

# Reproductive Tract Infections Among Young Married Women in Tamil Nadu, India

**CONTEXT:** Women often suffer silently with reproductive tract infections (RTIs). Studies of the prevalence of these infections in South Asia have been hindered by low participation rates, and little is known about rates among the youngest married women.

**METHODS:** A community-based cross-sectional study of RTIs was conducted in 1996–1997 among married women 16–22 years of age in Tamil Nadu, India. The women were questioned about symptoms, received pelvic and speculum examinations and provided samples for laboratory tests. Qualitative and quantitative data on treatment-seeking behavior were collected.

**RESULTS:** Fifty-three percent of women reported gynecologic symptoms, 38% had laboratory findings of RTIs and 14% had clinically diagnosed pelvic inflammatory disease or cervicitis. According to laboratory diagnoses, 15% had sexually transmitted infections and 28% had endogenous infections. Multivariate analysis found that women who worked as agricultural laborers had an elevated likelihood of having a sexually transmitted infection (odds ratio, 2.4), as did those married five or more years (2.1). Two-thirds of symptomatic women had not sought any treatment; the reasons cited were absence of a female provider in the nearby health care center, lack of privacy, distance from home, cost and a perception that their symptoms were normal.

**CONCLUSIONS:** Young married women in this rural Indian community have a high prevalence of RTIs but seldom seek treatment. Education and outreach are needed to reduce the stigma, embarrassment and lack of knowledge related to RTIs. The low social status of women, especially young women, appears to be a significant influence on their low rates of treatment for these conditions.

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Many women and men suffer from reproductive tract infections (RTIs), including sexually transmitted infections (STIs). An estimated 340 million new cases of curable STIs occur each year, with 151 million of them in South and Southeast Asia.<sup>1</sup> STIs are among the top five disease categories for which adults in developing countries seek health care, and about one-third of STIs globally occur among people younger than 25 years of age.<sup>2</sup>

RTIs often cause discomfort and lost economic productivity.<sup>3</sup> The most serious long-term sequelae arise in women: pelvic inflammatory disease (PID), cervical cancer, infertility, spontaneous abortion and ectopic pregnancy, the latter of which may lead to maternal death.<sup>4</sup> The presence of an STI increases the risk of acquiring and transmitting HIV infection by three to five times,<sup>5</sup> and bacterial vaginosis may be a cofactor for HIV transmission, especially among younger women.<sup>6</sup> Treatment of these infections and prevention of their sequelae are complicated by the fact that 30–50% of women with infections (up to 70–75% in the case of chlamydia), and a smaller but significant proportion of men, are asymptomatic.<sup>7</sup>

Young women are particularly susceptible to STIs because they have fewer antibodies to fight pathogens and greater cervical ectopy.<sup>8</sup> Adolescent women infected with *Chlamy-*

*dia trachomatis* are more likely than their adult counterparts to develop cancer of the cervix or PID and, consequently, infertility.<sup>9</sup> Worldwide, the majority of new HIV infections occur among young people aged 15–24, and young women are about six times as likely to be infected with HIV as young men.<sup>10</sup>

Much of the available data on RTIs comes from hospital- and clinic-based studies. Yet community-based studies, which are less commonly conducted, yield better estimates of prevalence, and several have been undertaken among women in South Asia,<sup>11</sup> as well as those in Egypt and Nigeria.<sup>12</sup> The South Asian studies had a common bias: Asymptomatic women were much less likely to participate (or were excluded in one study), and therefore a true prevalence estimate was not possible.<sup>13</sup> Only the studies in Egypt and Nigeria had high participation rates and reported laboratory data; of these, only the Nigerian study focused on adolescents.

In India, married women are reluctant to seek medical treatment because of lack of privacy, lack of a female doctor at the health facility, the cost of treatment and their subordinate social status.<sup>14</sup> This reluctance is exacerbated when symptoms are embarrassing, as they are with RTIs,<sup>15</sup> especially among adolescents.<sup>16</sup> A “culture of silence” shrouds gynecologic morbidity throughout India and elsewhere.<sup>17</sup>

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**TABLE 1. Diagnostic criteria for laboratory-diagnosed RTIs, clinically diagnosed RTIs and other gynecologic conditions**

Diagnosis	Diagnostic criteria
<b>LABORATORY-DIAGNOSED RTIs</b>	
<b>STIs</b>	
Trichomoniasis	Positive culture of viable <i>Trichomonas vaginalis</i> or positive wet mount preparation test
Chlamydia	Positive antigen detection test (Chlamydiazyme test)†
Syphilis	
Current infection	Positive serology by rapid plasma reagin test
Past infection	Positive result on the <i>Treponema pallidum</i> particle agglutination test
Gonorrhoea	Isolation of <i>Neisseria gonorrhoeae</i> from cervical cultures or identification of gram-negative intracellular diplococci in Gram-stained cervical smear
<b>Endogenous infections</b>	
Bacterial vaginosis	Presence of at least three of the following: (a) watery vaginal discharge, (b) elevated pH (>6), (c) positive amine odor test, (d) presence of clue cells in Gram-stained vaginal smear
Vaginal candidiasis	Positive culture for <i>Candida</i> with the presence of clinical signs (red, inflamed tissue and curdy white discharge)
<b>CLINICALLY DIAGNOSED RTIs</b>	
Cervicitis	Cervical erosion with purulent discharge from the cervix
Pelvic inflammatory disease	Adnexal tenderness and/or the presence of tender adnexal mass on bimanual pelvic examination
<b>OTHER GYNECOLOGIC CONDITIONS</b>	
Urinary tract infection	Urine culture with a bacterial colony count >100,000/ml urine
Hepatitis B	Positive hepatitis B surface antigen test
Uterine prolapse (second degree)	Descent of the cervix to the introitus as viewed through speculum
Infertility	Inability to conceive after two years of sexual activity without contraception in a couple trying to conceive, based on history

†Ligase chain reaction (LCR) tests of a second cervical specimen (184 women) and of urine (116 women) were used for cross-checking only. Sources: **Trichomoniasis**—Heine P and McGregor J, *Trichomonas vaginalis*: a reemerging pathogen, *Clinical Obstetrics and Gynaecology*, 1993, 36(1):137–143. **Syphilis, current infection**—Tramont E, *Treponema pallidum*, in: Mandell GL, Gordon Douglas JR and Bennett JE, eds., *Principles and Practice of Infectious Diseases*, New York: Churchill Livingstone, 1995, pp. 2117–2132. **Gonorrhoea**—World Health Organization, *Neisseria gonorrhoeae and Gonococcal Infections*, WHO Technical Report Series, 1978, No. 616. **Bacterial vaginosis**—Amsel R et al., Nonspecific vaginitis: diagnostic criteria and microbial and epidemiologic associations, *American Journal of Medicine*, 1983, 74(1):14–22; and Nugent R, Krohn M and Hillier S, Reliability of diagnosing bacterial vaginosis is improved by a standardized method of Gram stain interpretation, *Journal of Clinical Microbiology*, 1991, 29(2):297–301. **Vaginal candidiasis**—Sobar J, Candidal vulvovaginitis, *Clinical Obstetrics and Gynaecology*, 1993, 31(1):153–165. **Urinary tract infection**—Pels R et al., Dipstick urinalysis screening of asymptomatic adults for urinary tract disorders, *Journal of the American Medical Association*, 1985, 262(9):1221–1224. **Uterine prolapse, second degree**—Jackson S and Smith P, Fortnightly review: diagnosing and managing genitourinary prolapse, *British Journal of Medicine*, 1997, 314(7084):875–880.

Furthermore, women, more so than men, tend to regard RTI symptoms as normal discomfort and therefore often do not seek treatment.<sup>18</sup>

**METHODS**

A community-based, cross-sectional design was used to investigate RTIs, other gynecologic conditions and treatment-seeking behavior among married women aged 16–22 in a rural community in southern India. Quantitative data were collected through a survey about symptoms, clinical examinations and laboratory tests. Qualitative data from interviews and focus groups were collected to supplement the quantitative findings.

**Study Setting**

The study was conducted in 1996–1997 in a rural area—Kaniyambadi Block of Vellore District in the state of Tamil Nadu. This administrative unit has a population of 102,000 in 64 villages. Along with the government health services, the Community Health Department of Christian Medical College provides the primary health care for the block through its Community Health and Development (CHAD) program. CHAD emphasizes maternal and child health services, such as antenatal care, immunization, growth monitoring of young children and nutrition education. Health services are provided at the primary care level by a community health volunteer in each village, a health aide for

every 4,500–5,000 people, a public health nurse for every five or six health aides, and a medical doctor for every 30,000 people. The doctors and nurses operate a mobile clinic offering preventive and curative services, which visits each village monthly. Patients who cannot be treated at the primary level are referred to the 80-bed CHAD Hospital, which provides outpatient care, an emergency ward, obstetrics and gynecology wards, neonatal and pediatric care, surgical facilities and laboratory services. If tertiary care is needed, patients are further referred to the Christian Medical College Hospital, where specialty care and advanced laboratory services are available. Because of the CHAD program, the quality of health care is likely higher within Kaniyambadi Block than within other blocks, and access to care is consistently available.

**Quantitative Methods**

• **Sample selection.** For this study, young married women were of particular interest because, at their stage of life and in a social context that emphasizes early childbearing, they likely experience pregnancy and birth outcomes that might be influenced by RTIs. Unmarried young women were also of great interest; however, a speculum examination was not deemed culturally appropriate for them, and so they were not included in the study. The age-group of 16–22 was chosen because most women experience their childbearing during these years.

We calculated a desired sample size of 500 based on the prevalence of trichomoniasis (16%) among married women aged 15–49 from an unpublished study conducted in similar villages in the same area.<sup>19</sup> To attain the present sample, in 1996–1997, five health aides were chosen who worked 8–20 kilometers in different directions from the CHAD hospital, and a total of 13 of their assigned villages were randomly selected. Each village had a population of about 1,000 people, 4–5% of whom were women 16–22 years old. Approximately the same number of women were recruited from the catchment areas of each of the health aides. According to CHAD census data, these villages had a collective population of 19,559, of whom 619 were married women aged 16–22.

Women were not eligible if they were pregnant, reported missed periods or had given birth in the previous six weeks, because of greater susceptibility to vaginal candidiasis at these times. A total of 491 eligible women were identified, and this sample size was deemed close enough to the desired one.

We sought and obtained permission from village elders to conduct the study in their locales, although study design issues were not discussed or decided with them. The CHAD health aide of each village then invited the identified women to participate and explained study details. Their consent was obtained before setting up a convenient date for a medical examination. On the day of examination, women were excluded if they were menstruating, because menstrual blood would interfere with the laboratory tests. Women with evidence of infection on examination, and their partners, were treated free of charge.

• **Data collection.** A female physician (the first author) administered a questionnaire to each participant on the following topics: menstrual and obstetric history (menstrual irregularities, pain during menstruation or sexual intercourse, number of births, place of delivery and training of birth attendants, outcome of pregnancy, spontaneous and induced abortions), perceived gynecologic symptoms (vaginal discharge; itching, sores or ulcers in the genital area; lower abdominal pain; burning or pain while urinating; perception of the cause of symptoms), health-seeking behavior (if treatment was sought, where; if not, why), sexual history (age at first sex, weekly frequency of sexual intercourse) and contraceptive practices (use of oral contraceptives, condoms, natural family planning and other methods). The same physician then conducted a speculum examination, followed by a bimanual pelvic examination to detect clinical signs of RTIs. Having the physician administer both the questionnaire and the examination carried the advantages of fostering rapport with the women, providing an opportunity for them to ask questions, putting them relatively at ease for the examination and allowing them to receive counseling from the physician. Privacy was strictly maintained during all procedures, and the collected data were kept confidential. Data were coded and analyzed by the statistician for the study.

For laboratory testing, the physician collected samples of urine and blood from each woman and swabs from the

vagina and endocervix after sufficient cleaning of the ectocervix. To avoid testing bias, laboratory staff conducted all diagnostic tests. The physician diagnosed STIs, endogenous infections, urinary tract infections and other gynecologic conditions according to predefined criteria (Table 1).

Wet mount preparations, Gram staining of smears and amine odor tests were done at the examination site. Vaginal swabs were placed in transport medium and inoculated in the laboratory onto Diamond's medium for *Trichomonas vaginalis* and onto Sabouraud's medium for *Candida* species. Vaginal pH was measured with a pH strip indicator (British Drug House, Poole, UK; range, 2–11). Cervical swabs for the culture of *Neisseria gonorrhoeae* were inoculated directly onto Thayer-Martin selective agar medium at the examination site.

Cervical swabs for antigen detection of *Chlamydia trachomatis* with the Chlamydiazyme test were also placed in transport medium. Because this test can give false-positive results, an additional cervical swab was taken from a subgroup of 184 women for a ligase chain reaction (LCR) test and inoculated onto transport medium supplied by the manufacturer (Abbott Laboratories, Abbott Park, IL, USA), and urine was tested by this method for detection of *Chlamydia* in the urethra for a subgroup of 116 women.<sup>20</sup> The LCR test results were used only to cross-check the Chlamydiazyme results. Not all women provided samples for the two LCR tests because decisions to use them were made after examinations had begun.

Specimens were transported to and tested at the Microbiology Department of Christian Medical College and Hospital at the appropriate temperature. All vaginal and cervical smear preparations were double-checked for quality control, and a 20% subsample of all tests was repeated by the University College London Hospitals. Concordance between the laboratories was 99%. Cervical swabs and urine samples for LCR detection of *Chlamydia* were transported to and tested at the latter hospital.

### Qualitative Methods

Two qualitative methods were used: key informant interviews and focus group discussions. For these parts of the study, health aides recruited women who were knowledgeable about their village and willing to speak freely. The women were from eight villages in the study area and from three villages outside it. The purpose of the study was explained to them, their permission was obtained and confidentiality was strictly maintained.

The key informants were 11 married and six unmarried women from a variety of occupations (e.g., health workers, housewives and teachers), who ranged in age from 15 to 45 years. The interviews were designed to explore the diversity of sexual behaviors in the community, determine the terminology used to describe it and capture informants' perceptions about the causes of gynecologic symptoms, reasons for premarital and extramarital sex, and practices of safe sex.

Eight focus group discussions were conducted in the villages, each lasting about two hours and including seven or

**TABLE 2. Percentage distribution of married women aged 16–22 and their husbands, by selected social, demographic and reproductive characteristics, Tamil Nadu, India, 1996–1997**

Characteristic	Women (N=451)	Husbands (N=451)
<b>MEAN (SD)</b>		
Age	20.7 (1.4)	28.2 (4.1)
Age at marriage	17.1 (1.7)	u
<b>% DISTRIBUTION</b>		
<b>Age</b>		
16–18	8	0
19–20	31	2
21–22	61	4
≥23	0	94
<b>Yrs. of education</b>		
0	18	11
1–5	21	13
6–10	57	64
>10	4	12
<b>Age at marriage</b>		
13–15	18	u
16–17	37	u
18–21	44	u
≥22	1	u
<b>Weekly frequency of sexual intercourse</b>		
0–3	38	u
≥4	62	u
<b>No. of pregnancies</b>		
0	23	na
1	34	na
2	32	na
3–4	11	na
<b>Current family planning method</b>		
None	69	u
Tubal ligation	17	u
Induced abortion	6	u
IUD	4	u
Oral contraceptives	2	u
Condoms	1	u
Abstinence	1	u
<b>Occupation</b>		
Housewife only	55	na
Agricultural laborer	32	36
Farmer	9	18
Armed forces	0	16
Salaried/small business	0	12
Transport worker	0	3
Other	4	15
<b>Total</b>	<b>100</b>	<b>100</b>

Notes: u=unavailable. na=not applicable.

eight participants. One session was held with each of two groups of unmarried women aged 16–25 years—one at a craft center where women worked and one in a village temple courtyard. Other sessions were held with married women—one with craft center workers aged 18–25, two with women aged 16–22, one with day-care center teachers aged 30–40, one with part-time community health workers aged 40–60 and one with grandmothers aged 45–70. The focus group discussions had the same objectives as the key informant interviews, but also aimed to collect information about health-seeking behavior related to RTIs.

Two female physicians (the first and sixth authors) con-

ducted both the interviews and discussions using a question guide. Topics included common gynecologic problems (terminology for symptoms, consequences of untreated infections), sexual behavior (age at first sex, safer-sex practices), premarital and extramarital relationships), and use of contraception and abortion. Interviews and discussions were taped; transcribed, translated into English and entered into the computer by assistants; and then coded and analyzed by a statistician. Sessions were held until no new data were being obtained.

At the end of each interview or discussion, participants were encouraged to ask questions. Anyone with a medical problem was referred to the CHAD hospital for treatment.

**Statistical Analysis**

We used chi-square analysis to assess the bivariate relationships between independent risk factors (including interaction terms) and laboratory-diagnosed STIs and endogenous infections. The statistically significant variables from the bivariate analysis were then entered into a backward elimination multivariate logistic regression using SPSS version 8.5. The logistic regression analysis was used to assess the determinants of STIs and endogenous infections in this population. The following variables were considered: age, years of education, years of marriage, occupation (housewife vs. agricultural laborer or other), number of pregnancies, frequency of sex, tubal ligation, menstrual hygiene (use of cloth vs. sterile napkin), husband’s occupation (army staff or transport worker vs. other) and husband’s education level. Sensitivity and specificity of the laboratory diagnosis compared with the clinical diagnosis and reported symptoms will be described separately.

**RESULTS**

Among the 491 women eligible for the quantitative study, 451 (92%) participated. Those who did not participate either declined the examination (5%), were unavailable (2%) or were menstruating (1%). These women did not differ from participants in education level, occupation or marital status.

**Social and Demographic Characteristics**

On average, the women were 20.7 years old, and their husbands were 28.2 years old (Table 2). Two women were widowed and one was separated from her husband. The majority had more than five years of education, but 18% did not have any. Fifty-five percent reported that their sole occupation was performing household chores and taking care of young children. In addition to running a household, 32% worked as agricultural laborers for others, and 9% farmed their own land. Another 4% had other occupations. Among the husbands, 54% either farmed their own land or worked as agricultural laborers, 16% were in the armed forces, and 12% were salaried workers or engaged in small business. The remaining 18% reported various other occupations.

Women’s mean age at menarche was 14.2 years (not shown) and mean age at marriage was 17.1 years. The ma-

**TABLE 3. Numbers and percentages of women with laboratory-diagnosed RTIs, clinically diagnosed RTIs and other gynecologic conditions, by presence of symptoms**

Diagnost†	Total (N=451)		Symptomatic women* (N=240)		Asymptomatic women (N=211)	
	No.	%	No.	%	No.	%
<b>LABORATORY-DIAGNOSED RTIs</b>						
<b>STIs</b>						
Trichomoniasis	58	13	40	17	18	9
Chlamydia‡	8	2	6	3	2	1
Syphilis						
Current	1	0.2	1	0.4	0	0
Past	7	1.5	7	2.9	0	0
Gonorrhea	0	0	0	0	0	0
<b>Endogenous infections</b>						
Bacterial vaginosis	82	18	60	25	22	10
Vaginal candidiasis	45	10	24	10	21	10
<b>Total§</b>	<b>171</b>	<b>38</b>	<b>108</b>	<b>45</b>	<b>63</b>	<b>30</b>
<b>CLINICALLY DIAGNOSED RTIs</b>						
Cervicitis	38	8	21	9	17	8
PID	28	6	17	7	11	5
<b>OTHER GYNECOLOGIC CONDITIONS</b>						
Urinary tract infection	31	7	20	8	11	5
Hepatitis B	8	2	1	0.4	7	3
Uterine prolapse	3	0.7	2	0.8	1	0.5
Infertility	40	9	24	10	16	7

\*The proportion of symptomatic women was significantly greater ( $p < .05$ ) than the proportion asymptomatic for all infections and conditions except vaginal candidiasis and hepatitis B. †Diagnoses are based on criteria listed in Table 1. ‡By Chlamydiazyme test. §Numbers and percentages may not add up to the total values because 108 women had 131 current RTIs.

majority had been pregnant once or twice, but 23% had never been pregnant. Twenty-seven percent of births occurred at home, all conducted by a trained birth attendant (not shown). Reversible methods of family planning were not frequently used among this young population: Intrauterine devices were used by only 4% of women, oral contraceptives by 2%, and condoms and abstinence by 1% each. However, 17% had had a tubal ligation. Six percent reported having had an induced abortion, in all cases to space births.

### RTIs and Other Gynecologic Conditions

Fifty-three percent of women reported having gynecologic symptoms. On the basis of both clinical and laboratory findings, an even higher proportion (59%) had one or more gynecologic conditions—a laboratory-diagnosed RTI, a clinically diagnosed RTI, and/or a condition such as uterine prolapse or urinary tract infection.

• **Laboratory-diagnosed RTIs.** Overall, 38% of the women had laboratory-diagnosed RTIs (Table 3). Fifteen percent had STIs: Thirteen percent had trichomoniasis, 2% chlamydial infections and 0.2% syphilis. Many more women had endogenous RTIs: Bacterial vaginosis was diagnosed in 18% and vaginal candidiasis in 10%. Gonococci were not identified in cultures or in Gram-stained smears.

The sample size was not large enough to give a valid estimate for chlamydial infection. (Calculations indicated that a sample of 3,000 women would have been required to give

a valid estimate of a prevalence of 3%.) Furthermore, the Chlamydiazyme test found that 2% of women were infected, whereas the cervical and urinary LCR tests together (used with much smaller samples for cross-checking only) indicated 3%. Of the eight women with positive Chlamydiazyme results, two were asymptomatic and six had a white discharge on clinical examination.

Nineteen women reported a history of genital ulcers suggestive of syphilis (not shown). However, laboratory tests revealed that only one woman was currently infected with syphilis, while seven others had evidence of earlier infections. The ulcer had healed spontaneously in five women, while 14 had obtained treatment. These 19 women were more likely than others to experience other gynecologic morbidity, as is common with women who have, or have had, genital ulcers: Fifteen of the 19 had laboratory evidence of a current RTI and three had primary infertility (79% and 16%, respectively), compared with 156 and 37 women with these conditions among those who had not had ulcers (36% and 9%, respectively).

• **Clinically diagnosed RTIs.** Fourteen percent of women had clinically diagnosed RTIs: Eight percent had cervicitis and 6% had PID (Table 3). However, pathogens were detected by laboratory tests in only nine of the 38 women with clinical signs of cervicitis and in only eight of the 28 women with signs of PID (not shown). This was not surprising, because cervicitis can have a nonspecific cause, and both cervicitis and PID can be caused by pathogens other than those assessed (e.g., gram-negative bacteria). None of the women had genital warts, molluscum or clinical signs of herpes.

• **Other gynecologic conditions.** Seven percent of women had laboratory diagnoses of urinary tract infection, 0.7% exhibited clinical evidence of uterine prolapse (all second degree, in which the cervix is visible outside the vaginal introitus, but the uterine fundus remains inside) and 2% had hepatitis B; 9% of all married couples experienced primary infertility (Table 3). Of the 40 infertile couples, 40% of the wives had a laboratory-diagnosed RTI.

Of the 31 women with urinary tract infections, 58% also had laboratory-diagnosed RTIs (not shown). Eighty-five women reported burning pain when urinating and were considered symptomatic, but only 11 of them (13%) had bacterial growth indicative of an infection. Conversely, 20 women had an infection but did not report burning on urination.

### Symptoms and Infections

Among the 240 women who initially reported symptoms, 45% had RTIs according to the laboratory findings (Table 3). Some had multiple infections, as 131 infections occurred in 108 women. In addition, 16% of these 240 women had cervicitis or PID and reported associated symptoms.

By comparison, 30% of the 211 women who did not report any symptoms at that time had laboratory-diagnosed RTIs, and none of these women had multiple infections. A further 13% had cervicitis or PID that was diagnosed clinically. On further questioning after their exams, 50 of these 211 women reported that they actually did have symptoms,

**TABLE 4. Percentage of women with laboratory-diagnosed STIs, by selected characteristics**

Characteristic	N	%
<b>Yrs. of education</b>		
0 (ref)	81	25
1-5	93	16
>5	277	11**
<b>Yrs. of marriage</b>		
0 (ref)	35	14
1-4	278	12
≥5	138	20*
<b>Weekly frequency of sexual intercourse</b>		
0 (ref)	38	21
1-3	204	15
≥4	168	13
<b>No. of pregnancies</b>		
0 (ref)	106	18
1-2	297	14
≥3	48	15*
<b>Current family planning method</b>		
None (ref)	337	13
Tubal ligation	77	23*
IUD	18	17
Other	19	5
<b>Occupation</b>		
Housewife (ref)	248	10
Agricultural laborer/farmer	187	20***
Other	16	25
<b>Husband's occupation</b>		
Salaried or small business (ref)	53	8
Agricultural laborer	164	17
Farmer	82	16
Armed forces	70	7
Other	68	18
Transport worker	14	29*

\*p≤.05. \*\*p≤.01. \*\*\*p≤.001. Note: ref=reference group.

and 46 were found to have an RTI (not shown). Of the women who reported symptoms only on second questioning, 46% said they did not report them initially because they thought the symptoms might be a normal occurrence and 54% said they were reluctant to talk about the problem. The rate of asymptomatic RTI prevalence after the second questioning of symptoms was 11%, much lower than the initial 30%. The number of asymptomatic women likewise fell to 161, and the number with laboratory-diagnosed RTIs dropped to 17.

**Determinants of Infections**

Bivariate analysis found that several characteristics of young women were associated with laboratory-diagnosed STIs: Women with more than five years of education were less likely to have an STI than those with no education, whereas those married for five or more years, those having had a tubal ligation and those working as an agricultural laborer were more likely to have an STI (Table 4). The same bivariate analysis was conducted for associations with laboratory-diagnosed endogenous infections, but only number of pregnancies was statistically significant (p=.006 for three or more pregnancies and p=.04 for one or two pregnancies).

Multivariate logistic regression analysis showed that

young women who had been married for five years or more or who were employed outside the home (most commonly as agricultural laborers) had significantly elevated odds of having an STI, compared with their counterparts without these characteristics (odds ratios of 2.1 and 2.4, respectively; Table 5). The odds of having an STI were almost twice as high among women who had had a tubal ligation as among those who had not, but the finding was only marginally significant. Young women with more than five years of education had reduced odds of having an STI compared with women with less education (0.6); this finding too was of borderline significance. None of the factors studied in the multivariate analysis was significantly associated with having an endogenous infection.

**Treatment-Seeking Behavior**

Among symptomatic women, 65% had not sought any treatment for their gynecologic problems (not shown). Of these women, 58% reported that they felt the symptom was not alarming and so there was no need for treatment. Other less common reasons were absence of a female provider in the nearby health care center, lack of privacy and distance from home. Of the 35% who had sought treatment, 21% of them had opted for home remedies or traditional medicine, 57% had approached unqualified private practitioners and 13% had gone to CHAD Hospital. Only 9% had sought medical care at the government primary health centers.

**Qualitative Findings**

The key informant interviews and focus group discussions shed light both on the association of occupation with STIs and on women's treatment-seeking behavior. Data from these interviews and discussions suggested that sex commonly occurs in the agricultural fields, especially when the crops have grown high and provide privacy.

“Men and women who go to the field for work have sex...behind the bushes or the building sites or even in sugarcane or maize fields.”—*Middle-aged female agricultural laborer, focus group discussion*

Some comments suggested that this sex is consensual:

“In fact, if a woman tells a man that she is coming with him to the same field, it is an indirect sign for sex. Likewise if men also call women to come with them to the same field, again it happens. The girl says she is going to pass urine, the man says he is going to smoke and they have sex somewhere in the bush.”—*Middle-aged female agricultural laborer, focus group discussion*

However, an older key informant indicated that there may be a coercive element to the sexual activity:

“During harvest season, the landowners may have sex with the laborers. I know about a landowner in my village. His wife is a TB patient. He used to have sex with the servant women and with the laborers. They get money and paddy in return.”—*Middle-aged female agricultural laborer, informant interview*

A fuller understanding of treatment-seeking behavior was gleaned from the focus group discussions. Young

women with gynecologic problems, of which white vaginal discharge and problems related to menstruation were the most common, reported various behaviors. Their first reaction to the appearance of a symptom was to ignore it. A commonly reported reason was that the symptom did not cause a problem initially, only later when it became excessive. Many women did not think the symptoms were important enough to seek treatment, and others cited lack of money as a deterrent.

When they did seek treatment, the first level of contact for treatment of vaginal discharge was the traditional practitioner who uses plants:

“Some women eat the stem and leaves of ‘keezhanelli’ [*Phyllanthus nirui*] for vaginal discharge. Some others take the stem and leaves of ‘aana nerunchi mullu’ [*Tribulus terrestris*], put it in the rice kanji and drink it for 5–6 days. There is one man...who treats women with herbs for vaginal discharge.”—Middle-aged female agricultural laborer, focus group discussion

If the problem was not overcome through a visit to the traditional practitioner, the next level of contact was the local practitioner, who may be a physician or an unqualified person within or near the villages. Among many practices, the unqualified local practitioners conduct deliveries, perform induced abortions and give injections. Conditions such as irregular periods or back or stomach pain are treated with multiple injections and tablets. Women went to the hospital to be seen by a doctor if their gynecologic symptoms persisted after visits to the traditional and local practitioners.

## DISCUSSION

This study overcame a key challenge to gaining a true community-based prevalence estimate of RTIs: low response rate. Ninety-two percent of women in Kaniyambadi Block who were eligible participated in the study, a rate higher than those of seven studies in India and one in Bangladesh,<sup>21</sup> and comparable to those in a study in Egypt (91%) and another in Nigeria (94%).<sup>22</sup>

**TABLE 5. Adjusted odds ratios (and 95% confidence intervals) from multivariate logistic regression analysis assessing women's risk of STIs, by selected characteristics**

Characteristic	Odds ratio
<b>Yrs. of education</b>	
≤5 (ref)	1.00
>5	0.60 (0.05–1.16)†
<b>Yrs. of marriage</b>	
<5 (ref)	1.00
≥5	2.08 (1.51–2.64)**
<b>Tubal ligation</b>	
No (ref)	1.00
Yes	1.97 (0.98–1.25)†
<b>Occupation</b>	
Housewife (ref)	1.00
Agricultural laborer/other	2.41 (1.82–2.99)**

\*\*p≤.01. †p≤.10. Note: ref=reference group.

**TABLE 6. Comparison of study populations and percentages of women with laboratory-diagnosed RTIs across five community-based studies**

Characteristic	Tamil Nadu, India	Egypt	Nigeria†	Bangladesh	Maharashtra, India
Age-group	16–22	14–60	≤19	15–50	13–40
Marital status	Married	Married	Not married	Married	Not reported
Sample size	451	509	410	804	650
Participation rate (%)	92	91	94	66	59
<b>Laboratory-diagnosed infection rate (%)</b>					
Trichomoniasis	12.9	18.3	9.2	0.8	14.0
Chlamydia	1.8	8.6	7.4	0.5	u
Syphilis	0.2	0.8	2.6	0.7	10.5
Gonorrhea	0	0	1.7	0.5	0.3
Bacterial vaginosis	18.2	21.9	u	5.9	62.2
Vaginal candidiasis	10.0	11.0	61.5	6.7	34.0

†All women in this study were sexually active. Note: u=unavailable. Sources: **Tamil Nadu, India**—present study. **Egypt**—Younis N et al., 1993 (reference 12). **Nigeria**—Brabin L et al., 1995 (reference 12). **Bangladesh**—Hawkes S et al., 2002 (reference 11). **Maharashtra, India**—Bang R et al., 1989 (reference 11).

## Prevalence of RTIs

The proportions of women experiencing RTIs and other gynecologic morbidity are high given the young average age in our sample. Furthermore, the proportions with STIs are surprisingly high, given the conservative attitudes about extramarital relationships in India. Most of the women were likely infected only within marriage, because most women, particularly in rural India, are not sexually active prior to marriage.<sup>23</sup>

The apparent prevalence of asymptomatic RTIs (30%) was in the expected range.<sup>24</sup> However, when asymptomatic women were questioned a second time (after the examination, but before being told their diagnosis), more reported having symptoms, reducing the proportion with asymptomatic infections to 11%. Many women thought their symptoms were normal occurrences or were reluctant to mention them. However, nearly all of those who reported symptoms on second questioning had an RTI. This pattern is consistent with the underreporting of symptoms that has been described previously in India,<sup>25</sup> but also suggests that when women are shown—by being examined and questioned—that such symptoms are abnormal, they are willing to report them. Such underreporting and its consequences for reproductive health warrant further investigation.

Rates of laboratory-diagnosed RTIs in this study were generally lower than those found in the Egyptian and Nigerian studies, which were also community-based and had comparable participation (Table 6). The higher rates in the other studies may be attributed to a wider age range of participants in the Egyptian study, and the fact that adolescent women had been sexually active for longer in the Nigerian study.

Most community-based RTI studies in South Asia have had considerably lower response rates or did not report laboratory data,<sup>26</sup> making comparisons tenuous. Nonetheless, the findings of two studies—one in rural Bangladesh and one in rural Maharashtra, India—that had among the highest response rates (66% and 59%, respectively) show sharp contrasts with the present study: RTI rates were much lower in the Bangladesh study and much higher in the Ma-

harashtra study (Table 6).<sup>27</sup> These variations may be caused by differences in sexual norms and practices, which may affect exposure to RTIs, as well as by differences in willingness to report symptoms or be examined. Women in rural Bangladesh may be more secluded and live in a more conservative sexual milieu;<sup>28</sup> by contrast, social values in tribal areas such as that in the Maharashtra study commonly allow women more sexual freedom.<sup>29</sup>

The rate of infertility was relatively high in this study. Nine percent of young couples were classified as infertile on the basis of their history, and all of these were cases of primary infertility. This is a significant problem that is especially felt by women (although the cause could be infertility in either partner) because of the strong cultural pressure on them to produce children early in marriage. A World Health Organization report found a 4% primary infertility rate in rural India.<sup>30</sup> We determined that 40% of women in infertile couples had RTIs, suggesting that more attention to prevention and treatment of these infections could reduce the rate of infertility.

#### Determinants of STIs

This study found elevated odds of having STIs among women married five years or longer, probably an indication of more extramarital sexual relationships among these husbands and wives than among their counterparts married for fewer years. Extramarital relationships were reported in informant interviews and focus group discussions, and having multiple sexual partners is associated with greater risk of STIs.<sup>31</sup> Couples married longer would also have more exposure time to the risk of contracting STIs. The risk of STIs was marginally elevated among women who had had a tubal ligation, a group the qualitative data suggested were more likely to have extramarital relationships. Finally, women with a higher level of education had lower odds of having an STI, although the finding was only marginally significant; this is consistent with the known health benefits of education.<sup>32</sup>

Occupation was a significant factor in STI risk. Women who were agricultural laborers had elevated odds of STIs compared with those who worked solely in the home. The focus group and key informant data suggested that sexual activity is common among workers in agricultural fields. What was not clear is the degree to which this sexual activity was nonconsensual or coercive. An older key informant reported that landowners have sex with female workers in exchange for money or bags of rice, which indicates coercion. Women may fear that they will lose their jobs if they do not comply. Other qualitative data, however, suggest that women and men engage in consensual sex in the fields. Further investigation is needed of the increased risk of STIs among female agricultural laborers, as well as of the prevalence of nonconsensual sexual activity.

#### Treatment-Seeking Behavior

Only one-third of the women in this study who reported symptoms sought any treatment, a proportion lower than that reported at the national level.<sup>33</sup> This suggests that vil-

lage women retain their infections for long durations, which could mean they suffer more sequelae, and their partners are at greater risk of infection. The reasons given for not seeking care were similar to those reported in other studies in India: stigma and embarrassment, lack of privacy, lack of female doctors at health facilities and treatment cost.<sup>34</sup> Both in this study and nationally, only a small minority of women who sought care did so at the government health facilities, with the majority preferring private health care despite the cost.<sup>35</sup>

Seventeen percent of young women had obtained a tubal ligation. This proportion is not surprising in the Indian context, as small family size has become the norm in much of India, including Tamil Nadu, where women usually have just two or three children. When their family size is complete, many women in India undergo sterilization. Nonetheless, the rate of sterilization among women in this study was high compared with that in populations outside South Asia, and the use of temporary family planning methods was very low. This is partly because childbearing occurs at relatively young ages. Women's marriages are arranged for them while they are adolescents; in this study, 55% were married by the age of 18. They are also under pressure to produce children as soon as possible after marriage; 77% of the 16–22-year-olds in this study had been pregnant at least once. And unlike women in other parts of the world, Indian women are not expected to remarry if widowed or divorced, and so are not expected to produce more children in these circumstances. Therefore, it is not surprising that, by the age of 22, nearly one-fifth of young women have completed their childbearing and been sterilized.

This study has several limitations. Detailed sexual histories and partner symptoms were not obtained, and the availability of these data may have revealed other associations with RTIs. In addition, the sample size was not large enough to determine an accurate prevalence of chlamydial infection.

#### Conclusion and Recommendations

The study indicates a surprisingly high prevalence of gynecologic morbidity among married women 16–22 years old, including a high prevalence of RTIs, urinary tract infections and uterine prolapse, and of primary infertility among married couples. Women tend to consider many symptoms as normal, do not seek treatment until discomfort is quite high and so apparently remain infected for a long time. This is particularly true for young married women, who usually experience low social status in their husband's household and their community.

Rural Indian men and women—but especially young women—need accurate health education about gynecologic and reproductive morbidity to reduce the stigma and embarrassment of RTIs. Health services should be improved and made more accessible so that women feel comfortable in seeking treatment and are not deterred by concerns over privacy and confidentiality.

The CHAD program offers reproductive health educa-

tion to secondary school students, to out-of-school youth aged 14–20 and to young married couples. In response to the findings of this study, it incorporated information on RTIs and the use of condoms to prevent STIs, and now offers expanded health care services in community clinics that are more accessible to village women. Health personnel at CHAD Hospital and associated clinics now routinely ask married women if they are experiencing RTI symptoms, a practice that has promoted both education and treatment. Similar education and health care efforts implemented on a wider scale could dramatically improve the health of young women in rural areas across India and in other countries.

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## RESUMEN

**Contexto:** Con frecuencia las mujeres sufren en silencio las infecciones del aparato reproductor. Se han visto obstaculizados los estudios sobre la prevalencia de estas infecciones en el Sudeste Asiático debido a las bajas tasas de participación en tales estudios y, además, se conoce muy poco sobre las tasas entre las mujeres casadas más jóvenes.

**Métodos:** En 1996–1997, se llevó a cabo un estudio transversal basado en la comunidad sobre las infecciones del aparato reproductor entre mujeres casadas de 16–22 años de edad en Tamil Nadu, India. Se les preguntó a las entrevistadas acerca de los síntomas; se les sometió a los exámenes pélvicos y de espéculo; y se recopilaban muestras para los análisis de laboratorio. Se recopilaban datos cualitativos y cuantitativos sobre las mujeres que procuraban tratamiento para sus infecciones.

**Resultados:** El 53% de las mujeres indicaron que tenían síntomas ginecológicos, el 38% tuvieron resultados positivos de una infección en los exámenes de laboratorio, y el 14% tuvieron signos clínicos de esas infecciones. De acuerdo con los diagnósticos de laboratorio, el 15% de las mujeres tenían una infección transmitida sexualmente (ITS) y el 28%, una infección endógena. Los análisis multivariados indicaron que las mujeres que eran trabajadoras agrícolas tenían una mayor probabilidad de tener una ITS (razón de momios de 2,4), igual como las que estaban casadas hace cinco o más años (2,1). Los dos tercios de las mujeres que tuvieron síntomas ginecológicos no habían procurado un tratamiento; las razones para ello mencionadas con mayor frecuencia fueron la falta de una proveedora de este servicio en la clínica de atención de la salud más cercana, la falta de privacidad, la distancia de su casa hasta el centro de atención, el costo y la percepción de que estos síntomas eran una cuestión normal.

**Conclusiones:** Las jóvenes casadas en esta comunidad rural de la India presentaron una elevada prevalencia de las infecciones del aparato reproductor pero pocas veces procuraron un tratamiento. Es necesario realizar actividades de educación y de alcance para reducir el estigma, la vergüenza y la falta de conocimientos acerca de dichas infecciones. La baja condición

social de la mujer, especialmente entre las jóvenes, parece influir significativamente en las bajas tasas de tratamiento de estos problemas.

## RÉSUMÉ

**Contexte:** Les femmes souffrent souvent en silence d'infections de l'appareil génital (IAG). Les études de prévalence de ces infections en Asie du Sud ont été entravées par les faibles taux de participation. Les taux relatifs aux très jeunes femmes mariées sont du reste fort peu documentés.

**Méthodes:** Une étude transversale communautaire des IAG a été menée en 1996–1997 parmi les femmes mariées de 16 à 22 ans de Tamil Nadu, en Inde. Les femmes ont été interrogées sur leurs symptômes; elles ont subi un examen pelvien et au spéculum, avec prélèvements soumis à l'analyse. Les données qualitatives et quantitatives de comportement de recherche de traitement ont été recueillies.

**Résultats:** Cinquante trois pour cent des femmes ont déclaré des symptômes gynécologiques; pour 38%, les analyses ont révélé la présence d'IAG et 14% ont reçu un diagnostic clinique d'infection génitale. Selon les diagnostics de laboratoire, 15% étaient atteintes d'infections sexuellement transmissibles et 28%, d'infections endogènes. L'analyse multivariée a découvert que les travailleuses agricoles présentaient une probabilité élevée d'infection sexuellement transmissible (rapport de probabilités, 2,4), de même que les femmes mariées depuis au moins cinq ans (2,1). Deux tiers des femmes symptomatiques n'avaient recherché aucun traitement, invoquant des raisons d'absence de prestataire féminine au centre de santé local, manque de confidentialité, distance, coût et perception de normalité des symptômes.

**Conclusions:** Les jeunes femmes mariées de cette communauté rurale d'Inde présentent une haute prévalence d'IAG mais cherchent rarement à se faire soigner. L'éducation et la sensibilisation sont nécessaires à la réduction de l'opprobre, de l'embaras et de l'ignorance associés aux IAG. Le rang social inférieur des femmes, jeunes surtout, semble influencer significativement leurs faibles taux de traitement de ces conditions.

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