, y sintomáticas que solicitan asistencia. Las fuentes de datos del distrito de Hlabisa que se utilizaron fueron las siguientes: la vigilancia clínica de los síndromes de ITS tratados en los establecimientos de salud, los estudios microbiológicos de las mujeres que acuden a los dispensarios de atención prenatal y de planificación familiar, y una encuesta comunitaria. El censo demográfico proporcionó los datos denominadores. La idoneidad del tratamiento medicamentoso se determinó mediante encuestas sobre la calidad de la atención.

De 55 974 mujeres de edades comprendidas entre 15 y 49 años, 13 943 (24,9%) estaban infectadas

en un día dado por al menos uno de los siguientes agentes: *Trichomonas vaginalis*, *Neisseria gonorrhoeae*, *Chlamydia trachomatis* o *Treponema pallidum*. De las mujeres investigadas, 6697 (48%) eran asintomáticas, 6994 (50%) eran sintomáticas pero no habían solicitado asistencia, 238 (1,7%) eran sintomáticas y buscarían asistencia, y 14 (0,3%) habían solicitado asistencia ese día. De estas 14 mujeres, sólo 9 (65%) eran tratadas adecuadamente.

La falta de tratamiento de las ITS se debía bien a que las mujeres eran asintomáticas o bien a que los síntomas no se reconocían y, en consecuencia, no se hacía nada al respecto. Por lo tanto, no es probable que un mejor manejo de casos tenga, por sí solo, grandes repercusiones en la salud pública. Es esencial mejorar el tratamiento de la pareja y aumentar los conocimientos de las mujeres acerca de los síntomas, estudiando al mismo tiempo la posibilidad de un tratamiento masivo de las ITS.

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