

PREVALENCE OF LOWER GENITAL TRACT INFECTION AMONG WOMEN ATTENDING MATERNAL AND CHILD HEALTH AND FAMILY PLANNING CLINICS IN HANOI, VIETNAM

Phan Kim Anh¹, Nguyen Thi Ngoc Khanh¹, Dinh Thu Ha¹, Do Thi Chien², Pham Thi Thuc³, Pham Hien Luong⁴, Peter H Kilmarx^{5, 6}, Varee Wongchotigul⁷, Dwip Kitayaporn⁷ and Patrick J Rowe⁸

¹The Institute for the Protection of Mother and Newborn (IPMN), Hanoi, Vietnam; ²Obstetrics and Gynaecology Hospital of Hanoi, Hanoi, Vietnam; ³Hai Ba Trung Maternity Hospital, Hanoi, Vietnam; ⁴Obstetrics and Gynaecology Department, Thanh Nhan Hospital, Hanoi, Vietnam; ⁵The HIV/AIDS Collaboration, Nonthaburi, Thailand; ⁶Division of STD Prevention, National Center for HIV, STD and TB Prevention; Centers for Disease Control and Prevention; Atlanta, GA, USA; ⁷Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand; ⁸Special Program of Research, Development and Research Training in Human Reproduction, World Health Organization, Geneva, Switzerland

Abstract. To determine the prevalence of lower genital tract infection (LGTI) with *Candida* spp, *Trichomonas vaginalis*, *Neisseria gonorrhoeae*, *Chlamydia trachomatis*, and bacterial vaginosis among symptomatic and asymptomatic women attending maternal and child health and family planning (MCH/FP) clinics in Hanoi, Vietnam. A multi-centered, cross-sectional descriptive study stratified by reported symptoms of vaginal discharge was carried out in three MCH/FP clinics among 1,000 women aged 18-44 years in 1998. Of these, 89.1% lived in Hanoi, 97.6% were currently married, and 99.2% had only one sexual partner in the past 12 months. Regarding their contraceptive use, 28.2% did not use any contraception, 25.6% used an intrauterine device (IUD), 22.8% used condoms, and 23.4% used other methods. The overall prevalence of *Candida* spp was 11.1% (95% CI = 9.1-13.1%); *T. vaginalis*, 1.3% (95% CI = 0.6-2.0%); no gonococcal infection was found; the prevalence of *C. trachomatis* was 4.4% (95% CI = 3.1-5.7%); and of bacterial vaginosis, 3.5% (95% CI = 2.4-4.6%). The presence of LGTI was not associated with reported symptom of vaginal discharge. LGTI was common among married and monogamous women attending MCH/FP clinics in Hanoi, of whom many used IUDs and may have an increased risk of complications in the presence of LGTI. The lack of association between symptoms and laboratory-confirmed infection underscores the challenge of diagnosing LGTI when laboratory testing is not available.

INTRODUCTION

The intrauterine device (IUD) is the most commonly used contraceptive in Vietnam (Allman *et al*, 1991; Johansson *et al*, 1996). Complications of IUD use are more likely in the presence of lower genital tract infection (LGTI) (Hatcher *et al*, 1998), but data on the prevalence of these infections in Vietnam are very limited.

To fill this gap, the Institute for the Protection of Mother and Newborn (IPMN), supported by the World Health Organization (WHO), carried out this study to establish the prevalence of LGTI in women seeking care at maternal and child health and family planning (MCH/FP) clinics in Hanoi. This study aimed to determine the prevalence of LGTI so that prevention measures could be introduced to provide more effective reproductive health care. The objective of this research was to estimate the prevalence of important LGTI organisms in both self-reported symptomatic and asymptomatic women who attend the MCH/FP clinics in Hanoi, Vietnam. We also describe the clinical findings of these patients.

Correspondence: Dr Dwip Kitayaporn, Department of Social and Environmental Medicine, Faculty of Tropical Medicine, Mahidol University, 420/6 Rajvithi Road, Bangkok 10400, Thailand.
Fax: +66 (0) 2245 8472
E-mail: dwipk@dmc.inet.co.th

MATERIALS AND METHODS

Study design and data collection

The study was of multi-centered, cross-sectional, descriptive design (Kelsey *et al*, 1986) and was conducted in three MCH/FP clinics in Hanoi, Vietnam. The first clinic was the Obstetrics and Gynaecology Hospital of Hanoi, with 200 beds and 15,535 annual out-patient visits (March to May 1998). The second was the Hai Ba Trung Maternity Hospital, with 40 beds and 1,600 patients attending its polyclinic (May to September 1998). The third was the Obstetrics and Gynaecology Department, Thanh Nhan Hospital, Hanoi, with 38 beds and 7,151 out-patient visits (July-December 1998). Originally it was planned that only the first two clinics would be used in the study, but, because of insufficient number of women recruited into the study, the third clinic was added.

A total of 1,000 women, aged between 18-44 years old, were enrolled with sampling quotas of approximately one-half symptomatic and one-half asymptomatic, using a multi-staged stratification design (Kish, 1965; Moser and Kalton, 1972; Kelsey *et al*, 1986). Systematic sampling (Kelsey *et al*, 1986) was used at the Obstetrics and Gynaecology Hospital of Hanoi, while all potentially eligible patients were recruited at the other two sites.

Women were excluded if they had taken antibiotics, or had used vaginal antimicrobial agents or vaginal douches in the previous two weeks before the visit. Those who were menstruating, pregnant, physically incapacitated or mentally deprived or had undergone hysterectomy, were also excluded.

The research protocol was reviewed and approved by the institutional ethics review committee of the IPMN on behalf of the other participating institutions, and by the Scientific and Ethical Review Group of the Special Programme of Research, Development and Research Training in Human Reproduction of the WHO.

All potentially eligible patients were interviewed by a member of the nursing staff and informed consent was obtained. Patients were asked whether they had genital symptoms. They were

then stratified into two groups, *ie*, symptomatic (vaginal discharge) and asymptomatic. A pre-coded structured interview form was used to obtain information from each enrolled patient. The initial interview consisted of questions about age, education, profession, marital status, symptoms of genital tract infection and their current usage of contraceptives. Each patient then underwent general physical and pelvic examinations. A speculum was used to observe any vaginal discharge and its texture, color, and odor. The cervix was inspected for cervical lesions including inflammation, ectopy, dysplasia or any sign of ulceration or papillomata. The uterus and the adnexae were palpated for evidence of pelvic infection.

The gynecologist collected four specimens, two from the posterior vaginal fornix, and two from the endo-cervical canal. The results of the interviews were not revealed to the gynecologist, and the results of the clinical examinations were not available to the laboratory staff who entered their results on separate forms. All patients with detected abnormal conditions were treated according to the local standard of care.

Diagnostic procedures

Vaginal swabs. Material from the first high vaginal swab was examined for its appearance and pH estimation using narrow-range indicator papers (Whatman, Maidstone, UK). Gram stain was used for the identification of *Candida* spp, clue cells, and *Neisseria gonorrhoeae* (Barron and Finegold, 1990). The second high vaginal swab was used as a wet smear to examine for *Trichomonas vaginalis*, yeast pseudo-hyphae, clue cells, and for the 10% potassium hydroxide solution (KOH) 'whiff' test.

The Gram-stained specimen was also examined for yeast or pseudo-hyphae under microscopy for 10-15 oil immersion fields. The gradings obtained were negative if no yeast cells were found, border-line if one or two yeast cells were found, and positive if more than two yeast cells were found (Odds, 1979). The diagnosis of bacterial vaginosis was made by using the Amsel criteria (Moser and Kalton, 1972; Amsel *et al*, 1983).

Endocervical swabs. Dacron-tipped swabs were inserted into the endocervical canal and rotated two to three times to be sure of obtaining endocervical cells. The first swab was introduced into the external cervical os and gently rotated. It was then plated directly onto Thayer-Martin medium (Difco, MI, USA) and incubated in a 5-10% CO₂ candle jar at 37°C for 48 hours and examined for *N. gonorrhoeae* (Koneman *et al*, 1988). The second swab was used to diagnose *C. trachomatis* using an enzyme immuno-assay kit (Chlamydiazyme, Abbott Laboratories, North Chicago, IL, USA) (Mazara *et al*, 1989). The direct detection of the chlamydial antigen was used and the positive tests were confirmed by the Chlamydiazyme blocking reagent kit. The order of use of the swabs were alternately allocated to either of these two tests.

Data management and data analysis

All coded data were entered into computer twice and validated by using Epi Info Version 6.04 (Atlanta, GA, USA: Centers for Disease Control and Prevention, 1997) to minimize key-punch errors. Data were then tabulated and cross-checked for out-of-range errors and inconsistencies until they were considered clean. For bi-variable analysis, Pearson's χ^2 corrected for survey designs was used for categorical data analysis. Statistical inference on prevalence data was done by using the 95% confidence intervals, and odds ratios (OR) were used to measure the strength of association (Fleiss, 1981). We used Intercooled Stata version 6.0 for Windows 98/95/NT (College Station, TX, USA: Stata Corporation, 1999) statistical package. Kappa statistics (κ -statistics) were used to measure agreements between observers (Fleiss, 1981).

RESULTS

Study population

One thousand women were enrolled into this study out of 1,620 potential participants. One hundred and seventy women were excluded because of prior recent use of antibiotics or vaginal antimicrobial medication. Five hundred women (50.0%) were enrolled at the Obstetrics and Gynaecology Hospital of Hanoi, 286 (28.6%)

were from the Hai Ba Trung Maternity Hospital and 214 (21.4%) were from Thanh Nhan Hospital. The mean age (\pm SD) of these 1,000 women was 34.1 ± 6.8 years; their mean age at their first marriage was 23.5 ± 3.5 years; and their age at first sexual intercourse was 23.4 ± 3.5 years. Of these women, 99.2% had had only one sexual partner in the past 12 months; 97.6% were currently married; 89.1% were living in Hanoi; 35.3% were laborers or farmers, 25.5% were office workers, and 39.2% were housewives or had other occupations (such as students); 35.6% attained primary school education or lower, 43.6% had secondary school education, and 20.7% attained above secondary school education. Regarding their contraceptive use, 28.2% did not use any contraception, 25.6% used an IUD, 22.8% used condoms, and 23.4% used other methods, such as periodic abstinence or coitus interruptus. A total of 504 women (50.4%) were symptomatic with vaginal discharge.

When the above characteristics between the two strata of symptomatic and asymptomatic were compared, the asymptomatic group was 1.3 years older than the symptomatic group ($p < 0.01$). There were, however, no differences between strata in any of the other above-mentioned variables ($p > 0.07$ for any variables, data not shown).

Clinical histories and findings

Many women reported multiple complaints; 50.4% complained of vaginal discharge, 24.3% complained of vulva itching, 8.6% reported having had dyspareunia, 4.8% had a chief complaint of dysuria, 3.7% complained of genital ulcer, and 0.8% complained of non-menstrual vaginal bleeding. These complaints were not mutually exclusive. Of women who complained of having vaginal discharge on the current visit, 46.3% described the discharge as creamy, 9.2% as colorless, 9.0% as greenish-yellow, 4.2% as blood-stained, and 31.3% with different variable characteristics. More than half (55.1%) complained of having at least one episode of vaginal discharge during the past six months, not including the current episode; 39.9% had it treated. Of those who sought treatment, 81.7% were treated by medical doctors, 14.6% had treated themselves, and 3.7% had used other sources, such as traditional medicine.

Table 1

Comparison of pelvic examination results between asymptomatic and symptomatic Vietnamese women^a.

Findings		Asymptomatic (N = 496)	Symptomatic (N = 504)	Odds ratio (95% CI)	p
		number	number		
Vulva					
Vulvitis	No	455	408	1.0 ^b	<0.01
	Yes	41	96	2.6 (1.8-3.9)	
Vagina					
Texture of vaginal discharge					
Normal		310	188	1.0 ^b	<0.01
Homogeneous		81	162	3.3 (2.4-4.6)	
Curdy		53	66	2.1 (1.4-3.1)	
Yellowish-frothy		15	38	4.2 (2.2-7.8)	
Other		37	50	2.2 (1.4-3.5)	
Color of vaginal discharge					
Normal		299	174	1.0 ^b	<0.01
White		83	103	2.1 (1.5-3.0)	
Yellow		100	209	3.6 (2.7-4.9)	
Other		14	18	2.2 (1.1-4.6)	
Vaginitis	No	320	236	1.0 ^b	<0.01
	Yes	176	268	2.1 (1.6-2.7)	
Cervix					
Cervicitis	No	280	208	1.0 ^b	<0.01
	Yes	216	296	1.8 (1.4-2.4)	
Ulceration	No	466	455	1.0 ^b	0.03
	Yes	30	49	1.7 (1.02, 2.8)	

^aTotals vary because of incomplete data; ^bReferent.

On pelvic examination, 15.5% of women had abnormal vulva findings such as vulvitis or leukoplakia-like lesions; 50.2% with vaginal discharge were clinically classified as abnormal, 52.7% had abnormal vaginal discharge color, 45.1% had abnormal vaginal mucosal appearance, and 57.8% had abnormal cervical appearance, such as cervicitis or ectopy. Most (91.3%) had normal uterine size and 85% had a normal adnexal examination. Again, these pelvic examination results were not mutually exclusive. The bivariable analyses of characteristics between the reported asymptomatic, versus the symptomatic, women showed six clinical findings associating with symptomatic conditions ($p < 0.05$), *ie*, presence of vulvitis, texture of vaginal discharge and its color, vaginitis, cervicitis, and cervical ulcer-

ation (Table 1). Of note, the major complaints of the patients did not agree well with the clinical findings ($\kappa = 0.22$, $p < 0.001$). Only 84.8% of those reported as having any symptoms had positive clinical findings, and 63.4% reported as having no symptoms had some positive clinical findings.

Prevalence of lower genital tract infections

The overall prevalence of *Candida* spp (more than two yeast cells found) was 11.1%. If we included the border-line cases, the prevalence of *Candida* spp would be 34.2% (95% CI = 31.2-37.1%). The prevalence of this infection was quite similar, both in the asymptomatic and the symptomatic group, as was the case for infection with *T. vaginalis*, *N. gonorrhoeae*, and *C. trachomatis*,

Table 2
Prevalence of lower genital tract infections among Vietnamese women, overall and by presence of symptoms at the current visit (symptomatic, N = 504, asymptomatic, N = 496).

Infection	Prevalence (%) and (95% CI)
<i>Candida</i> spp	
Overall	11.1 (9.1-13.1)
Symptomatic	11.3 (8.5-14.1)
Asymptomatic	10.9 (8.1-13.6)
<i>Trichomonas vaginalis</i>	
Overall	1.3 (0.6-2.0)
Symptomatic	1.0 (0.1-1.9)
Asymptomatic	1.6 (1.5-2.7)
<i>Neisseria gonorrhoeae</i>	
Overall	0.0 (0.0-0.4) ^a
Symptomatic	0.0 (0.0-0.7) ^a
Asymptomatic	0.0 (0.0-0.7) ^a
<i>Chlamydia trachomatis</i>	
Overall	4.4 (3.1-5.7)
Symptomatic	5.0 (3.1-6.9)
Asymptomatic	3.8 (2.1-5.5)
Bacterial vaginosis	
Overall	3.5 (2.4-4.6)
Symptomatic	3.2 (1.6-4.7)
Asymptomatic	3.8 (2.1-5.5)

^aOne-sided, 97.5% confidence interval.

and with the presence of bacterial vaginosis (Table 2).

There were nine women (0.9%) who had more than one infection. Among these, one had *Candida* spp and *T. vaginalis*, three had *Candida* spp and *C. trachomatis*, three had *T. vaginalis* and *C. trachomatis*, and two had *T. vaginalis* and bacterial vaginosis. If the women with co-infections were excluded, the prevalence of any single LGTI was 18.7% (95% CI = 16.2-21.1%).

DISCUSSION

Our study provides prevalence data of five important infections of the lower genital tract in women attending maternal and child care clinics in the capital of Vietnam. These include the preva-

lence of *Candida* spp (11.1%), *N. gonorrhoeae* (0%), *T. vaginalis* (1.3%), *C. trachomatis* (4.0%), and bacterial vaginosis (3.5%).

Caution should be used in comparing our results with those of other studies of LGTI because those may have included populations with either low or high risk, eg, women attending ante-natal care clinics, female sex workers, women attending MCH/FP clinics, clients of men visiting STD clinics, etc. Also, there is variation in the settings, eg, in developing countries or in underdeveloped communities in developed countries, STD clinics, community surveys, MCH/FP clinics, etc. We thus choose to compare our data with selected study populations in less-developed communities carried out with a similar design. In addition, detected prevalences may differ depending upon the laboratory methods used, which also varied in these other studies.

Our results showed that the prevalence of *Candida* spp was similar to those obtained from Sudan (Kafi *et al*, 2000), Thailand (Thongkrajai *et al*, 1999), and rural Vietnam (Boon *et al*, 1999; Hung *et al*, 2001). The absence of *N. gonorrhoeae* is consistent with the findings of our pilot study in Hanoi (Anh *et al*, 1996), Thailand (Thongkrajai *et al*, 1999), and Turkey (Ortayli *et al*, 2001); a slightly higher prevalence (<1.0%) was found in indigenous women in Australia (Bowden *et al*, 1999), Indonesia (Iskandar *et al*, 2000), and northern Thailand (Kilmarx *et al*, 1998). The prevalence of *T. vaginalis* was much lower than that found in India (Vishwanath *et al*, 2000), Indonesia (Iskandar *et al*, 2000), Kenya (Feldblum *et al*, 2000; Fonck *et al*, 2000), or Thailand (Thongkrajai *et al*, 1999). Meanwhile, the prevalence of chlamydial infection was similar to that found in our pilot study in Hanoi (Anh *et al*, 1996), Indonesia (Iskandar *et al*, 2000), Kenya (Feldblum *et al*, 2000), and northern Thailand (Kilmarx *et al*, 1998), but was about ten-fold lower than that found in Jamaica (Dowe *et al*, 1999). Finally, the prevalence of bacterial vaginosis was much lower than found elsewhere (Dowe *et al*, 1999; Iskandar *et al*, 2000).

The low prevalence of condom use as found among women in this study, together with that reported in men who frequent commercial sex

workers in southern Vietnam (Thuy *et al*, 1999), and the low knowledge of reproductive tract infection among Vietnamese women (Thuy *et al*, 1999), raise concerns about the control of HIV/AIDS and other sexually-transmitted diseases in Vietnam.

Although the prevalence of LGTI was lower than in some other studies, some pathogen was still found in about one in five women. Many women also used the IUD, and an increased rate of complications of IUD use may be seen in those with concurrent LGTI (Hatcher *et al*, 1998). The inconsistencies found in reported symptoms, physical examination findings, and laboratory results, underscore the challenges of establishing syndromic diagnostic algorithms (Boon *et al*, 1999; Vishwanath *et al*, 2000). Low-cost, simple diagnostic tests for reproductive tract infections remain an urgent need.

This study has some limitations, in that it was carried out in the capital city of Vietnam and does not reflect the general population of Vietnam, especially in rural settings, but it does reflect the situation among women seeking health care in Hanoi. This study provides justification for future risk-factor studies in this area, as well as for prevention and treatment activities.

ACKNOWLEDGEMENTS

We would like to thank the volunteers of this study. Also, we thank the following scientists or clinic staff who made significant contributions to this study, namely, Prof Duong Thi Cuong, Prof Tran Phuong Mai, Ms Hoang Minh Phuong, Dr Nguyen Thanh Yen, Ms Nguyen Thi Tinh, Dr Buri Thanh Hien, Ms Nguyen Thi Ha, Dr Nguyen Bich Ngoc, and Ms Trinh Thu Huyen. We also would like to thank Dr Pratap Singhasivanon, and Dr Jaranit Kaewkungwal for some statistical advice. We also thank Ms Panpen Narukatpichai for secretarial support. The study was funded by the Special Programme of Research, Development and Research Training in Human Reproduction, World Health Organization, Geneva, Switzerland.

REFERENCES

Allman J, Vu QN, Nguyen MT, Pham BS, Vu DM. Fer-

tility and family planning in Vietnam. *Stud Fam Plann* 1991; 22: 308-17.

Amsel R, Tolten PA, Spiegel CA, *et al*. Non-specific vaginitis; diagnostic criteria and microbiologic and epidemiologic associations. *Am J Med* 1983; 74: 14-22.

Anh PTK, Mai TP, Phuong HTM, *et al*. Prevalence of lower genital tract infections among Vietnamese women attending a Maternal and Child Health Center in Hanoi, Vietnam. *Southeast Asian J Trop Med Public Health* 1996; 27: 193-5.

Barron JE, Finegold MS. Bailey and Scott's diagnostic microbiology. 8th ed. St Louis: The CV Mosby, 1990.

Boon ME, Schwinghammer H, van der Veen G. Analysis of lifestyle data and cytologic findings in a pilot cervical screening project in rural Vietnam. *Acta Cytol* 1999; 43: 786-93.

Bowden FJ, Paterson BA, Mein J, *et al*. Estimating the prevalence of *Trichomonas vaginalis*, *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, and human papilloma virus infection in indigenous women in northern Australia. *Sex Transm Infect* 1999; 75: 431-4.

Dowe G, Smikle M, King SD, Wynter H, Frederick J, Hylton-Kong T. High prevalence of genital *Chlamydia trachomatis* infection in women presenting in different clinical settings in Jamaica: implications for control strategies. *Sex Transm Infect* 1999; 75: 412-6.

Feldblum PJ, Kuyoh M, Omari M, Ryan KA, Bwayo JJ, Welsh M. Baseline STD prevalence in a community intervention trial of the female condom in Kenya. *Sex Transm Infect* 2000; 76: 454-6.

Fleiss JL. Statistical methods for rates and proportions. New York: John Wiley and Sons, 1981.

Fonck K, Kidula N, Jaoko W, *et al*. Validity of the vaginal discharge algorithm among pregnant and non-pregnant women in Nairobi, Kenya. *Sex Transm Infect* 2000; 76: 33-8.

Hatcher RA, Trussel J, Stewart F, *et al*. Contraceptive technology. 17th ed. New York (NY): Ardent Media, 1998.

Hung ND, Thanh DX, Phuong PM, *et al*. The knowledge, attitude, practice and prevalence of reproductive tract infections among women 15-49 in Vietnam. In: Kohl PK, Jodl SJ, eds. Sexually transmitted Infections. Bologna: Monduzzi Editore, 2001: 121-6.

Iskandar MB, Patten JH, Qomariyah SN, Vickers C, Molyneux SI. Detecting cervical infection among family planning clients: difficulties at the primary health-care level in Indonesia. *Int J STD*

- AIDS* 2000; 11: 180-6.
- Johansson A, Hoa HT, Tuyet LT, Bich MH, Hojer B. Family planning in Vietnam—women's experiences and dilemma: a community study from the Red River Delta. *J Psychosom Obstet Gynaecol* 1996; 17: 59-67.
- Kafi SK, Mohamed AO, Musa HA. Prevalence of sexually transmitted diseases (STD) among women in a suburban Sudanese community. *Ups J Med Sci* 2000; 105: 249-53.
- Kelsey JL, Thompson WD, Evans AS. Methods in observational epidemiology. New York: Oxford University Press, 1986.
- Kilmarx PH, Black CM, Limpakarnjanarat K, *et al*. Rapid assessment of sexually transmitted diseases in a sentinel population in Thailand: prevalence of chlamydial infection, gonorrhoea, and syphilis among pregnant women—1996. *Sex Transm Infect* 1998; 74: 189-93.
- Kish L. Survey sampling. New York: Wiley and Sons; 1965.
- Koneman EW, Allen SD, Janda WM, Schreckenberger PC, Winn WC Jr. Color atlas and textbook of diagnostic microbiology. 5th ed. Philadelphia: Lippincott-Raven Publishers, 1997.
- Mazara M, Porta D, Gentili G, Giglio A, Palamara G, Spano C. Prevalence of *Chlamydia trachomatis* in cases of genital non-gonococcal infection according to microbiological and serological investigations. *Infections* 1989; 17: 360-3.
- Moser CA, Kalton. G. Survey methods in social investigation, 2nd ed. New York: Basic Books, 1972.
- Odds FC. Candida and candidosis. Baltimore: University Park Press, 1979.
- Ortayli N, Sahip Y, Amca B, Say L, Sahip N, Aydin D. Curable sexually transmitted infections among the clientele of a family planning clinic in Istanbul, Turkey. *Sex Transm Dis* 2001; 28: 58-61.
- Thongkrajai P, Thongkrajai E, Pengsaa P, Pakarasang M. The prevalence of *Chlamydia trachomatis* infection in rural Thai women. *Southeast Asian J Trop Med Public Health* 1999; 30: 52-7.
- Thuy NT, Lindan CP, Phong TH, *et al*. Predictors of visits to commercial sex workers by male attendees at sexually transmitted disease clinics in southern Vietnam. *AIDS* 1999; 13: 719-25.
- Vishwanath S, Talwar V, Prasad R, Coyaji K, Elias CJ, de Zoysa I. Syndromic management of vaginal discharge among women in a reproductive health clinic in India. *Sex Transm Infect* 2000; 76: 303-6.