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## Original Article

## Prevalence and risk factors for bacterial vaginosis and cervicitis among 511 female workers attending gynecological examination in Changchun, China

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## ABSTRACT

**Objective:** This study aims to identify the prevalence of bacterial vaginosis (BV) and cervicitis among 511 female workers attending gynecological examination and determine the risk factors for bacterial vaginosis and cervicitis.**Materials and methods:** This study enrolled 511 female workers attending gynecological examination in Changchun Obstetrics-Gynaecology Hospital in Changchun city from January 1, 2015 to December 31, 2015. A structured questionnaire was designed to survey the general demographic characteristics, living habits and health status of the participants. Gynecological examinations were performed to assess the presence of bacterial vaginosis and cervicitis. Univariate and multivariate logistic regression analysis were used to identify risk factors associated with bacterial vaginosis and cervicitis.**Results:** Of 511 female workers (median age, 40 years) were enrolled in our study, the prevalence of BV was 5.3%, and the prevalence of cervicitis was 22.1%. In multivariable analysis, women of specific ethnic groups had a higher odds ratio of BV (OR = 3.332, 95%CI 1.014–10.955) and premenopausal women had a reduced odds ratio of BV (OR = 0.162, 95%CI 0.061–0.425). Higher levels of education were associated with a reduced odds ratio of cervicitis (OR = 0.248, 95%CI 0.080–0.772).**Conclusions:** BV and cervicitis were both common among female workers. Improving women's educational level should be concerned so as to reduce the prevalence of cervicitis.© 2019 Taiwan Association of Obstetrics & Gynecology. Publishing services by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## Introduction

Worldwide, total DALYs (disability-adjusted life years) due to gynecologic diseases increased from 9292.8 thousands in 2005, to 10255.1 thousands in 2015 [1]. Both sexual and reproductive health are important to health outcomes all over the world. Over the entire life course, women's sexual and reproductive health play significant roles in their physical and mental health and well-being [2]. However, gynecologic diseases are common around the world and have become major health problems among women of reproductive age.

Bacterial vaginosis (BV) is a polymicrobial clinical syndrome which is characterized by the replacement of vaginal *Lactobacillus*

sp. with predominantly anaerobic bacteria such as *Ureaplasma*, *Mycoplasma*, *Gardnerella vaginalis*, *Prevotella*, *Peptostreptococcus* and *Bacteroides* spp [3,4]. Cervicitis is an inflammatory condition of the cervix which is frequently asymptomatic and common among women of reproductive age [5]. Both BV and cervicitis are prevalent in Africa, Europe, Asia and even the whole world [6], and have been associated with an increased risk of pelvic inflammatory disease, adverse pregnancy outcomes, and human immunodeficiency virus (HIV) [7–9]. While epidemiological researchers have shown that BV was associated with race, increasing sexual partners, low education attainment, and oral contraceptive pills [10,11], the risk factors for cervicitis included older age, female sex partner, unprotected sex [9,12]. In China, BV and cervicitis were quite common and became health threats among women of reproductive age [13,14]. However, BV and cervicitis were continued to be overlooked these years and there is still a lack of studies on the epidemiology of BV and cervicitis in northeast China.

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Considering the scarce data available in Changchun, China, a cross-sectional study was undertaken in Changchun Obstetrics-Gynaecology Hospital during 2015. The aim of this study was to determine the prevalence of BV and cervicitis and risk factors associated with BV and cervicitis among female workers in Changchun, Jilin Province, China.

## Methods

The study was conducted in Changchun Obstetrics-Gynaecology Hospital in Changchun, Jilin Province, China. Every year, some companies and units in Changchun City organize their female employees to take routine gynecological examinations at the Changchun Obstetrics-Gynaecology Hospital. All female workers attending gynecological examination in the maternity hospital between 1 January 2015 and 31 December 2015 were offered this study. Women with informed consent were recruited. The inclusion criteria included: 1) aged 18 years or older; 2) had lived in communities in Jilin province for more than 6 months as of June 30, 2015; 3) engaged in any of the eight occupations in the Occupational Classification of People's Republic of China [15]: leaders of Party organs, state organs, mass organizations, social organizations and institutions; professional skilled worker; service personnel and related personnel; social production and life service personnel; agricultural, forestry, animal husbandry and fishery production staff; manufacturing and related personnel; soldier; other practitioners. Exclusion criteria included: 1) virgin; 2) women who were unemployed or retired; 3) women in pregnancy or lactation; 4) women who were menstruating; 5) intravaginal medication in the past 72 h; 6) HIV infection; 7) after hysterectomy; 8) subjects with missing data on age, age of first sex or gynecological examination results. Ethical approval was obtained by the Ethics Committee of the School of Public Health, Jilin University (reference number: 2015-03-16). Informed consent was obtained from all participants. We confirm that all methods were performed in accordance with the relevant guidelines and regulations.

A structured questionnaire was used to collect data including demographic characteristics (age, ethnic, marital status, education, family monthly income per capita), living habits (smoking, drinking, and diet habit), family history of gynecological diseases (vaginitis, cervicitis, uterine fibroid, annex inflammation and others), personal history of gynecological diseases (vaginitis, cervicitis, uterine fibroid, annex inflammation and others), personal history of menstruation (age at menarche, menstrual cycle, menstrual duration and last menstrual period), personal history of childbearing (gravidity, parity, abortion number, and delivery mode), and personal history of sexual life (age of first sex and contraceptive use). All the eligible participants completed the questionnaire face to face under the guidance of trained gynecologists.

Routine gynecological examination including female breasts, abdomen and genitalia were performed by centrally trained gynecologists. Vaginal and endocervical samples were collected for both asymptomatic and symptomatic subjects. Cervicitis was defined as the presence of visible purulent or mucopurulent endocervical exudate on an endocervical swab specimen or in the endocervical canal [3]. Bacterial vaginosis was diagnosed using the Amsel's Diagnostic Criteria [16] which requires at least three of the following symptoms: 1) thin and homogeneous vaginal discharge covering the vaginal walls; 2) the presence of clue cells on the microscopic examination; 3) pH of vaginal fluid higher than 4.5; 4) positive "whiff test": a fishy odor of the vaginal discharge before or after addition of 10% potassium hydroxide (KOH).

During the period from January 1, 2015 to December 31, 2015, a total of 550 women participated in our study. Of the 550 subjects, 12 subjects were excluded due to missing data on age or age of first sex, 10 subjects were excluded because they were unemployed or

retired, 17 subjects were excluded because they did not carry on a gynecological examination. In the end, 511 eligible participants were enrolled in the study, all of them completed the questionnaire and sample collection.

All the data collected were entered twice into a database using EpiData 3.0 and analyzed using SPSS 18.0 software (version 18.0; SPSS). The prevalence was calculated, and associations between the characteristics of the subjects and bacterial vaginosis/cervicitis were measured by Rao-Scott Chi-squared tests and the Mann-Whitney U test (for nonparametric comparisons of continuous variables). The characteristics that were assessed included demographic characteristics, as well as current smoking and drinking, diet habit, family history of gynecological diseases, personal history of gynecological diseases, age at menarche, age of first sex, gravidity, parity, history of abortion, menopause status, delivery mode, and contraceptive use. Multivariate analysis was used to assess the potential risk factors (method: backward conditional, entry probability = 0.05, removal probability = 0.10). A two-tailed P-value of <0.05 was considered significant.

## Results

A total of 511 female workers, median age 40 years (range: 22–60 years) were included in the study. Hans comprised 94.5% (n = 483) of the study population, and other ethnic minorities represented 5.5% (n = 28). Overall, 96.5% of the subjects were

**Table 1**  
Characteristics of 511 female workers in Changchun City.

characteristics	N	Percentage (%)
Age		
18–29	49	9.6
30–39	219	42.9
40–49	199	38.9
50–60	44	8.6
Ethnic		
Han	483	94.5
Ethnic minorities	28	5.5
Marital status		
Married/cohabiting	493	96.5
Never married	7	1.3
Separated/divorced	9	1.8
Widowed	2	0.4
Education		
Junior middle school and below	35	6.8
Senior high school	52	10.2
Undergraduate	359	70.3
Graduate and above	65	12.7
Occupation		
Manual labor	35	6.8
Mental labor	456	89.2
Other works	20	4.0
Family monthly income per capita (RMB)		
<3000	84	16.4
3000–4999	190	37.2
≥5000	220	43.1
Unknown	17	3.3
Smoking		
Yes	2	0.4
Ever	1	0.2
No	508	99.4
Drinking		
Yes	51	10.0
No	460	90.0
Diet balance		
Meat more	33	6.5
Vegetable more	60	11.7
Balanced	418	81.8
Family history of gynecological disease		
Yes	105	20.5
No	406	79.5

**Table 2**

Univariate associations between the characteristics of the subjects and the presence of bacterial vaginosis and cervicitis.

Characteristic	Bacterial vaginosis				Cervicitis			
	Subjects with BV <sup>a</sup>	Subjects without BV <sup>a</sup>	OR (95% CI)	P	Subjects with cervicitis <sup>a</sup>	Subjects without cervicitis <sup>a</sup>	OR (95% CI)	P
Age, years				0.003				0.527
18–29	3 (11.1)	46 (9.5)	1.0 <sup>b</sup>		14 (12.4)	35 (8.8)	1.0 <sup>b</sup>	
30–39	10 (37.1)	209 (43.2)	0.7 (0.2,2.8)		47 (41.6)	172 (43.2)	0.7 (0.3,1.4)	
40–49	6 (22.2)	193 (39.9)	0.5 (0.1,2.0)		45 (39.8)	154 (38.7)	0.7 (0.4,1.5)	
50–60	8 (29.6)	36 (7.4)	3.4 (0.8,13.8)		7 (6.2)	37 (9.3)	0.5 (0.2,1.3)	
Ethnic				0.038				0.080
Han	23 (85.2)	460 (95.0)	1.0 <sup>b</sup>		103 (91.2)	380 (95.5)	1.0 <sup>b</sup>	
Others	4 (14.8)	24 (5.0)	3.3 (1.1,10.4)		10 (8.8)	18 (4.5)	2.1 (0.9,4.6)	
Marital status				0.905				0.054
Married/Cohabiting	26 (96.3)	467 (96.5)	1.0 <sup>b</sup>		107 (94.7)	386 (97.0)	1.0 <sup>b</sup>	
Never married	0	7 (1.4)	...		0	7 (1.7)	...	
Separated/divorced	1 (3.7)	8 (1.7)	2.2 (0.3,18.6)		6 (5.3)	3 (0.8)	7.2 (1.8,29.3)	
Widowed	0	2 (0.4)	...		0	2 (0.5)	...	
Education				0.176				0.035
Senior high school and below	8 (29.6)	79 (16.3)	1.0 <sup>b</sup>		25 (22.1)	62 (15.6)	1.0 <sup>b</sup>	
Undergraduate	15 (55.6)	344 (71.1)	0.4 (0.2,1.1)		81 (71.7)	278 (69.8)	0.7 (0.4,1.2)	
Graduate and above	4 (14.8)	61 (12.6)	0.6 (0.2,2.3)		7 (6.2)	58 (14.6)	0.3 (0.1,0.7)	
Occupation				0.413				0.390
Manual labor	3 (11.1)	32 (6.6)	1.0 <sup>b</sup>		11 (9.8)	24 (6.0)	1.0 <sup>b</sup>	
Mental labor	22 (81.5)	434 (89.7)	0.5 (0.2,1.9)		98 (86.7)	358 (89.9)	0.6 (0.3,1.3)	
Other works	2 (7.4)	18 (3.7)	1.2 (0.2,7.8)		4 (3.5)	16 (4.1)	0.5 (0.1,2.0)	
Income (RMB)				0.680				0.147
less than 3000	5 (18.5)	79 (16.3)	1.0 <sup>b</sup>		22 (19.5)	62 (15.6)	1.0 <sup>b</sup>	
3000–4999	13 (48.1)	177 (36.6)	1.2 (0.4,3.4)		48 (42.5)	142 (35.7)	0.9 (0.5,1.7)	
more than 5000	9 (33.3)	211 (43.6)	0.7 (0.2,2.1)		38 (33.6)	182 (45.7)	0.6 (0.3,1.1)	
unknown	0	17 (3.5)	...		5 (4.4)	12 (3.0)	1.2 (0.4,3.7)	
Smoking				1.000				1.000
Yes	0	2 (0.4)	...		0	2 (0.5)	...	
Ever	0	1 (0.2)	...		1 (0.9)	0	...	
No	27 (100.0)	481 (99.4)	1.0 <sup>b</sup>		112 (99.1)	396 (99.5)	1.0 <sup>b</sup>	
Drinking				0.393				0.650
Yes	4 (14.8)	47 (9.7)	1.6 (0.5,4.9)		10 (8.8)	41 (10.3)	0.8 (0.4,1.7)	
No	23 (85.2)	437 (90.3)	1.0 <sup>b</sup>		103 (91.2)	357 (89.7)	1.0 <sup>b</sup>	
Diet habit				0.218				0.025
Meat more	1 (3.7)	32 (6.6)	0.6 (0.1,4.8)		1 (0.9)	32 (8.0)	0.1 (0.0,0.8)	
Vegetable more	6 (22.2)	54 (11.2)	2.2 (0.8,5.7)		17 (15.0)	43 (10.8)	1.3 (0.7,2.5)	
Balanced	20 (74.1)	398 (82.2)	1.0 <sup>b</sup>		95 (84.1)	323 (81.2)	1.0 <sup>b</sup>	
Family history of gynecologic diseases				0.056				0.267
Yes	1 (3.7)	104 (21.5)	0.1 (0.0,1.0)		19 (16.8)	86 (21.6)	0.7 (0.4,1.3)	
No	26 (96.3)	380 (78.5)	1.0 <sup>b</sup>		94 (83.2)	312 (78.4)	1.0 <sup>b</sup>	
Personal history of gynecologic diseases				0.850				0.930
Yes	13 (48.1)	224 (46.3)	1.1 (0.5,2.3)		52 (46.0)	185 (46.5)	0.9 (0.6,1.5)	
No	14 (51.9)	260 (53.7)	1.0 <sup>b</sup>		61 (54.0)	213 (53.5)	1.0 <sup>b</sup>	
Age at menarche	14.0 (13.0,16.0) <sup>c</sup>	14.0 (13.0,15.0) <sup>c</sup>	0.8 (0.7,1.0) <sup>c</sup>	0.104	14.0 (13.0,15.0) <sup>c</sup>	14.0 (13.0,15.0) <sup>c</sup>	1.0 (0.9,1.1)	0.900
Age of first sex	24.0 (23.0,25.0) <sup>c</sup>	24.0 (23.0,26.0) <sup>c</sup>	1.0 (0.9,1.2) <sup>c</sup>	0.741	24.0 (22.0,26.0) <sup>c</sup>	24.0 (23.0,26.0) <sup>c</sup>	0.9 (0.9,1.0)	0.273
Age of first childbearing	27.0 (25.0,29.0) <sup>c</sup>	26.0 (24.0,29.0) <sup>c</sup>	0.9 (0.9,1.1) <sup>c</sup>	0.758	26.0 (24.0,28.0) <sup>c</sup>	27.0 (24.0,30.0) <sup>c</sup>	0.9 (0.8,0.9)	0.035
Gravidity	1.00 (1.0,3.0) <sup>c</sup>	1.00 (1.0,2.0) <sup>c</sup>	0.9 (0.6,1.2) <sup>c</sup>	0.421	1.00 (1.0,2.0) <sup>c</sup>	1.00 (1.0,2.0) <sup>c</sup>	0.9 (0.8,1.1)	0.483
Parity	1.0 (1.0,1.0) <sup>c</sup>	1.0 (1.0,1.0) <sup>c</sup>	1.4 (0.6,3.1) <sup>c</sup>	0.385	1.0 (1.0,1.0) <sup>c</sup>	1.0 (1.0,1.0) <sup>c</sup>	1.2 (0.8,1.8)	0.416
History of abortion				0.935				0.509
Yes	15 (55.6)	265 (54.8)	1.0 (0.4,2.1)		65 (57.5)	215 (54.0)	0.9 (0.6,1.3)	
No	12 (44.4)	219 (45.2)	1.0 <sup>b</sup>		48 (42.5)	183 (46.0)	1.0 <sup>b</sup>	
Delivery mode				0.628				0.263
Vaginal delivery	10 (37.0)	201 (41.5)	1.0 <sup>b</sup>		54 (47.8)	157 (39.5)	1.0 <sup>b</sup>	
Cesarean section	11 (40.7)	209 (43.2)	1.1 (0.4,2.5)		42 (37.2)	178 (44.7)	0.7 (0.4,1.1)	
Non delivery	6 (22.2)	74 (15.3)	1.6 (0.6,4.6)		17 (15.0)	63 (15.8)	0.8 (0.4,1.5)	
Contraceptive use				0.794				0.384
Un-contraceptives	8 (29.6)	136 (28.1)	1.0 <sup>b</sup>		27 (23.9)	117 (29.4)	1.0 <sup>b</sup>	
Intrauterine Device	6 (22.2)	151 (31.2)	0.7 (0.2,2.0)		42 (37.2)	115 (28.9)	1.6 (0.9,2.7)	
Condom	9 (33.3)	139 (28.7)	1.1 (0.4,2.9)		31 (27.4)	117 (29.4)	1.1 (0.6,2.0)	
Others	4 (14.8)	58 (12.0)	1.29 (0.3,4.0)		13 (11.5)	49 (12.3)	1.2 (0.5,2.4)	
Menopause state				<0.001				0.826
Yes	7 (25.9)	27 (5.6)	1.0 <sup>b</sup>		7 (6.2)	27 (6.8)	1.0 <sup>b</sup>	
No	18 (66.7)	441 (91.1)	0.2 (0.1,0.4)		101 (89.4)	358 (89.9)	1.1 (0.5,2.6)	
Unknown	2 (7.4)	16 (3.3)	0.5 (0.1,2.6)		5 (4.4)	13 (3.3)	1.5 (0.4,5.6)	

NOTE. Data are no. (%) of subjects, unless indicated otherwise. CI, confidence interval; OR, odds ratio.

<sup>a</sup> Data were not available for all variables for all subjects.<sup>b</sup> Reference 95% CI.<sup>c</sup> Data are median (P<sub>25</sub>, P<sub>75</sub>) for continuous variables.

**Table 3**  
Multivariate logistic regression analysis of risk factors for bacterial vaginosis.

	$\beta$	S.E.	Wald	Sig.	OR	95%CI
Ethnic						
Han	Reference					
Ethnic minorities	1.204	0.607	3.929	0.047	3.332	(1.014,10.955)
Menopause status						
Postmenopause	Reference					
Premenopause	−1.822	0.494	13.630	<0.001	0.162	(0.061,0.425)
Unknown	−0.592	0.869	0.464	0.496	0.553	(0.101,3.038)
Constant	−1.488	0.438	11.516	0.001	0.226	—

married or cohabiting. The majority (83%) had completed at least a undergraduate education. Table 1 showed socio-demographic and lifestyle characteristics of the participants. In addition, the average age at menarche was  $14.03 \pm 1.61$  years old. The average age of first sex was  $24.31 \pm 2.64$  years old. 45.2% (231/511) of the participants had a history of abortion. The results of the routine gynecologic examination showed that among 511 female workers participated in our study, 5.3% (27/511) of them had bacterial vaginosis, and 22.1% (113/511) of them had cervicitis.

The results of univariate analysis were showed in Table 2. The likelihood of BV was higher with age of 40–50, and premenopause. Female workers who were ethnic minorities had a lower likelihood of developing BV. No association was found between BV and education, marital status, occupation, income, menarche, gravidity, parity or the other potential risk behaviors noted. The prevalence of cervicitis varied by education, diet habit and the age of first child-bearing. However, age, education, marital status, occupation, family monthly income per capita, smoking, drinking, age of menarche, age of first sex, gravidity, parity and other potential risk factors noted were not significantly related to the risk of cervicitis.

Table 3 and Table 4 list risk factors for BV and cervicitis separately based on multivariate logistic regression. In the multivariable model, there was no association between cervicitis and education. Independent risk factors for BV was premenopause, while ethnic minorities were protective against BV. Graduate and above education was associated with a decreased likelihood of cervicitis.

## Discussion

This study was undertaken in Changchun, China in order to determine the epidemiological characteristics as well as the risk factors of bacterial vaginosis and cervicitis among female workers. In the present study of 511 female workers, we found that BV and cervicitis were relatively common. Overall, 5.3% (27/511) of the female workers involved in our study had bacterial vaginosis, and 22.1% (113/511) of them had cervicitis. Ethnic and menopause status were independently associated with bacterial vaginosis among female workers. In addition, graduate and above education was associated with a decreased likelihood of cervicitis. However, occupation was not found associated with BV or cervicitis.

There were several studies with similar aims in China [14,17,18], although they were limited to specific populations. In Maanshan city, a prospective study showed that changing underwear nearly

everyday, miscarriage history, urinary tract infection, and concurrent trichomoniasis and candidiasis were associated with BV [13]. A community-based, cross-sectional study in Beijing found that 11.4% of the 6339 married women aged 25–54 years suffered from common female lower genital tract infections (LGTIs), about 8.7% of the 6339 married women had bacterial vaginosis. The risk factors included not using condoms, two or more sexual partners and age 30–49 years [14].

Although bacterial vaginosis is not considered a sexually transmitted infection (STI) in many studies, a systematic review showed that the epidemiological profile of BV was similar to that of established STIs such as trichomoniasis and chlamydia [11,19]. Worldwide, BV had a high prevalence and increased the risks of suffering of many other diseases including human immunodeficiency virus (HIV) [8]. The prevalence of BV varied between different ethnicities and geographical regions [8]. In a nationally representative sample of the US civilian non-institutionalized population, the prevalence of BV was 29.2% [10]. In southeastern Brazil [20], a cross-sectional study showed that 30.1% of the 1519 women aged 14–54 years attending 18 primary healthcare units for cervical screening had BV. Previous studies [10,21,22] showed an association between BV and race, education, smoking and contraceptive use. Also, many other factors contribute to the prevalence of BV including douching, use of an intrauterine device, having male sexual partners or having more sexual partners, inconsistent condom use [8,19].

Apart from BV, cervicitis is also believed to be associated with significant adverse outcomes for women and plays a potential role in HIV transmission. However, lack of consensus regarding cervicitis case definition contributed to the lack of comparability between different studies [23,24]. In the United States, the results of a phase III, multi-center study [25] showed that 23% (131/577) of screened women were found to have mucopurulent cervicitis (MPC). Over half of the cases of MPC had cervicitis of unknown etiology. In an observational study in Peru, 24.90% participants had cervicitis among 497 female sex workers [26]. While in Brazil, a study included 251 young women of 15–25 years of age found that the overall prevalence rate of cervicitis was 83.2% (209/251) [27]. Compared to the study in Brazil, the results of our study showed the prevalence of cervicitis among 511 female workers was much lower (22.1%). Recent findings show that many aetiological agents may be associated with cervicitis including mycoplasma genitalium, herpes simplex virus, cytomegalovirus, bacterial vaginosis and Trichomonas [23]. However, demographic and behavioral factors can contribute to the developing of cervicitis. In a cross-sectional study performed in Iran from 2007 to 2009, a total of 13472 (47.3%) Iranian vulnerable household women were found to have different types of vulvovaginitis [24]. The results of a cross-sectional study showed that the women with reproductive tract infections were predominantly married, and they had a significantly higher number of pregnancies, lower education levels than the healthy women. However, oral contraceptives and current employment had been proved to be protective factors for reproductive infections [17]. In our study, diet habit was related to cervicitis in univariate analysis. This was consistent with a recent study on mouse experiments

**Table 4**  
Multivariate logistic regression analysis of risk factors for cervicitis.

	$\beta$	S.E.	Wald	Sig.	OR	95%CI
Education						
Senior high school and below	Reference					
Undergraduate	−0.385	0.277	1.933	0.164	0.680	(0.395,1.171)
Graduate and above	−1.395	0.580	5.790	0.016	0.248	(0.080,0.772)
Constant	−0.805	0.246	10.722	0.001	0.447	—



which confirmed that high-fat diets might be associated with severe uterine bacterial infections [28]. However, there are few population-based studies on the relationship between diet and cervicitis. Besides, age of first childbearing was also related to cervicitis in our univariate analysis. Nevertheless, previous studies have confirmed that age at first birth might be associated with obesity [29], breast cancer [30] and depression [31], while there is also a lack of clinical and epidemiological research on the relationship of first childbearing age and cervicitis. In multivariate analysis, graduate and above education had been proved to be associated with a lower risk of cervicitis, while the link between occupation and cervicitis has not been found.

We demonstrate a association between BV and ethnic and menopause status. Also, we found that higher levels of education were associated with a reduced odds of cervicitis. Another important finding of the present study was the significantly lower prevalence of BV among premenopausal women. This association remained significant even after controlling for age and demographic variables. And it might due to the drop in hormone levels or less sexual behaviors after menopause. Cervicitis and bacterial vaginosis (BV) are associated with an increased risk of upper genital tract and sexually transmitted infections [32] and acquisition of HIV [33,34]. So additional studies to more completely assess the significance of these findings are needed.

There are two limitations of this analysis. The first limitation of this study lies in the properties of the cross-sectional study. Second, due to highly representative sample of occupational women, results of this study cannot be generalized to all women.

## Conflicts of interest

The authors have no conflicts of interest relevant to this article.

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