

# The Prevalence of Reproductive Tract Infections in Hue, Vietnam

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*A study was conducted in central Vietnam to measure the prevalence of reproductive tract infections among clients of a family planning clinic, and to determine the usefulness of simple, clinic-based diagnostic tests. The prevalence of such infections was moderate, with the majority being endogenous. Few cases of cervical infection were identified, and no clinical or sociodemographic variables proved to be good predictors of such infection. Most vaginal infections could be identified through simple, clinic-based diagnostic tests, although further research into the cost-effectiveness of establishing and maintaining these services would be useful. Comparison of the results from laboratory tests and the presumptive diagnosis of the clinician indicate that the current practice of presumptive treatment is leading to significant overtreatment. Use of the World Health Organization flowcharts would reduce the overtreatment of vaginal infection but not of cervical infection. The importance of adapting the flowcharts to local epidemiology is highlighted. (STUDIES IN FAMILY PLANNING 2002; 33[3]: 217–226)*

Recognition is growing of the need to introduce and strengthen services for the prevention and treatment of reproductive tract infections (RTIs) within established family planning services in developing countries (Cates and Stone 1992; Elias and Leonard 1995). This need was clearly articulated in the Programme of Action endorsed at the International Conference on Population and Development in Cairo in 1994 and reaffirmed five years later at the Fourth World Women's Conference in Beijing. Globally, three different types of RTI cause significant amounts of morbidity and mortality among women: sexually transmitted infections (STIs) (including gonorrhea, chlamydia, syphilis, trichomonas, and HIV infec-

tion); endogenous infections resulting from the overgrowth of organisms normally present in the reproductive tract (such as candidiasis and bacterial vaginosis); and iatrogenic infections related to medical procedures (such as menstrual regulation, abortion, or IUD insertion). A relationship exists between the provision of RTI and contraceptive services. The recognition and management of RTIs among women generally requires access to the same client population (that is, women of reproductive age), as well as to providers with similar clinical skills (for example, the ability to perform a competent pelvic examination and communicate with clients concerning sensitive issues related to sexuality).

One essential aspect of providing optimal treatment of reproductive tract infections within maternal and child health and family planning (MCH-FP) services is the development of appropriate case-management guidelines for symptomatic individuals. This necessity is especially challenging in resource-poor settings where the diagnostic capacity to determine the specific causes of infection is either lacking or prohibitively expensive. Ideally, therapeutic guidance should be informed by knowledge of the local epidemiology of RTIs as well as of prevailing antibiotic resistance patterns.

MCH-FP providers in Vietnam generally have lacked a systematic approach to the clinical or laboratory evaluation of the various RTI syndromes common

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among women, such as vaginal discharge (Phuong et al. 2000). In discussions with health providers, policy-makers, and women's health advocates in Vietnam, RTIs are often identified as a common and serious cause of reproductive morbidity among Vietnamese women. Several community-based studies have found women to be deeply concerned about reproductive tract symptoms and to perceive such symptoms as being relatively common (Gorbach et al. 1997; Binh et al. 2002; Huong 2002). The demand for services of good quality is high, as evidenced by the large number of women seeking treatment for vaginal-discharge syndromes in both the public and private sectors. Consequently, the MCH-FP Center in Hue conducted a cross-sectional descriptive study of RTI prevalence among its clientele in 1996 in order to define local epidemiology, as well as to inform the development of a more systematic approach to symptomatic RTI case management.

Although the population attending the MCH-FP Center in Hue for the treatment of reproductive tract symptoms is not representative of all women seeking such treatment in Vietnam (many women either self-treat or seek services from private doctors [Hong et al. 1997; Binh et al. 2002]), providing these women with high-quality services is an important component in any comprehensive program for the treatment of RTIs. The center also plays an important role in the training of health professionals at the district and commune level, including training in RTI diagnosis and management. Enhancing the capacity of staff in RTI management within this setting has the potential, therefore, of improving such management in other facilities in the region.

Previous studies of RTI prevalence in Vietnam are limited, although anecdotal evidence from health-care providers suggests that such infections are a significant problem among family planning clients, and that the number of women being treated specifically for sexually transmitted infections is rising. Because proper laboratory equipment is often lacking and categorization of RTI syndromes between studies is inconsistent (Phuong et al. 2000), however, those quantitative investigations that have examined RTI prevalence in Vietnam have shown significant variation in the observed rates and types of infections. For example, one cross-sectional study of women in rural communes found an overall RTI prevalence rate of 69 percent (Assisting Family Planning Center 1995). Broad definitions of suspected pelvic inflammatory disease, bacterial vaginosis, and cervicitis were used in that study, however, and the diagnosis of cervicitis likely included many cases of minor cervical ectopy. Other studies have found significantly different rates of infection, ranging from 24 to 82 percent (Phuong et al. 1993; Hai and An 1995; Minh et al. 1999), and most

studies did not assess the prevalence of cervical chlamydia infection. The Ministry of Health places the overall rate of RTIs at around 40 percent (Phuong et al. 2000).

In order to inform the emerging discussion concerning RTI prevention and treatment in Vietnam, the study described here used internationally recognized definitions of RTIs in an attempt to standardize terminology and measure accurately the prevalence of specific infections of various types. The authors also sought to understand the indicative clinical signs used to arrive at presumptive diagnoses of vaginal-discharge syndromes, and, subsequently, an exploration of the sensitivity, specificity, and positive and negative predictive values of the clinician's presumptive diagnoses was conducted. For comparison, a similar analysis was performed following a simulated application of the flowchart for the syndromic case management of vaginal discharge recommended by the World Health Organization (WHO).

## Methodology

All women attending the MCH-FP Center in Hue were eligible for participation in the study, except those presenting for delivery care and those currently using intravaginal medication. To facilitate optimal specimen handling, only the first five women who were eligible and willing to participate in the study were enrolled each day. One clinician at the center was responsible for examining all the study participants and for collecting specimens. She participated actively in the design of the study protocol and received intensive training on consent procedures and on specimen collection, preparation, and handling.

After the client's informed consent was obtained, a precoded structured questionnaire was used to collect information concerning her personal, social, behavioral, and medical history. All participants were thoroughly examined, and specimens for RTI diagnosis were collected using standardized collection procedures and laboratory guidelines. Standard breast, abdominal, and bimanual examinations were performed, and information collected on lower abdominal and pelvic tenderness. A vaginal speculum evaluation was conducted to elicit information concerning inflammation, ulceration, and vaginal discharge. Sterile cotton swabs were used to collect vaginal secretions for RTI testing. A cervical evaluation identified the size of any cervical redness and described any endocervical discharge or ulceration. Endocervical secretions were also collected for RTI testing.

To allow a determination of the usefulness of on-site testing, laboratory evaluations were conducted at both the center and at a reference laboratory at the De-

partment of Microbiology of Hue Central Hospital. One laboratory technician performed all the laboratory evaluations at the center. This technician received training in on-site laboratory testing from an international trainer as well as from staff of the Hue Central Hospital laboratory. The same people monitored the quality of the center's laboratory testing throughout the study. The reference laboratory at Central Hospital had been performing the required laboratory tests before the study, and after an assessment of the technical staff's skills, further training was deemed unnecessary. As a form of quality control, the head of laboratory services examined all positive results personally.

Tests performed at the center were limited to those that conceivably could be sustained at such a facility, given resources and training available in Vietnam. Although more accurate tests are available for the diagnosis of some infections, the tests used at the center are considered the best international practice for clinical diagnosis when feasibility issues are taken into account. To the extent possible, these tests were repeated at the reference laboratory (for example, all tests except the KOH whiff test and vaginal pH were repeated). The reference laboratory was also able to perform a number of additional gold-standard tests. Staff from the Department of Obstetrics and Gynecology at Hue Central Hospital fixed and stained Pap smears at the center and analyzed these smears independently. The various criteria used to make a diagnosis of each RTI are summarized in Table 1. The site of the various tests (that is, the MCH-FP Center or Central Hospital) is also indicated.

If a woman was found to have a treatable RTI, the center provided appropriate therapy free of charge, using standard treatment guidelines based on local norms regarding antibiotic selection. Those with significant Pap smear findings received follow-up evaluation by staff from the hospital's Department of Obstetrics and Gynecology.

To ensure the feasibility of the study protocol, a pilot study was conducted involving the recruitment of 72 women. The pilot study focused particularly on the consent process, case-record completion, specimen handling, and the reporting of positive test results that required initiation of therapy or the revision of previously administered empiric therapy. Once the experiences of the initial participants had been reviewed by the investigators, the full study was initiated, and a total of 600 women were enrolled over a six-month period between May and October 1996.

## Characteristics of Women Attending the Hue MCH-FP Center

The MCH-FP Center provides a broad range of reproductive health services and, consequently, women present to the clinic for gynecological complaints, family planning services, abortion and menstrual regulation procedures, sterilization, and antenatal and delivery care. Among the study sample, 87 percent of the 600 women were attending the center because of gynecological problems (see Table 2). Prior to the study, center staff had estimated that approximately 50 percent of clients

**Table 1** Nature and location of laboratory tests performed for the identification of various reproductive tract infections and the criteria used for etiologic diagnosis, Hue, Vietnam, 1996

Organism/syndrome	Tests performed	Testing site <sup>a</sup>	Diagnostic criteria
Gonorrhea	Thayer-Martin culture (endocervix)	Hospital	Positive Thayer-Martin culture or gram stain (cervical or vaginal) showing gram-negative intracellular diplococci
	Endocervical gram stain	Both	
	Vaginal gram stain	Both	
Chlamydia	SYVA ELISA test	Hospital	Positive SYVA ELISA test
Syphilis	RPR with TPHA confirmation	Hospital	Positive RPR and positive TPHA confirmation
Trichomonas	Wet prep	Both	Trichomonads observed on wet prep, gram stain (vaginal or cervical) or Pap smear
	Cervical gram stain	Both	
	Vaginal gram stain	Both	
	Pap smear	Hospital	
Bacterial vaginosis	KOH whiff test	Center	If the woman has three or four of the following: (1) homogeneous vaginal discharge; (2) pH>4.5; (3) positive whiff test; (4) clue cells observed on wet prep or gram stain (vaginal or cervical)
	Vaginal pH	Center	
	Vaginal gram stain for clue cells	Both	
	Cervical gram stain for clue cells	Both	
	Wet prep for clue cells	Both	
Candidiasis	KOH wet prep	Both	Fungal elements seen on KOH wet prep and an abnormal vaginal discharge
Pelvic inflammatory disease	—	—	Lower abdominal pain and cervical motion tenderness and one or more of the following: (1) purulent discharge (vaginal or cervical); (2) temperature above 38°C; (3) etiologic diagnosis of chlamydia or gonorrhea; (4) presence of a pelvic mass

RPR = Rapid plasma reagent. TPHA = Treponema pallidum hemagglutination assay. KOH = Potassium hydroxide.

<sup>a</sup> Hospital = Hue Central Hospital; Center = Hue MCH-FP Center; both = Hue Central Hospital and Hue MCH-FP Center.

— = Not applicable.

**Table 2** Sociodemographic and reproductive characteristics of RTI study participants, Hue, Vietnam, 1996

Characteristic	Percent	(N)
Reason for visit		
Gynecological problems	87.2	(523)
Family planning	6.0	(36)
Abortion services	2.3	(14)
Sterilization	0.8	(5)
Other	3.7	(22)
Currently married	96.5	(579)
Education		
None	4.2	(25)
Primary	49.8	(299)
Secondary	37.2	(223)
University	8.8	(53)
Residence		
Hue City	81.7	(490)
Hue Province	17.7	(106)
Other	0.7	(4)
Ethnicity		
Kinh	100.0	(600)
Number of induced abortions <sup>a</sup>		
0	97.7	(462)
1	1.3	(6)
2	1.1	(5)
Number of menstrual regulations <sup>b</sup>		
0	70.9	(366)
1	22.1	(114)
2+	7.0	(36)
Ever use of contraceptives <sup>c</sup>		
Any method	93.9	(558)
Withdrawal	46.8	(278)
Condom	46.1	(274)
IUD	45.5	(270)
Oral contraceptives	7.6	(45)
Other	12.3	(73)
Current use of contraceptives		
Any method	86.7	(520)
Condom	31.3	(188)
Withdrawal	25.7	(154)
IUD	18.8	(113)
Oral contraceptives	3.0	(18)
Other	7.8	(47)
	<b>Mean [standard deviation]</b>	
Age	36.3 [7.0]	(600)
Length of current marriage (years)	12.1 [7.0]	(578)
Number of deliveries	2.7 [1.5]	(583)
Age at first intercourse	24.1 [3.9]	(600)

<sup>a</sup> Data are missing for 127 participants. <sup>b</sup> Data are missing for 84 participants.

<sup>c</sup> Data are missing for 6 participants.

presented with “gynecological disease.”<sup>1</sup> Apparently, women were more likely to be enrolled in the study if they were presenting with gynecological complaints, not because other clients refused to participate, but because those with gynecological complaints came to the clinic earlier in the day than did other clients. In fact, over time, women began to come to the center seeking to enroll in the study at the recommendation of their friends. Once they became aware of this phenomenon, investigators began to record whether the women said they knew of

the study prior to coming to the center on the day of their enrollment. An analysis of this information, as well as a trend analysis of RTI prevalence over the course of the study, indicates that prevalence did not change as a result of this effect among the study participants enrolled later.

Table 2 shows basic background characteristics of the 600 women participating in the study. Almost all were currently married. They had a mean age of 36 years, and nearly half were in their thirties. A similar proportion of the women had only primary schooling. The mean number of previous deliveries among the participants was 2.7. Reported coital frequency was low, with more than three-fourths of women stating that they have intercourse infrequently or only once a week, and only three women reporting ever having had intercourse with someone other than their current partner (not shown). A large majority of participants were resident in Hue City, and although many women who attended the clinic were expected to come from outside the city and from outside the province, almost all of the study participants not residing in Hue City were from Thua Thien Hue province. The word-of-mouth referral described above may have produced this higher-than-expected proportion of Hue City residents and may also explain why all study participants were of the majority Kinh ethnic group.

With regard to contraceptive use, 94 percent of women who responded to the relevant question had ever used a family planning method. Of the 520 women who reported current contraceptive use, most reported using condoms, withdrawal, or the IUD. Only 11 respondents reported a previous experience of induced abortion. One hundred twenty-seven women did not answer this question, however. In contrast, 150 women responded that they had ever had at least one menstrual regulation; 84 women did not respond to that question.

## Prevalence of RTIs

Using the standardized diagnostic criteria outlined in Table 1, the investigators found only a moderate prevalence of RTIs in this sample of women attending the Hue MCH-FP Center, as Table 3 shows. Reproductive tract infections were identified in 21 percent of all women, including 28 cases (5 percent) of sexually transmitted infection (trichomonas, syphilis, chlamydia, and gonorrhea). More than half of the women with any RTI were found to have candidiasis (12 percent overall prevalence), and one-fourth to have bacterial vaginosis (6 percent of all participants). Thirteen women had two infections; seven of these had candidiasis and bacterial vaginosis.

**Table 3** Percentage of women attending the Hue MCH–FP Center, by etiologically diagnosed reproductive tract infections, Hue, Vietnam, 1996

Reproductive tract infection	Asymptomatic women	Symptomatic women	All women
Any RTI	19.2	21.7	21.2
Any STI	4.2	4.8	4.7
Endogenous RTI	15.0	17.7	17.2
Candidiasis	10.0	12.5	12.0
Bacterial vaginosis	5.0	6.7	6.3
Trichomonas	1.7	3.1	2.8
Syphilis	1.7	1.0	1.2
Chlamydia	0.8	0.8	0.8
Gonorrhea	0.0	0.2	0.2
Pelvic inflammatory disease	0.0	0.0	0.0
(N)	(120)	(480)	(600)

**Note:** Thirteen women were diagnosed with two RTIs. None of the differences between asymptomatic and symptomatic women was statistically significant.

### The Usefulness of Center-based Diagnostic Tests

One of the objectives of the study was to assess the usefulness of center-based testing for RTIs. Because a number of the infections were diagnosed separately at both the center and the hospital, a comparison of the prevalence of various RTIs is possible, calculated by combining data from both the center and the hospital, with test results from the center only (this analysis assumes that all positive tests at both the center and the hospital are true positives). Because of the definitions used for classifying RTIs (that is, if the organism was observed at either the center or the hospital), the figures from the center are invariably equal to or lower than the total prevalence observed using a combination of the data from the two testing sites. Table 4 shows these findings.

The center did not identify trichomonas infection among 11 women whom the hospital had positively diagnosed, thereby missing more than 60 percent of the cases of this infection. The center's results for bacterial vaginosis and candidiasis were better; 13 and 8 percent of cases, respectively, were missed.

**Table 4** Percentage of women attending the Hue MCH–FP Center, by reproductive tract infections identified at either the center or the hospital and at the center only, Hue, Vietnam, 1996

Reproductive tract infection	Center or hospital (N = 600)	Center only (N = 600)	Percent of cases identified (N)
Gonorrhea	0.2	0.2	100.0 (1)
Trichomonas	2.8	1.0	35.3 (17)
Bacterial vaginosis	6.3	5.5	86.8 (38)
Candidiasis	12.0	11.0	91.7 (72)

**Note:** Tests for syphilis and chlamydia were not conducted at the center.

### Assessment of Presumptive Case Management

In accord with the study's protocol, the clinician was asked to make note for each woman she examined of whether she believed the woman had a reproductive tract infection, following her clinical examination of the woman and before any laboratory test results other than the KOH whiff test and vaginal pH were available. If she presumed that the client had an RTI, the clinician also recorded her impression as to whether it was vaginal, cervical, and/or pelvic in nature. The presumptive diagnoses recorded by the clinician are summarized in Table 5.

More than 60 percent of the study participants were presumptively diagnosed as having an RTI. This proportion is substantially higher than the RTI prevalence rates found by means of laboratory evaluations. For cervical infection, 44 percent of women were presumed to be infected, whereas, in fact, the combined prevalence of gonorrhea and chlamydia was only 1 percent.

An analysis was conducted to determine which criteria led the clinician at the center to her diagnosis. All RTIs were initially grouped together in order to identify the variables associated with the clinician's perceptions of infection. Three clinically observed signs were found to be significantly associated with the clinician's positive diagnosis of an RTI: the presence of a vaginal discharge noted during the pelvic examination, redness of the cervix, and bleeding of the cervix when touched (contact bleeding) (see Table 6).

These three signs were also statistically significant in the clinician's diagnosis of a cervical infection. Vaginal discharge was not as strongly related to cervical infection as it was to any infection, and redness of the cervix and contact bleeding were more strongly related to cervical infection. The clinician determined which women had cervical redness based on relatively minimal clinical signs. She reported that among 40 percent of those women who were categorized as having a cervix that displayed redness, the redness covered 5 percent or less of the cervix, a sign that may indicate minor cervical ectopy rather than infection.

**Table 5** Percentage of women attending the Hue MCH–FP Center, by clinician's presumptive diagnosis and etiologic diagnosis, Hue, Vietnam, 1996

Type of infection	Presumptive diagnosis (N)	Etiologic diagnosis (N)
Any	61.5 (600)	21.2 (600)
Vaginal	42.8 (600)	20.3 (600)
Cervical	43.5 (598)	1.0 (600)
Pelvic	2.3 (600)	0.0 (600)

**Note:** The clinicians considered many women (24.3 percent) to have both cervical and vaginal infections.

**Table 6** Odds ratios for the signs and symptoms significantly associated with the MCH–FP Center clinician’s presumptive diagnosis, and etiologic diagnosis of reproductive tract infection, Hue, Vietnam, 1996

Diagnosis	Clinically observed vaginal discharge	Redness of cervix	Contact bleeding	Self-reported vaginal discharge
	Odds ratio (CI)	Odds ratio (CI)	Odds ratio (CI)	Odds ratio (CI)
Presumptive diagnosis				
Any RTI	19.29 (10.18–36.55)	2.68 (2.32–3.09)	1.61 (1.46–1.78)	1.43 (1.16–1.75)
Vaginal infection	40.69 (13.20–125.37)	1.56 (1.30–1.87)	1.63 (1.24–2.14)	1.36 (1.03–1.78)
Cervical infection	15.16 (7.66–30.00)	13.51 (9.09–20.08)	2.08 (1.73–2.49)	2.06 (1.47–2.88)
Etiologic diagnosis				
Any RTI	8.34 (3.07–17.52)	1.23 (0.90–1.68)	1.01 (0.49–2.08)	1.13 (0.75–1.70)
Vaginal infection	10.99 (4.56–26.48)	1.20 (0.87–1.67)	1.09 (0.53–2.26)	1.23 (0.79–1.90)
Cervical infection	2.43 (0.29–20.67)	1.31 (0.27–6.44)	—	1.25 (0.15–10.60)

CI = 95 percent confidence interval. — = Not applicable.

**Note:** None of the women with contact bleeding had a cervical infection.

Although women’s own reports of vaginal discharge (that is, their symptom status) were associated with the clinician’s diagnosis of RTI (see Table 6), this association was not as strong as the signs discussed above, and after controlling for clinically observed vaginal discharge, this association was no longer significant.

The signs the clinician used as criteria for diagnosing infection do not, in fact, correlate well with the presence of an infection. Although the great majority of RTI cases were accompanied by observed vaginal discharge, only 30 percent of all women observed to have a discharge had an RTI. Neither redness of the cervix nor contact bleeding of the cervix was statistically significant in relation to the laboratory-diagnosed presence of any specific RTI or STI.

## Focus on Symptomatic Women

To this point, this study has considered all women attending the MCH–FP Center in Hue. Standardized case-management procedures, as recommended by WHO and discussed below, have been designed for use with symptomatic women, that is, women presenting with self-reported vaginal discharge and seeking treatment for a gynecological complaint. Of the 600 participants in this study, 480 (80 percent) reported that they were experiencing vaginal discharge. Ninety percent of these women came to the clinic specifically for treatment of this complaint. The following analyses are limited to symptomatic women to facilitate an assessment of how effectively such a standardized case-management protocol might function in the Hue context.

Although the RTI prevalence rates among the 480 women who complained of vaginal discharge (shown in Table 3) are consistently a little higher, they do not differ appreciably from those observed in the total study sample, and are not statistically significantly different from the prevalence rates occurring among asymptomatic women.

Since the signs currently used by the clinician as syndromic identifiers for presumptive diagnosis and treatment of reproductive tract infections correlate poorly with the presence of actual infection, a wide range of other variables was analyzed in order to explore the possibility that alternative criteria might predict more accurately the presence of infection. Based largely on experience in other settings with a higher prevalence of RTIs, several of the authors of this study have suggested that risk assessment using locally verified combinations of symptoms, signs, and background characteristics might allow a more accurate classification of symptomatic individuals for presumptive treatment and guide referral for more extensive diagnostic testing (Cates 1997).

If syndromic case-management criteria are viewed essentially as heuristics used to classify individuals for potential treatment for various infections, the performance of these case-management systems can be assessed by determining the sensitivity, specificity, and positive and negative predictive values of the various criteria in comparison with the presence of infection as assessed by gold-standard testing. Sensitivity indicates how well the testing technique manages to identify positive cases of the condition; it measures the proportion of a given type of infection detected by the use of the indicator criterion. Specificity refers to the ability of the criterion to diagnose correctly the absence of a defined condition; it measures the proportion of uninfected individuals correctly identified. The positive predictive value demonstrates how well the presence of a criterion indicates the true presence of a condition; it gives the proportion of cases that test positive using the criterion that are correctly so classified. Finally, the negative predictive value illustrates the ability of the absence of a criterion to rule out infection; it indicates the proportion of cases diagnosed as negative by the absence of the criterion that are correctly so classified. Both positive and negative predictive values are strongly influenced by the prevalence of the outcome of interest in the population.

As illustrated in Table 7, using observed vaginal discharge as an indication of any RTI yields a criterion with high sensitivity (97 percent), but low specificity (35 percent). Therefore, it makes a poor positive predictor because many of the positive diagnoses based on this criterion are false and do not indicate infection. On the other hand, it can be used more reliably as a negative predictor, because the absence of observed vaginal discharge has a high success rate (98 percent) in ruling out the possibility of RTI among this population with a relatively low overall prevalence of RTIs.

Self-reported offensive smell of vaginal discharge, by comparison, has lower sensitivity in identifying any sexually transmitted infection (53 percent), but a somewhat higher specificity (77 percent). Nevertheless, it is not very useful as a positive predictor, although it performs well as a negative predictor (97 percent)—that is, an extremely small proportion of women who reported no offensive smell of vaginal discharge did, in fact, have an STI. This pattern of predictive values reflects the generally low prevalence of STIs in this study population.

Some of the simpler clinical tests were also assessed for their value for predicting infection when they were used alone. High vaginal pH could identify 82 percent of the cases of RTI, but could also indicate that 91 percent of those not etiologically diagnosed had an infection. A positive whiff test and the presence of clue cells were better at identifying women without infection (99 and 96 percent specificity, respectively), but positively identified only 8 and 35 percent of those with an infection. The literature indicates that vaginal pH could be a good measure for distinguishing between candidiasis and bacterial vaginosis (Sobol 1999) among symptomatic individuals. Because of the relatively low prevalence of infection even among the symptomatic women in this study, this measure is a useful negative predictor (100 percent for bacterial vaginosis and 90 percent for candidiasis), but does not do well at identifying true cases of infection (it had positive predictive values of 7 and 35 percent for bacterial vaginosis and candidiasis, respectively).

One of the most debated issues with regard to standardized case management of symptomatic vaginal dis-

charge concerns the usefulness of indicator criteria for predicting the presence of cervical infection with gonorrhea or chlamydia. The interest in these two infections stems from their potential to have serious consequences (including infertility, ectopic pregnancy, and congenital infection) and from their being sexually transmissible. Table 7 also displays the sensitivity, specificity, and positive and negative predictive values for a number of variables measured in this study as possible case-finding criteria for cervical infections. Given the low prevalence of cervical infection and the lack of a strong correlation between self-reported symptoms, the clinician's observations, and the laboratory diagnosis of cervical infection, no variables were found that provided an adequate positive predictor of cervical infection.

### Comparison with WHO Vaginal Discharge Flowchart

In an attempt to standardize global recommendations for common RTI syndromes, the World Health Organization has issued guidelines for syndromic case management. In this study, we collected all the data necessary for conducting a simulated application of this flowchart among the 480 women who reported the presence of vaginal discharge.

Not a single woman met the risk-assessment criteria<sup>2</sup> that would call for an empirical treatment for cervical infection. In contrast, almost half (237) of the symptomatic women would have received presumptive treatment for cervical infection if "discharge from cervix" were to be considered equivalent to "mucopus," the official term used in the WHO algorithm. When we asked the clinician to record her observation of discharge, she was instructed to record whether the discharge was present in the cervical os and vagina or was present in the vagina but the cervical os was clear. Most of the vaginal discharges observed by the clinician were considered to be present in the cervical os.

To further differentiate the presence of mucopus from other types of cervical discharge, we looked at the

**Table 7** Sensitivity, specificity, and positive and negative predictive values for selected indicator criteria and outcomes among women with symptomatic vaginal discharge attending the MCH-FP Center, Hue, Vietnam, 1996

Indicator criterion	Testing for	Sensitivity (percent)	Specificity (percent)	Positive predictive value (percent)	Negative predictive value (percent)	(N)
Clinically observed vaginal discharge	Any RTI	97	35	29	98	(476)
Vaginal pH above 4.5	Any RTI	82	9	20	63	(480)
Self-reported offensive smell of vaginal discharge	Any STI	53	77	10	97	(427)
Self-reported abnormal discharge	Any cervical infection	40	68	1	99	(480)
Self-reported offensive smell of vaginal discharge	Any cervical infection	33	76	1	99	(427)
Clinician's presumptive diagnosis of cervical infection	Any cervical infection	80	52	2	99	(479)

clinician's record of the color of the discharge, assuming a cervical discharge characterized as "yellowish or green" most accurately corresponds to the WHO definition of "mucopus." With this specification, the number of symptomatic women who would receive treatment for cervical infections is reduced to 93 (19 percent), a figure that would still represent considerable overdiagnosis of chlamydia and gonorrhea.

Moreover, 16 women (3 percent) would have been treated for trichomonas and bacterial vaginosis, because either trichomonads or clue cells were observed on the wet mount, and 67 women (14 percent) would have been treated for candidiasis based on the presence of yeast cells on the wet mount.

As a result of this analysis, rates of infection as determined by the flowchart can be compared with both the clinician's presumptive diagnoses and the true rates of infection as determined by gold-standard laboratory procedures. Table 8 clearly indicates that although the use of the WHO algorithm would improve the clinician's ability to identify vaginal RTIs by lowering the level of overdiagnosis, it would result in a considerable degree of overtreatment for cervical infection even if only specific cervical discharge syndromes were used for diagnostic purposes. Treating women for trichomonas, bacterial vaginosis, or candidiasis, as recommended by the chart, would not have varied much from the treatment resulting from the identification of cases by diagnostic tests at the center and hospital combined (in fact the resulting number of cases is nearly identical to the prevalence determined by the use of tests performed only at the center). This finding is not surprising in light of the similarity of diagnostic microscopy criteria for vaginal infections in the two approaches.

## Discussion and Conclusions

Until the availability of low-cost, simple RTI diagnostic tests makes etiologic management more feasible, front-line providers require guidance concerning optimal strategies for treating presumptively or referring women who present to clinical services with symptoms potentially related to RTIs. This study aimed to collect information on RTI prevalence, and to understand the clinical signs used for presumptive diagnosis, in order to inform decisionmaking on RTI diagnosis and treatment in an MCH-FP setting in central Vietnam. The study revealed only a moderate prevalence of reproductive tract infection (21 percent), substantially lower than that suggested by previous studies conducted in Vietnam. The majority of RTIs observed (75 percent) were caused by endogenous vaginal infections (that is, candidiasis and bacterial vaginosis).

**Table 8** Percentage of 480 symptomatic women attending the MCH-FP Center, by diagnosis of reproductive tract infection determined presumptively by the clinician, the WHO flowcharts, and etiologic diagnosis, Hue, Vietnam, 1996

Infection	Presumptive diagnosis	WHO flowchart	Etiologic diagnosis
Cervicitis (gonorrhea and chlamydia)	48.4	49.4 or 19.4	1.0
Vaginitis	45.2	16.9	20.4
Bacterial vaginosis	—	3.3	6.7
Candidiasis	—	14.0	12.5
Trichomonas	—	3.3	3.1

— = Not applicable.

**Notes:** The proportion of women diagnosed with cervicitis from the WHO flowchart depends on the definition used for the term "mucopus." The clinician did not presumptively distinguish between specific vaginal infections.

By contrast, the observed rate of STIs was low (5 percent), and only 1 percent of women had a cervical infection. This important observation has broad implications for STI/HIV prevention and control efforts, as well as for MCH-FP programs in Vietnam. Because the rates of STIs among women seeking treatment for vaginal discharge within MCH-FP settings are low, one implication of these findings is that case-management efforts for symptomatic women should focus on the more common endogenous infections, as opposed to mounting more costly, difficult, and largely unsuccessful attempts to provide presumptive treatment for cervical infection among this population of women. Given the widespread use of the IUD in Vietnam (NCPFP 1999) and the lack of reliable criteria for identifying women likely to have an RTI based on sociodemographic, behavioral, or clinical variables, the low prevalence of cervical infection is a reassuring finding for both MCH-FP program managers and contraceptive service providers. Case-finding efforts for cervical infection among asymptomatic women would be better directed at improving partner notification and empirical treatment of the female partners of men with symptomatic STI syndromes, such as urethral discharge. Given a syphilis prevalence of 1 percent, antenatal syphilis screening may also be a cost-effective intervention.

In contrast to the findings concerning diagnosis of cervical infection, the results of this study suggest that, with adequate training and supervision, the most common causes of vaginal infection could be diagnosed definitively using simple microscopy tests performed in MCH-FP clinics. Adequate training in the recognition of even the three most common RTIs (candidiasis, bacterial vaginosis, and trichomonas) requires significant time and human resources, however. The intensive training provided at the outset of this study focused on candidiasis and bacterial vaginosis diagnosis because clue cells and yeast were felt to require greater microscopy skills; relatively less emphasis was placed on trichomonas. The

ability of the center to diagnose trichomonas was disappointing, however, and indicates that more intensive efforts are required for training and quality assurance in regard to trichomonas detection if etiologic diagnosis of vaginal infections were to be implemented on a wide scale. Moreover, the relatively low prevalence of trichomonas may provide a challenge to quality assurance efforts at some facilities.

Consequently, although the etiologic diagnosis of common vaginal infections may be feasible within MCH-FP facilities, whether the investment required to establish and maintain such diagnostic facilities would provide cost advantages over simple empirical treatment of vaginal infection and the use of nonmicroscopy tests, such as vaginal pH alone, is important to determine.

The clinical and laboratory training provided at the initial stages of this research project and the technical support provided throughout the period of data collection have enhanced the skills of the center's clinician and laboratory technician in the diagnosis and treatment of the most common RTIs in the clinic population. Since the completion of the study, the Hue MCH-FP Center has expanded its training role. Although the center does not have a large enough clientele to function as a major training facility, the staff have many skills to offer during training courses conducted in other parts of Vietnam, and, in fact, both the clinician and the laboratory technician have recently been recruited for this purpose.

One of the most important findings of this study is the high rates of overdiagnosis and overtreatment for RTIs that result from current clinical practices. This finding is particularly striking with regard to the presumptive diagnosis and treatment of cervical infection, and it suggests that a need exists to review the current criteria used for presumptive clinical diagnosis of RTIs in light of accurate prevalence data drawn from studies such as the one conducted at the Hue MCH-FP Center. Insights gained in this way should be reflected in medical training curricula. In light of the diagnostic challenges involved in performing gold-standard laboratory tests, limited data have been available traditionally for describing the correlation (or lack thereof) between reported symptoms, clinical observations, and the presence of different types of RTIs. Now that such information is becoming available, particularly for those infections that are not sexually transmissible, these findings require broader discussion and dissemination in an effort to inform more appropriate presumptive treatment approaches.

Another important finding of this study is that, although the current unstandardized presumptive diagnoses of the clinician result in significant overdiagnosis of RTIs, attempts to standardize case management by adoption of the WHO syndromic flowchart for vaginal

discharge would also be problematic. As mentioned above, the clinician's presumptive diagnosis currently leads to a significant overtreatment for both vaginal and cervical infections. The amount of overdiagnosis of vaginal infections would be greatly reduced by application of the WHO vaginal discharge flowchart. The use of this flowchart would bring treatment levels generally in line with the observed prevalence rates for vaginal infection. Unfortunately, high levels of overtreatment for cervicitis would persist. Consequently, although adoption of the WHO flowchart clearly would be an improvement over current practice, it would address only partially the most costly component of overdiagnosis.

One solution would be to adapt the WHO vaginal discharge flowchart based on local epidemiological data. WHO suggests local modification and validation of flowcharts whenever possible as an accompaniment to efforts to introduce its approach. Such modification is rarely accomplished. Because this study shows that the clinician's observation of discharge in the cervical os has a poor correlation with cervical infection, the authors propose that, in Vietnam, the arm of the flowchart dealing with empirical treatment for gonorrhea and chlamydia be dropped in areas and clinics with a low prevalence of STIs. Treatment levels would then be based essentially on the etiologic diagnosis of vaginal infection. An alternative approach would be to consider designing and testing flowcharts that involve return visits and the sequential use of empirical treatment for different RTI pathogens. Obviously, such modified flowcharts would require independent validation before being widely used.

## Notes

- 1 Qualitative research concerning women's perceptions of reproductive morbidity show that, as a result of an extensive health-education campaign conducted by village-level cadre, the Vietnamese term *benh phu khoa*, translated as "gynecological disease," is often used as a synonym for vaginal discharge (Binh et al. 2002).
- 2 The risk assessment is positive if a patient answers the question "Does your sexual partner have a discharge from his penis or open sores anywhere in his genital area?" affirmatively or if she answers two or more of the following questions affirmatively: "Are you younger than 21?"; "Are you unmarried, or not in a union?"; "Have you been with your husband or sexual partner for less than three months?"; or "Have you had more than one sexual partner in the last four weeks?"

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