AN EPIDEMIOLOGICAL SURVEY OF FEMALE REPRODUCTIVE HEALTH STATUS : GYNECOLOGICAL COMPLAINTS AND SEXUALLY-TRANSMITTED DISEASES

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Abstract. An epidemiological survey of gynecological and sexually-transmitted diseases was conducted in 4 villages of Narmpong district, Khon Kaen, Thailand. It was focused on the reproductive health status of rural women. A mobile gynecological clinic was set up to collect materials and data including demographic characteristics, physical examination and specimen collection. Vaginal swabs were examined by microscope, Gram staining, pH measurement, KOH test and bacteriological cultivation. Endocervical swabs were examined for *Chlamydia trachomatis,* herpes simplex virus (HSV) and human papilloma virus (HPV) by polymerase chain reaction. Papanicolaou's test was applied for diagnosis of cytological abnormalities. Blood was tested by RPR and TPHA and urine was tested by LED test. The chief complaint was dysmenorrhea (44.8%). The others ranging from 43.4-3.0% were lower abdominal pain to genital ulcer. Prevalence of *C. trachomatis, C albicans, T. vaginalis, T. pallidum* and *G. vaginalis* were found in 4.6, 10.9, 5.1, 2.7 and 1.0% of 586 women and HSV and HPV were found in 6.4% and 1.4% of 110 women, respectively. The three pathogens. *C. trachomatis, C. albicans* and *T. vaginalis,* were frequently found among women in the age of 20-49 years. The number of marriages and sex partners in the past year had an association with *C. trachomatis* infection while vaginal pH > 4.5, marietal status, number of marriages and itching of genitalia had an association with *T. vaginalis* infection.

INTRODUCTION

In the era of rapid growth and development in the socioeconomic structure of Thailand, most rural communities are exposed to outside changes. For example, family members leave home more frequently to find jobs in big cities and this brings about changes in sexual behavior among those exposed to commercial sex (Orubuloye *et al,* 1993; Sanders and Sambo, 1991). Sexually transmitted diseases (STDs), including HIV/AIDS and the impact of these diseases on human reproduction, particularly that of the women in rural villages are found to increase as a result of this short term migration (Hunt, 1989).

Bang and colleagues (1989) found that 55% of rural women in India had one or more types of gynecological diseases and STDs. The average number of diseases for each woman was 3.6. Most women (92.2%) had never undergone gynecological examination in the past. These findings suggested that reproductive health and STDs had been neglected among rural women in developing countries.

In Thailand, maternal and child health had been put forward as one of the eight basic items for primary health care, but little or no attention has been given to reproductive and sexual health of women, particularly in the rural communities. Woman's health regarding STDs and reproductive problems have been ignored even after the HIV/AIDS epidemic was recognized nationally in 1988 (Thongkrajai *et al,* 1988; Weniger *et al,* 1991). The prevalence of gynecological disorders and STDs in rural women and factors affecting the occurrence of such diseases are unknown. Most available data have been obtained from hospitals in big cities, including university hospitals. These results are selective and probably do not reflect the real situation of reproductive health problems of women in the countryside.

This study was designed to evaluate the distribution, prevalence and types of gynecological disorders and STDs among rual Thai woman as well as the associated demographic variables. It describes the prevalence of gynecological and sexually transmitted diseases in association with some socioeconomic and demographic factors among rural women in Thailand.

MATERIALS AND METHODS

Target population

A cross-sectional study of 12 months duration

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was designed to assess gynecological disorders and STDs among women in rural areas. A total of 586 women, age 15-55 years in four villages of Nam Pong district, Khon Kaen Province, were recruited. At the time of data collection all women recruited to the study were healthy and it was assumed that these women were representative of the general female population.

Data collection

Working-site : A mobile clinic staffed by a gynecologist, two nurses, five trained health workers (interviewers) and one medical technologist, was set up at the subdistrict health center. They were responsible for subject enrolment, interviews for gynecological, STD and demographic data, physical examination, specimen collection and simple laboratory investigations.

Interviews : The target population was interviewed using structured questionnaires. The questionnaires were modified from that of Thongkrajai (1995). Data collected using the questionnaires included : i) personal characteristics, *eg*, age, education, occupation, marietal status, residence, ii) gynecological history, *eg*, gravidity, number of abortions, previous STD, current use of contraception, risk factors including number of sexual partners, age at first intercourse, duration of marriage and relationship with current partner, iii) current signs and symptoms, *ie*, dysuria, genital ulcer and itching, dyspareuria, low abdominal pain, vaginal discharge, genital papules, difficulty in urination and iv) husband's characteristics, *eg*, age, occupation, education, residence, STD history, sexual behavior, frequency and length of time away from home.

Physical examination : All women were examined for skin rashes. A speculum and general examination was also performed to detect the presence of :-

i) vaginal discharge aspect

ii) cervical discharge (after cleaning)

iii) cervical dysplasia/ectropion (contact bleeding), cervicitis

iv) genital and perianal ulcer and warts,

v) condylomata lata,

vi) bi-manual pelvic palpation was carried out to determine if there was a pain on moving the cervix.

Specimen collection

Vaginal specimens : Three vaginal swabs were taken from the posterior fornix. One was dipped into a saline solution on a glass slide for wet preparation and in potassium hydroxide for "sniff test". The second swab was assessed using a pH dipstick and the third one was directly smeared on to chocolate and blood agar plates for cultivation of *Neisseria gonorrhoeae* and *Gardnerella vaginalis* respectively and rolled on to a glass slide for Gram staining.

Endocervical swab : After removing the mucous plug around the cervix, an endocervical swab was collected from each subject and put in a 3 ml transport medium containing 0.4M sucrose phoshate buffer pH 7.2, supplemented with 10% fetal calf serum and antibiotic (vancomycin). The samples were transported to the laboratory at 4°C (ice bath) within 3 hours. Immediately upon arrival, the samples were split into three Eppendorf tubes (1 ml/tube) and stored at-70°C until processing. One tube of each sample was tested for *Chlamydia trachomatis* by polymerase chain reaction (PCR), the other two were tested for HSV and HPV (300 samples only) by PCR.

A papanicolaou smear and stanining was also carried out for each subject for the detection of cervical intraepithelial neoplasia (CIN).

Blood and urine : A venous blood sample (10 ml) was collected from each woman together with a urine specimen.

PCR primers

Primers for *C. trachomatis* : The FLA (5′-TTA GAAGCAGAATTGTGCATTTACCTGAGC-3′), NEST2 (5′-CATGAGTGGCAAGCAAGTTTA-3′) and NEST 4 (5′-GCTCTCTCATCGATCAA GCG-3′) primers were used to amplify *C. trachomatis* DNA (MOMP gene). All primers were kindly provided by Dr Patrick J Rowe of the Special Program of Research Development and Research Training in Human Reproduction, WHO, Geneva.

Primers for herpes simplex viruses : The HSV primers were designed by oligo 5.0 program (National Biosciences, Inc, USA). They were as follows:

Primer for HSV	Sequence (5′ ⇒ 3′)
Primer 1	ACG CTG CTG CGG GTT TAT AT
Primer 2	TGC TCA TTG TTA TCT GGG CG

Primers for human papilloma viruses : The HPV primers were based on that of Yoshikawa (1991). Detection and typing of multiple genital human papilloma viruses were carried out by DNA amplification with consensus primers. The following show HPV primers used :

Primer for HPV	Sequence (5′ ⇒ 3′)
Primer 1	5′ CGT AAA CGT TTT CCC TAT TTT TTT 3′
Primer 2	5′ GTT ATG TCT CAT AAA TCC CAT3′

Laboratory investigation

All types of specimens and laboratory tests are summarized in Table 1. These included i) on site tests, *ie* leukocyte esterase (LED) test, microscopic examination, pH measurement, sniff test and bacterial inoculation and ii) laboratory tests, *ie* Gram stain, bacterial isolation and identification, cytological study and PCR. The on-site tests which were performed included : wet preparation, examined for the presence of *Trichomonas vaginalis* and *Candida albicans;* KOH test (sniff test), smell for the presence of aromatic amines (positive test in cases of bacterial vaginosis); pH test in which the discharge was applied directly onto a strip and the color development read according to the manufacturer's instructions. Results were categorized into pH > 4.5 and pH ≤ 4.5. The LED test was carried out by a brief dipping of the reagent strip in urine sample and reading of color development within 60-120 seconds. Categorization of results were negative, trace (10-25 WBC/ml), moderate (75 cells/ml) and positive (>100 cells/ml).

The laboratory tests included the following :

Gram stain : This was to examine for the presence of some bacteria and "clue cells" *ie* epithelial cells with Gram negative bacteria adhering to the surface, usually found in bacterial vaginosis cases.

Bacterial isolation and identification : The isolation of *N. gonorhoeae* was conducted in a chocolate agar plate in a candle-extinction jar. At the end of the field work, it was transported to the laboratory and incubated for 24-48 hours in 5% CO_2 atmosphere at 37°C. The identification was based on standard tests for *Neisseria* species (Holt *et al*, 1994).

For diagnosis of *G. vaginalis,* samples were applied onto a blood agar plate and transported to the laboratory for further incubation at 37°C. The identification of *G. vaginalis* was also based on standard tests applied for *Gardnerella* species (Holt *et al*, 1994).

Table 1
Type of specimens and tests used in this study.

Type of specimens	Tests applied
Urine	LED test
Vaginal swabs	Microscopic examination
	Gram stain
	pH measurement
	KOH (sniff test)
	Bacterial isolation and identification
Blood	RPR and TPHA
Endocervical swab	PCR for *C. trachomatis,* HSV and HPV
Papanicolaou smear	Cytological examination

RPR and TPHA : A commercial diagnostic kit for serodiagnosis of syphilis was used to test the sera. Sera with RPR positive were confirmed by the TPHA commercial kit.

Papanicolaou smear and staining : The diagnosis of cytological abnormalities was conducted by using Papanicolaou's test. Results were analyzed by qualified pathologist and expressed as normal, atypical cellular changes and abnormal or cervical intraepithelial neoplasia (CIN). The abnormal Pap smear test included CIN type 1, 2 and 3.

Polymerase chain reaction for *C. trachomatis* detection : The method used was similar to that described by Ossewaarde (1992). Briefly, a pelleted suspension was washed with phosphate buffer saline solution (PBS) and resuspended in 300 µl of PBS. The washed sells were stored at -20°C until use for DNA extraction.

Preparation of *C. trachomatis* DNA : The method was modified from that of Holland *et al* (1992). Samples digested with proteinkinase K (100 µg/ml) at 37°C over night, were primarily extracted twice with an equal volume of a mixture of phenol, chloroform and isoamyl alcohol at a proportion of 25:24:1,V/V. The second extraction was carried out twice with an equal volume of a mixture of choroform and isoamyl slcohol (ratio 24:1, V/V). The DNA was recovered by precipitation with sodium acetate/ethanol, resuspended in small volume of sterile distilled water and stored at -20°C.

DNA amplification :

Primary PCR : The amplification reaction of primary PCR was performed in a final volume of 50 µl. Each reaction tube contained DNA sample, 50 mM KC1, 1.5 mM $MgC1_2$, 20 mM Tris HCI (pH8.4), 200 µM each of deoxynucleotide triphosphate (dATP, dTTP, dGTP and dCTP), 1 µM of each primer (FLA and NEST 2) and one unit of Taq DNA polymerase. Each reaction mixture was overlayered with 50 µl mineral oil to prevent evaporation. The amplifica-

tion was carried out for 30 cycles in a thermocycler (Perkin Elmer Cetus, Norwalk, Conn, USA) at 94°C for one minute, 46°C for one minute and 72°C for 1.5 minute. After this, samples were subjected to a complete extension of the primer for 7 minutes.

Secondary PCR : A volume of 5 µl of the primarily amplified product was added to a new reaction tube containing fresh reaction mixture and primers NEST2 and NEST4. The final concentrations of PCR reagents and cycles of amplification were similar to that of the primary PCR.

The secondary amplified products and a standard marker were loaded onto 1.5% agarose containing 0.5 µg/ml ethidium bromide. An electrophoresis was carried out at 100 volt using tris-acetate EDTA buffer. After electrophoresis, the gel was visualized and photographed under UV translumination.

In order to prevent contamination three separate rooms were allocated for PCR assay; one for preparation of samples, one for preparation of reagents and reaction mixtures and one for PCR manipulation.

Polymerase chain reaction for detection of HSV and HPV genomes

Reaction solutions contained DNA samples, 200 µM dNTPs, 50 mM KCl, 2.5 mM $MgCl_2$, 10 mM Tris-HCl pH 8.4 and oligonucleotide primers each at concentration of 0.2 µM, 1.25 units of *Taq* polymerase (Perkin-Elmer Cetus, Norwalk, Conn, USA) and sterile distilled water to a 50-µl volume. The tubes were overlaid with 70 µl of mineral oil and subjected to 40 PCR cycles of 94°C for 1 minute, 50 and 48°C for HSV and HPV, repectively for 1 minute and 72°C for 2 minutes with an automatic thermocycler (Coy Incorporation, Grass Lake, Michigan). Each test run included both positive and negative controls. Positive control contained PCR reagents plus 10 fg of pHSV 106, a plasmid carring thymidine kinase of HSV type 1 and in case of HPV detection, plasmids carrying HPV6, 11, 16, 18, 31 and 33 were used as positive control. The negative control employed in this test system was DNA extracted from peripheral blood mononuclear cells derived from blood donor and reagent control (no DNA) was also included.

To determine whether the present DNA was suitable for amplification, samples were tested using primers that flank a region of the human β-globin gene.

Amplified products were electrophoresed in 1.8% agarose gel containing 1 µg/ml ethidium bromide at 80 V and visualized by ultraviolet light exposure. Amplified products of HSV had the length of 250 bps and that of HPV ranged from 244-256 bps depend on types of HPV (244 bps in HPV type 6,11;253 bps in HPV types 16 , 18 and 256 bps in HPV type 31 and 33).

To prevent contamination during the performance of the tests, three physically separate rooms were used : one for preparing stock reagents and the master mix, one for processing specimens and the other for processing the amplified reaction products. All other recommended precautions against amplicon carry-over contamination were also included.

RESULTS

General and health characteristics of women

The majority of women (93.4%) were married while 1.9% and 4.7% were single and devorced respectively. Most of them were farmers (85.2%) and finished primary school (94.5%) but a small proportion (0.2%) was illiterate. The mean number of gravidity per a woman was 2.7 ± 1.5. Approximately 20% of the subjects had an abortion, 43% had ever suffered from illness and 26% had been hospitalized for severe illness.

Regarding STDs, 54.9% of women knew about STDs and 32% regarded themselves as a high risk and nearby 4% had had a STD. There were 11 women (1.7%) who reported more than one sexual partner in the past year. The age of first sexual intercourse and the age of first marriage were similar (about 20.1 ± 3.5). It was shown that 36.3% of women's husbands worked away from home and approximately 57% of the women regarded their husbands' sexual behavior as untrustworthy and at high risk for STD. In terms of contraception methods applied, the intrauterine device (IUD) was the most commonly used (48.1%). Injectable contraceptives and oral pill were the second commonest methods. The condom-using rate was about 4.1%

Gynecological complaints

The gynecological and sexual complaints obtained by questionnaires from the survey are summarized in Table 2. If weakness, weight loss, lack of appetite and chronic oral ulcer which did not relate directly to gynecological complaints, were excluded from the analysis, it was found that 634 women had a total number of 1,453 gyneocological and sexual complaints, *ie* 2.3 events per a woman

Table 2
Proportion of women with common gynecological and sexual complaints in the past 3 months.

	Symptoms complained	Frequency	% (n=634)
1	Dysmenorrhea	284	44.8
2	Lower abdominal pain	275	43.4
3	Weakness	227	35.8
4	Weight loss	226	35.6
5	Lack of appetite	165	26.0
6	Itching around genitalia	155	24.4
7	Itching in vagina	130	20.5
8	Leukorrhea	126	19.9
9	Dyspareunia	124	19.6
10	Dysuria	113	17.8
11	Genital papules	97	15.3
12	Difficulty in urination	89	14.0
13	Chronic oral ulcer	34	5.4
14	Vaginal discharge	21	3.3
15	Ulcer around genitalia	20	3.2
16	Enlarge groin nodes	19	3.0

Table 3
Cytological finding of Papanicolaou smear and staining.

Age range	Total No. tested No. (%)	Normal finding No. (%)	Atypical* cell changes No. (%)	Abnormal finding No. (%)
15-19	8(100)	7(87.5)	1(12.5)	0
20-24	57(100)	43(75.4)	14(24.6)	0
25-29	85(100)	62(72.9)	22(25.9)	1(1.2)
30-34	99(100)	66(66.7)	33(33.3)	0
35-39	107(100)	81(75.7)	26(24.3)	0
40-44	71(100)	53(74.6)	17(23.9)	1(1.4)
45-49	70(100)	42(60.0)	27(38.6)	1(1.4)
>49	64(100)	50(78.1)	14(21.9)	0
Total	561(100)	404(72.0)	154(27.5)	3(0.5)**

* Benign cellular changes or atypical squamous and glandular cell changes
** All three subjects were mild dysplasia (CIN1)

in the past 3 months. The most common findings were dysmenorrhea (44.8%), lower abdominal pain (43.4%), itching around genitalia (24.4%) and vagina (20.5%), leukorrhea (19.9%), dyspareunia (19.6%), dysuria (17.8%), genital papules (15.3) and difficulty in urination (14.0%). Futher more, it was found that i) 3(0.5%) subjects showed abnormal Papanicolaou smear, *ie* mild dysplasia (CIN type 1), ii) 154 (27.5%) subjects showed atypical cellular changes and iii) 404 (42.0%) subjects were normal (Table 3). No moderate and severe dysplasia (CIN type 2,3) were observed.

Prevalence, type and distribution of STDs

The prevalences of significant pathogens, [*Chlamydia trachomatis* (4.6%), *Candida albicans* (10.9%), *Trichomonas vaginalis* (5.1%), *Treponema pallidum* (2.7%) and *Gardnerella vaginalis* (1.0%)] are presented in Table 4. Scabies (*Phthirus pubis*) was found in one subject. *Neisseria gonorrhoeae* was not found. The prevalences of HSV (6.4%) and HPV (1.4%) are also indicated. Pathogens including *C. trachomatis*, *C. albicans* and *T. vaginalis* were found more frequently among women of 20-49 years of age (Table 5).

Gynecological complaints and sexually transmitted diseases with some selected characteristics

Table 6 shows odds ratio (OR) values of some risk factors for *C. trachomatis* and *T. vaginalis*. The common risk factor for both organisms is "more than one marriage" with OR values of 3.2 and 2.8 ($p <$

Table 4
The prevalence of some STD pathogens found in rural women.

Pathogens*	No. (%)	
	Positive	Negative
1. *Chlamydia trachomatis*	27(4.6)	559(94.5)
2. *Candida albicans*	64(10.9)	522(89.1)
3. *Trichomonas vaginalis*	30(5.1)	556(94.9)
4. *Treponema pallidum*	16(2.7)	570(97.3)
5. *Gardnerella vaginalis*	6(1.0)	580(99.0)
6. *Neisseria gonorrhoeae*	0(0.0)	586(100.0)
7. Herpes simplex virus	9(6.4)	132(93.6)
8. Human papilloma virus	2(1.4)	139(98.6)

* Scabies (*Phthirus pubis*) was detected microscopically in one sample.

Table 5
Numbers and percents of rural women infected with *Chlamydia trachomatis*, *Candida albicans* and *Trichomonas vaginalis* by age groups.

Age range (years)	Total No. tested	Number of positive tests (%)		
		C. trachomatis	*C. albicans*	*T. vaginalis*
15-19	10	0(0.0)	0(0.0)	0(0.0)
20-29	148	12(8.1)	16(10.8)	5(3.4)
30-39	215	7(3.3)	28(13.0)	10(4.7)
40-49	152	7(4.6)	15(9.9)	12(7.4)
50-54	61	1(1.6)	5(8.2)	3(4.9)
Total	586	27(4.6)	64(10.9)	30(5.1)

Table 6
Risk factors for *C. trachomatis* and *T. vaginalis* infections among rural women.

Risk factors	O.R.	95% ci and p-value
C. trachomatis		
1. More than one sex partner in the past year	4.8	0.48-24.74, p=0.05
2. Number of marriage (>1)	3.2	0.89-9.32, p=0.04
T. vaginalis		
1. Vaginal pH>4.5	9.0	2.23-7.80, p=0.01
2. Marrietal status (widow or divorcee)	3.6	0.83-11.50, p=0.04
3. Number of marriage (>1)	2.8	0.80-8.03, p=0.05
4. Itching around genital area	2.3	1.03-5.17, p=0.04

0.05). Women with more than one sex partner in the past year had a high risk of *C. trachomatis* infection (OR = 4.8). For *T. vaginalis*, women with vaginal pH > 4 .5 possessed a very high risk to infection with the organism (OR = 9.0). Other risk factors are previous status (widow or divorcee), more than one marriage and itching around genital area. Other factors were not found to be related to any type of complaints and STDs.

DISCUSSION

A large proportion of women felt that they had bad health and high morbidity rate (43.2%). More than 20% of them had an abortion at some time. It was not clear whether these abortions were legal or illegal or spontaneous. The majority of women (91.8%) never had a STD diagnosed previously. However, 32% of the subjects considered themselves

as "at risk of STD" and 4% (25 women) had ever the diseases, while 43(6.8%) women's husbands ever had STDs. Among them, 13 women responsed that gonorrhea was the most common disease. This was not clear how these women diagnosed the STD they had as gonorrhea. A proportion (27.8%) of them still treated themselves without a doctor's prescription. These findings agreed with the women's comments that 57% of their husbands had untrustworthy sexual behavior and resulted in high risk for STDs. In terms of contraceptives used, the condom was not popular (4.1%). The IUD was the most widely used (48.1%). This was consistent with the highly use rate of IUD for the national family planning policy. In addition, all subjects participating in the project were normal women. Thus no significant gynecological signs, symptoms and diseases were observed except some complaints as stated.

In the northeast Thailand, men taking jobs outside their home villages has become a part of rural life. This study indicated that about 36% of the women's husbands left home for work. The frequency of men leaving home varied widely from once a year to many times. This supports the hypothesis that a temporary short term migration of peoples may be the mechanism by which STDs and HIV/AIDS spread into rural communities.

In many parts of the world, STD prevalence tended to vary widely depending on many factors like the social and economic situation (Harahap, 1980; Hopcraft *et al*, 1973; Lazar, 1971; Niamsanit *et al*, 1988; Omer *et al*, 1985; Vuylsteke *et al*, 1993). This study indicated a high prevalence in gynecological and sexual complaints (Table 2). More than 43% of women had complaint of dysmenorrhea and lower abdominal pain. Bonhomme *et al* (1994) reported high STD incidences (31.7% gonorrhea, 43.1% chlamydiasis, 1.8% trichomoniasis and 3.5% candidiasis) among uninfected women at risk of contracting STD in Bangkok massage parlours. However, the STD prevalence including infections by *C. trachomatis, C. albicans, T. vaginalis, T. pallidum, G. vaginalis, N.gonorrhoeae,* HSV and HPV found in this report (Table 4) was low in comparison to the previous findings and no bacterial vaginosis was observed. This may be due to the mass campaign against HIV/AIDS and the difference in the nature of populations at risk.

These results seemed to indicate that woman's health regarding STDs and gynecological diseases has been neglected by both the general population and the health care-providers. In this study, even though most women were aware of STDs and gynecological disorders, how many of them realized the severity, treatment, prevention and seeking for further education and counselling was not known. Since most of the pathogens found among these subjects caused no or mild symptoms, treatment was rarely undergone. During the interviews for data collection, there were some women who said that they used to have gynecological or STD signs and symptoms but they did not seek for treatment. It is possible that these women did not realize harmfulness of the diseases, or due to social and economic pressure such as the cost of treatment, travelling to the hospitals and embarrassment and unwillingness to be examined or talk about gynecological and sexual diseases resulted in this low rate of health seeking behavior. In many health center settings, there is a lack of good laboratory facilities to confirm the diagnosis which may result in inadequate investigation and inappropriate clinical management.

We report here the prevalence of *C. trachomatis* of 4.6% while that of Niamsanit *et al* (1988) among women attending an antenatal clinic in Bangkok of 16.1%. The highest prevalence (8.1%) was found among the age of 20-29 while that of Nimsamit *et al* (23.7%) was reported among the age group of 20-24. The differences may be due to nature of the population and the residential location. So far, there were no reports of sexually transmitted chlamydial diseases among rural women in Thailand. Vuylsteke *et al* (1993) carried out a cross sectional study among rural women in Mozambique and found that 65% of 85 women had genital complaints. Genital ulcer was present in 6% and 28% of pregnant women and general female respectively. *Neisseria gonorrhoeae* or *Chlamydia trachomatis* were found in 16% of pregnant women and 23% of general females and active syphilis was 15%. High prevalences of gynecological diseases and STDs were also reported among rural women in India (Bang *et al*, 1989). As demonstrated by Lazar (1971), the incidence of *C. albicans* was associated with the use of contraceptives including IUD. We observed similar results, *ie* the prevalence of *C. albicans* among women who used or used to use contraceptives was higher than the group who did not. However, the difference was not significant. It is interesting that both *T. vaginalis* and *N. gonorrhoea* are STD pathogens and transmitted by sexual intercourse but none of *N. gonorrhoea* was found among 586 samples while 5.1% (30/556) of *T. vaginalis* was found in this study. The reasons for the difference was probably because of mass campaign against AIDS that changes sexual behaviors of males. In addition gonorrhea is an acute purulent and painful disease, so infected

individuals would tend to seek proper treatment immediately while the *T.vaginalis* causes a mild, annoying disease sometime with no signs and symptoms. The disease then was left untreated for years as seen by a high incidence in older age group 40-49 (Table 5) *G. vaginalis* was also at low incidence (1.0%). The infection by this microorganism may be associated with non-hygienic personal sexual behavior and physiological changes in the vaginal canal. In our previous report, HSV was detected in 9.9% of the vaginal swabs from 403 pregnant women (Thongkrajai *et al*, 1986) while 9 (6.4%) vaginal swabs were found to be positive for HSV in this study. In terms of CIN and HPV association, it was impossible to find out any correlation since only 1.4% of women showed HPV-positivity. In contrast, HPV was demonstrated in 46-65% of women with and without CIN respectively in the urban of Natal Durban (Kharsony *et al*, 1993).

Furthermore, it was found that LED test was not useful for diagnosis of urinary tract infection in this study. This is because most of the target women were not infected. Those with infection would be chronic and asymptomatic. The LED test, with sensitivity of 76% and specificity of 80% for chlamydial and gonococcal urethritis (Tyndall *et al*, 1994) may be appropiate for an acute urinary tract infection.

Results in Table 6 suggest that the proportion of *C. trachomatis*-infected women was significantly related to their number of sex partners and marriages. It was observed that in women with genital ulcer, husbands away from home and regarding their husbands a high risk to STD had higher rate (10.0%) of *C. trachomatis* infection than women without the items mentioned (3.9%). However the difference was not statistically sigificant. This implies that while away from home, husbands might have sex with high risk promiscuous women or commercial sex workers without proper protection. This agrees with the report that more than 80% of AIDS patients were laborers, farmers and many types of low wage workers (MOPH, Thailand, 1997). It is well recognised that these people, a temporary migrant, mainly come from the northeast region for jobs in big cities through out the country. This also accounts for the 57% of women in this study regarding their husbands' sexual behavior as untrustworthy and high risk to STD.

Regarding the risk factors, the number of marriage (>1) seemed to be the risk of both infections by *C. trachomatis* and *T. vaginalis* (OR = 3.2, 2.8; p=0.04, 0.05 respectively, Table 6). It is also conceivable that couple behaviors relating to sexual activities tended to be a significant risk factor for *C. trachomatis* infection, *ie* more than one sexual partner in the past year (OR=4.8, p=0.05). The following items could be concluded as risk factors for *T.vaginalis* infection, *ie* vaginal pH>4.5 (OR=9.03, p=0.01), marrietal status (widow or devorcee, OR=3.6, p=0.04), number of marriage >1 (OR=2.8, p=0.05) and itching around genital area (OR=2.3, p=0.04). There were no other laboratory indicators (except pH>4.5) that seemed to relate to the infections of *C. trachomatis, T. vaginalis* and other pathogens. These findings suggest that extra-marrital and promiscuous sexual activities result in high risk to reproductive tract infection. In the case of *T. vaginalis* infection, the vaginal pH>4.5 was very important factor increasing high risk to the pathogen. While the status of widow or divorcee would make individuals feel free in response to their sexual need. In addition, all data were analysed to find out the relationship between gynecological complaints and other pathogens but no correlation was found.

It was obviously demonstrated by this study that gynecological disorders and STDs were endemic among women in the rural communities of the northeast Thailand. The magnitude of problems would be greater for woman reproductive and public health if the short term migration of people in the area still persists. It is important to adequately prevent, control and treat the diseases. This could be assisted by integrating women's reproductive health policy into the family planning or maternal and child health policy (dos Santor *et al*, 1992). Along with this integrated policy, laboratory and clinical investigation facilities needed for definite diagnosis of the diseases should be strengthened at least at the community hospital level.

It is of interest to further investigate serotypes or genotypes of some pathogens including *C. trachomatis* and human papilloma viruses. These pathogens frequently cause asymtomatic infection. But in certain circumstances they create a more severe and complicated clinical outcomes (Schuch *et al*, 1984). It is not know whether a specific type of the pathogen initiates a specific clinical outcome and this awaits for futher studies.

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