

Lower genital tract infection: a community-based approach study

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Abstract

Introduction and objectives: Infections of the lower vaginal tract are one of the most prevalent diseases affecting women, and can cause not only acute illness but also complications and sequelae. This study aims to determine the epidemiology and some related factors of lower genital tract infections in the community of Quang Tri province.

Materials and Methods: A descriptive cross-sectional study was conducted with 1010 women aged 21 to 65 who had sex in 12 communes in three districts of Quang Tri province (Hai Lang, Trieu Phong and Gio Linh). The information was gathered between July 2019 and July 2020. Participants were inspected to determine the condition of the cervix and vagina, and to collect cervical/vaginal swab samples for wet mount evaluation by a parasitologist.

Results: Itching was the most prevalent gynecological symptom (21.8%), followed by abnormal discharge (2.7%). The macroscopic appearance of the cervix in 46.8% of patients was normal. Positive wet mount results were observed in 59.6% of cases. The most prevalent disorder was accounted for bacterial vaginosis (86.0%), followed by *Candida* species (13.7%) and parasites (0.3%). Positive wet mount microscopy results were associated with IUD (OR=0.699, 95% CI: 0.526 - 0.928) and farming occupation (OR=0.719, 95% CI: 0.554 - 0.932) ($p < 0.05$).

Conclusions: Lower genital tract infections are caused by a variety of pathogens and influenced by a number of variables, with bacterial pathogens being the most prevalent. The results of the study provide further clinical and epidemiological data that may aid in enhancing the quality of treatment for infections of the lower genital tract.

Keywords: lower genital tract infections; Bacterial Vaginosis; *Candida albicans*.

1. INTRODUCTION

Lower genital tract infections (LGTIs) are frequent among women, particularly in low- to middle-income countries. The disorder is known to be caused by pathogens, which fall into two main categories: sexually transmitted infections (STIs) and endogenous bacterial overgrowth or infection. In 2016, according to the World Health Organization (WHO), around 376 million women acquired the four most common STI diseases, including Chlamydia, Gonorrhea, Syphilis, and Trichomoniasis [1]. However, endogenous infections, such as vulvovaginal candidiasis and bacterial vaginosis, continue to be the most prevalent causes [2], [3].

Bacterial vaginosis is the most common lower genital tract infection, affecting approximately 30% of women. This disease is associated with a disruption of the optimal vaginal microflora, which is characterized by a decreased proportion of lactic acid-producing bacteria and an increased rate of a wide range of strict and easily cultured anaerobes. Related bacteria include *Gardnerella vaginalis* (*G. vaginalis*), *Megasphaera spp.*, *Fannyhessea vaginale* [4].

Lower genital tract infection is not only an acute sickness, but it is also capable of causing consequences and sequelae, such as pelvic inflammatory diseases (PIDs), persistent pelvic pain, spontaneous abortion, stillbirth, low birth weight, neonatal infections, and infertility [5]. According to a study by Le Minh Tam et

al. (2014), the incidence of lower genital infections in cases with imminent preterm birth is 69.5% (25/36), including *Candida* (50%), *Escherichia coli* (8.3%), *Trichomonas vaginalis* (5.6%), and bacterial vaginosis (5.6%) are among the different pathogens [6].

Research by Nguyen Duc Vy et al. (2013) in 13 communes spreading over Hue and Quang Tri province shows that rate of LGTIs is 63.9%, in which 73.7% is vaginitis and 24.1% is cervicitis. Among pathogens, bacteria take up the highest place with 77.8%, then yeast with 14% [7]. In order to evaluate this disease through clinical examination and wet mount test, we conduct this study aiming to:

Nguyen Duc Vy et al. (2013) found that the rate of LGTIs in 13 communes dispersed over Hue and Quang Tri provinces is 63.9%, of which 73.7% are vaginitis and 24.1% are cervicitis. Among pathogens, bacteria account for 77.8%, followed by yeast at 14% [7]. In order to analyze this disease via clinical examination and wet mount test, this study sought to determine the prevalence of lower genital tract infections among women in Quang Tri province.

2. MATERIALS AND METHODS

This descriptive cross-sectional study recruited women ages 21 to 65 with a history of sexual activity who agreed to participate after receiving clear information. Between July 2019 and July 2020, a total of 1010 cases

were recruited from 12 communes in three districts of Quang Tri province, including Hai Lang, Trieu Phong, and Gio Linh. Women who had a total hysterectomy, became pregnant, or in the postpartum phase had a vaginal suppository or douching within the previous 24 hours were excluded from the study.

The study followed the flowchart below:

Step 1: Organize training, standardize the gynecological examination method, and address researchers' and doctors' inquiries.

Step 2: Conduct interviews with research participants to collect data according to the research questionnaire.

Step 3: Assess the status of the cervix and vagina, document any abnormalities, and collect cervical/vaginal fluid samples for a wet mount exam.

Step 4: Doctor/parasitology technician observes the specimen under a microscope (wet mount) as the fourth step.

Step 5: Perform data analysis and processing.

Classify the results of wet mount – giemsa stain: characteristics of vaginitis; causal agents include: Negative (normal result; absence of infection) and Positive (an infectious agent is present). Pathogens included bacterial vaginosis (*Gardnerella vaginalis*) yeast infection (caused by *Candida*), Trichomoniasis, bacteria (Gram (+) and Gram (-) cocci)

Using the SPSS 20.0 and Excel applications, data were entered, processed, and analyzed. Identifier variables: quantity (n), percentage (%). Quantitative variables: mean (X), standard deviation (SD). Analyze the association between related factors and residential LGTIs using the Chi-square test. When 20% of cells have predicted values of less than five, the Chi-squared test is replaced by Fisher's exact test. When $p < 0.05$, the test is statistically significant.

The research protocol was approved by the Ethics Committee in Biomedical Research, University of Medicine and Pharmacy, Hue University.

3. RESULTS

3.1. General characteristics of research participants

Table 1. General characteristics of research participants

Characteristics	Groups	Quantity (n=1010)	Percentage (%)
Age (years)	21 - 29	54	5.3
	30 - 39	269	26.6
	40 - 49	381	37.7
	50 - 59	262	25.9
	≥ 60	44	4.4
	± SD (Min - Max)		44.2 ± 9.2 (22 - 65)
Educational level	Illiteracy	24	2.4
	Primary school	29	2.9
	Junior high school	42	4.2
	Senior high school	775	76.7
	Technical school, college, university	140	13.9
Occupation	Farmer	614	60.8
	Officers	106	10.5
	Housewife	87	8.6
	Others	203	20.1

The average age of study participants was 44.2 ± 9.2 years (Min - Max: 22 - 65). 76.7% of the population has completed their high school education. Among all occupations, farming accounts for the greatest proportion (60.8%).

3.2. Histories of obstetric and gynecological conditions

Table 2. Histories of obstetric and gynecological conditions

Factors	Groups	Quantity (n=1010)	Percentage (%)
Marriage status	Currently living with husband	985	97.5
	Single and sexually active	4	0.4
	Divorce	10	1.0
	Widow	11	1.1
Number of children	0 - 2	423	41.9
	3 - 5	509	50.4
	≥ 5	78	7.7
Number of miscarriages	0	679	67.2
	1 - 2	319	31.6
	≥ 3	12	1.2
Contraceptive methods	Do not use	355	35.1
	Currently use:	655	64.9
	- External ejaculation	208	31.8
	- Condom	114	17.4
	- Intrauterine devices	281	42.9
	- Contraceptive pills	31	4.7
	- Calculate ovulation date	11	1.8
- Others	10	1.5	
Previous gynecological diseases	Genital infection	371	36.7
	Abnormal vaginal bleeding	5	0.5
	Gynecological tumor	58	5.7
	Others	24	2.4

With a rate of 97.5%, the majority of women live with their spouses. The current proportion of children aged 3 to 5 represents the highest proportion (50.4%). There were 64.9% of instances employing contraceptive techniques, with the IUD being the most prevalent (42.9%), followed by external ejaculation (31.8%). 36.7% of women had a history of lower genital tract infection.

3.3. Clinical signs and symptoms

Table 3. Clinical signs and symptoms

Gynecological signs and symptoms	Quantity (n=1010)	Percentage (%)	
Symptoms	Itchy	220	21.8
	burning	35	3.5
	Dysuria	12	1.2
	Dyspareunia	47	4.7

	Chronic pelvic pain	14	1.4
	Abnormal discharge	74	7.3
	Others	12	1.2
	No symptoms	700	69.3
Vulva experience	Normal	1006	99.6
	Red and swelling	3	0.3
	Lichenification	1	0.1
Discharge characteristics	Transparent	550	54.5
	Opalescent	413	40.9
	Yellowish	28	2.8
	Foamy	9	0.9
	Greenish-yellow	10	1.0
Characteristics of cervical mucus	Less transparent	732	72.5
	More transparent	106	10.5
	Less opaque	137	13.6
	More opaque	35	3.5
Cervix	Normal	473	46.8
	Ectropion	279	27.6
	Acute inflammation	39	3.9
	Regenerative (metaplasia)	16	1.6
	Polyp	69	6.8
	Sore, bleeding	3	0.3
	Nabothian cyst	123	12.2
Atrophic inflammation	17	1.7	

Itching was the most prevalent gynecological symptom (21.8%), followed by abnormal discharge (2.7%). In 46.8% of instances, a gynecological checkup revealed a normal cervix.

3.4. Wet mount examination results

Table 4. Vaginal discharge wet mount results

Wet mount results	Quantity (n=1010)	Percentage (%)
Negative	408	40.4
Positive	602	59.6
Agents (n=773)		
- Mixed flora	267	34.5
- <i>Gardnerella vaginalis</i>	118	15.3

- Bacteria	280	36.2
- Yeast	106	13.7
- <i>Trichomonas Vaginalis</i>	2	0.3

The results of wet mount showed 59.6% positive cases. *Bacterial agents* accounted for the highest proportion (36.2%), followed by *bacterial vaginosis* (15.3%) and fungi (13.7%), parasites accounting for 0.3%.

3.5. Factors relating to the wet mount examination results

Table 5. Factors relating to the wet mount examination results

Wet mount results	Negative (n = 408)	Positive (n = 602)	Total (n = 1010)	p-value	OR (95%CI)
Age (year old)					
< 50 years	415 (68.9%)	289 (70.8%)	704 (69.7%)	0.520	-
≥ 50 years	187 (31.1%)	119 (29.2%)	306 (30.3%)		
Educational level					
< Senior high school	32 (7.8%)	63 (10.5%)	95 (9.4%)	0.161	-
≥ Senior high school	376 (92.2%)	539 (89.5%)	915 (90.6%)		
Current number of children					
< 3	178 (43.6%)	245 (40.7%)	423 (41.9%)	0.354	-
≥ 3	230 (56.4%)	357 (59.3%)	587 (58.1%)		
Occupation					
Farmer	267 (65.4%)	347 (57.6%)	614 (60.8%)	0.013	0.719 (0.554 - 0.932)
Others	141 (34.6%)	255 (42.4%)	396 (39.2%)		
History of genital infections					
Yes	162 (39.7%)	209 (34.7%)	371 (36.7%)	0.107	-
No	246 (60.3%)	393 (65.3%)	639 (63.3%)		
Contraceptives					
Use	264 (64.7%)	391 (65.0%)	655 (64.9%)	0.936	-
Do not use	144 (35.3%)	211 (35.0%)	355 (35.1%)		
Intrauterine devices					
Use	100 (24.5%)	191 (31.7%)	291 (28.8%)	0.013	0.699 (0.526 - 0.928)
Do not use	308 (75.5%)	411 (68.3%)	719 (71.2%)		

We observed a correlation ($p < 0.05$) between IUD insertion, farmer occupation, and positive test findings.

4. DISCUSSION

As shown in Table 1, the average age of research participants is 44.2 ± 9.2 , 76.7% of women have completed high school or above. We observed a

correlation between age groups and menopausal status and LGTIs status. According to a study conducted by Mohamed Diadihou et al. (2019) on 276 women of reproductive age, the rate of female genital tract infection

was 69.6% [5]. In 2016, Le Lam Huong et al. found that 49.4% of women with LGTIs and a menopause duration of less than 5 years comprised the greatest proportion [8]. Regarding occupation, the majority (60.8%) are farmers, which correlates well with research areas in six communes in three districts Gio Linh, Trieu Phong, and Hai Lang, which are agriculturally based communes.

Tables 2 and 3 demonstrate that 97.5% of the women in the survey currently reside with their husbands. Currently, there are three to five children occupying the first spot (50.4%). There are 64.9% of cases involving the use of contraceptives, with the majority involving intrauterine devices (42.9%), followed by external ejaculation (31.8%). 36.7% of women have a history of vaginal and cervical irritation. In our study, the majority of women present to the clinic with no or limited clinical symptoms, such as itching and rash (1.0%), cervicitis, etc (4.0%).

Infections of the lower genital tract were listed in table 4. Wet mount examination of vaginal fluid is commonly performed to investigate and determine the origin of abnormal discharge in females. This technique is utilized in the majority of gynecological examinations. Positive cases account for 59.6% of wet mount results in the current investigation. Bacterial agents scored first at 86.0%, followed by yeast at 13.7% and parasites at 0.3%. This result is fairly comparable to what Nguyen Duc Vy et al. (2013) discovered, namely that bacteria account for the largest proportion (77.8%), followed by fungi (14%) [7].

According to research by Mohamed Diadiou et al. (2019), bacterial vaginosis (39.5%) and vaginal candidiasis (29%) are the most prevalent causes of vaginal infections, while trichomoniasis is the third most common cause (2.5 percent). *Ureaplasma urealyticum* is the most common microbe causing cervical infections (27.5%), followed by *Mycoplasma hominis* (14.5%), *Chlamydia trachomatis* (4.7%), and *Neisseria gonorrhoeae* (1.1%) [5].

Vaginal candidiasis is an extremely prevalent illness that affects 75% of women at least once in their lifetimes. Sexual activity, recent antibiotic usage, pregnancy, and immunosuppression owing to HIV infection or diabetes that is poorly controlled are risk factors [9]. Using ELISA to detect IgM and IgG antibodies in serum samples, Tran Dinh Vinh et al. (2020) detected *C. trachomatis* infection in 15.6% of 600 women who visited clinics. Manual labor (OR = 2.1, 95% CI 1.4 - 3.2, $p = 0.0004$), first sex at 18 years old (OR = 1.9, 95% CI 1.2 - 2.7, $p = 0.0023$), lower abdominal discomfort pelvic pain (OR = 2.1, 95% CI 1.4 - 3.4, $p = 0.0007$), vaginitis (OR = 2.0, 95% CI 1.2 - 3.2, $p [10]$).

Concerning related factors, we identified significant correlations ($p < 0.05$) between the use of an intrauterine device (IUD), farming occupation, and

positive test findings while examining a number of parameters connected to positive wet mount results. A study conducted by Mohamed Diadiou et al. (2019) on 276 rural women with abnormal vaginal discharge in the city of Dakar revealed that more than two-thirds of participants suffer from lower genital tract infections (69.6%). Age less than 25 years, few years of formal education (less than 7 years), and recent sexual activity (less than 3 months prior) were individually associated with an increased risk of LGTIs in women with vaginal discharge [5].

Le Lam Huong et al. (2016) showed no statistically significant association between the practice of cleaning the vulva after urination, the practice of washing the vulva with an antiseptic solution, a history of LGTIs, and sexual contact with kinds of LGTIs ($p > 0.05$) [8]. The study by Semra Eroglu et al. (2022) revealed that the *bacterial vaginosis* was found in 46.3%, *Ureaplasma urealyticum* in 26.7%, and *Mycoplasma hominis* in 3.7%. The most significant risk variables for a bacterial agent were vaginal douching (aOR = 6.80, 95% CI: 3.60–12.8), a history of abortion (aOR = 2.82, 95% CI: 1.55–5.12), and a high body mass index (BMI) (aOR = 0.81, 95% CI: 0.74 – 0.81). The percentage of infertile patients with the above-mentioned characteristics was substantially higher than that of normal patients ($p = 0.002$) [11]. It indicates that there are a variety of elements associated with vaginal hygiene behavior that influence the LGTI trait.

In conclusion, lower genital tract infections are caused by a variety of pathogens and influenced by a number of variables, with bacterial pathogens being the most prevalent. The results of the study provide further clinical and epidemiological data that may aid in enhancing the quality of treatment for infections of the lower genital tract.

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REFERENCES

1. World Health Organization. Report on global sexually transmitted infection surveillance 2018 [Internet]. Geneva: World Health Organization; 2018 [cited 2022 Jul 4]. 63 p. Available from: <https://apps.who.int/iris/handle/10665/277258>
2. Suiza) OM de la S (Ginebra, Who, Organization WH, UNAIDS. Guidelines for the Management of Sexually Transmitted Infections. World Health Organization; 2003. 101 p.
3. Jansåker F, Frimodt-Møller N, Li X, Sundquist K. Novel risk factors associated with common vaginal infections: a nationwide primary health care cohort study.

- Novel risk factors for vaginal infections. *International Journal of Infectious Diseases*. 2022 Mar 1;116:380–6.
4. Qin H, Xiao B. Research Progress on the Correlation Between Gardnerella Typing and Bacterial Vaginosis. *Front Cell Infect Microbiol*. 2022 Mar 25;12:858155.
 5. Diadiou M, Ba Diallo A, Barry MS, Alavo SC, Mall I, Gassama O, et al. Prevalence and Risk Factors of Lower Reproductive Tract Infections in Symptomatic Women in Dakar, Senegal. *Infect Dis (Auckl)*. 2019 May 31;12:1178633719851825.
 6. Lê Minh Tâm, Trần Minh Thắng, Nguyễn Minh Chánh. Nghiên cứu tình trạng nhiễm trùng sinh dục thấp trong dọa sinh non. *Tạp chí Phụ sản tập 12 số 1, tháng 4/2014*, tr:68 - 71.
 7. Nguyễn, Đức V., Dương, L. D., & Phan, T. H. (2014). Thực trạng viêm nhiễm đường sinh dục dưới và tìm hiểu yếu tố liên quan đến thói quen vệ sinh của phụ nữ tại 13 xã – Huế và Quảng Trị năm 2013. *Tạp Chí Phụ sản*, 12(3),28-31. <https://doi.org/10.46755/vjog.2014.3.969>.
 8. Lê, L. H. (2016). Tình hình viêm nhiễm đường sinh dục thấp ở phụ nữ mãn kinh đến khám tại Bệnh viện Trường Đại học Y Dược Huế. *Tạp Chí Phụ sản*, 14(2), 56-61. <https://doi.org/10.46755/vjog.2016.2.733>.
 9. Van Schalkwyk J, Yudin MH, Yudin MH, Allen V, Bouchard C, Boucher M, et al. Vulvovaginitis: Screening for and Management of Trichomoniasis, Vulvovaginal Candidiasis, and Bacterial Vaginosis. *Journal of Obstetrics and Gynaecology Canada*. 2015 Mar 1;37[3]:266–74.
 10. Trần, Đình V., Phạm, C. K., Huỳnh, M. N., & Lê, H. Y. C. (2020). Tình hình nhiễm Chlamydia trachomatis ở bệnh nhân đến khám tại Bệnh viện Phụ sản - Nhi Đà Nẵng năm 2018 - 2019. *Tạp Chí Phụ sản*, 18(2), 57-62. <https://doi.org/10.46755/vjog.2020.2.1115>.
 11. Eroglu S, Asgin N. Bacterial vaginosis and Mycoplasma infections in reproductive-age women: Clarifying the association with risk factors. *Clínica e Investigación en Ginecología y Obstetricia*. 2022 Oct 1;49[4]:100769.