Prevalence and Risk Factors of Cervicitis in Married Women in Shahroud, Northeast of Iran
Bahare Ameri¹, Moussa Abolhassani², *Fatemeh Mehravar³

¹ Clinical Research Development Unit (CRDU), Imam Hosein Hospital, Shahroud University of Medical Sciences, Shahroud, Iran ² Student Research Committee, Department of Epidemiology, School of Public Health, Shahid Beheshti University of Medical Sciences, Tehran, Iran ³ Clinical Research Development Unit (CRDU), 5th Azar Hospital, Golestan University of Medical Sciences, Gorgan, Iran

ABSTRACT
Introduction: Mucopurulent cervicitis (MPC) is a clinical syndrome characterized by mucopurulent discharge from the cervix and other signs of inflammation. In this study, we evaluated the prevalence and risk factors of MPC in married women referred to health centers of Shahroud (northeast of Iran) in 2016. Methods: In this cross-sectional study, 346 married women aged ≥18 years were screened for MPC via clinical examination by a gynecologist. Logistic regression was used to evaluate association of sociodemographic, behavioral and sexual health related variables with prevalence of cervicitis. Results: Mean age of subjects was 31.5 years (range 14–69 years) and 121 (35%) subjects had MPC. In addition, 38.2% of the subjects were with less than a high school diploma and 72.8% were housekeeper. The mean (standard deviation) value of body mass index was 25.2 (4.3) Kg/m² (range: 16.2-38.5 Kg/m²). Coital frequency per week (P=0.004) and method of delivery (P=0.02) were significantly associated with the prevalence of cervicitis. Conclusion: Our findings suggest that weekly coital frequency, method of delivery, vaginal discharge and history of genital herpes may be associated with the risk of cervicitis.

KEYWORDS: Mucopurulent cervicitis, MPC, Inflammation, Shahroud

INTRODUCTION
Sexually transmitted infections (STIs) are major causes of acute illness, infertility, long-term disability and death, affecting the life and well-being of millions around the globe (1). The infectious etiologies of cervicitis i.e. STI are notably more prevalent than the noninfectious causes (2). Mucopurulent cervicitis (MPC) is a clinical condition diagnosed by a visible, purulent or mucopurulent endocervical exudate in the endocervical canal or on an endocervical swab specimen and abnormal vaginal bleeding (3, 4). More elusive signs of this condition include edema of the cervical ectropion and increase in the number of polymorphonuclear leukocytes in Gram-stained smear from endocervical secretions under high-power magnification (5). Cervicitis is usually caused by STIs, such as chlamydia and gonorrhea (6), but it can also develop from noninfectious causes. Insertion of a device into the pelvic area, allergic reaction to spermicides used for birth control and latex condoms, and exposure to chemicals are among other causes of cervicitis (7).

Estimates of the prevalence of cervicitis vary widely mainly because it is not a reportable disease and there is no fully standardized clinical/diagnostic criteria (8). However, few studies estimated the true prevalence of cervicitis to be high among various clinical settings (9). Therefore, we aimed to evaluate the prevalence and risk factors of cervicitis in married women referred to health centers of Shahroud, Iran.

MATERIALS AND METHODS
This cross-sectional study was carried out during February 2016 to July 2016 on 346 women living in Shahroud, northeastern Iran. The subjects included married women aged ≥18 years who were randomly selected from 11 health centers in the city. Participation in the study was voluntarily and written consent was obtained from all participants prior to the beginning of the study. The subjects were screened for MPC via clinical examinations...
by a gynecologist. Specimen was collected from subjects with suspected clinical MPC diagnosed by presence of cervical mucopus and/or easily induced cervical bleeding (10). In pelvic examination, a speculum is inserted into the vagina to hold the vaginal walls apart, permitting inspection of the cervix and vaginal walls for redness, irritation, unusual discharge, or sores (11). Self-reported demographic and behavioral variables were collected verbally from each subject using a researcher-made questionnaire. The study variables included age, current vaginal symptoms (vaginal discharge, dysuria, spotting after intercourse and dyspareunia), coital frequency per week, number of children, and family planning method. Logistic regression was used to evaluate association of sociodemographic, behavioral, and sexual health related characteristics with the prevalence of cervicitis. Statistical analysis was done with SPSS (version 18) at significance level of 0.05. Data were analyzed using descriptive statistics including frequency, percentage and standard deviation (SD). Differences in categorical variables were analyzed using chi-square test and two-tailed Fisher's exact test, and continuous variables were compared using t-test. The study was approved by the Ethics Committee of Shahroud University of Medical Science (approval code: Ir.shmu.rec.1394.163).

RESULTS
Overall, 121 (35%) subjects had MPC. Table 1 represents the demographic data of the subjects under study. The mean (SD) age of the subjects was 31.5 (8.4) years. In addition, 38.2% of the subjects were with less than a high school diploma and 72.8% were housekeeper. The mean (SD) value of body mass index (BMI) was 25.2 (4.3) Kg/m² (range: 16.2-38.5 Kg/m²).

Table 1. Frequency of cervicitis and demographic characteristics of women referred to health centers in the city of Shahroud in 2016

| Variables                        | Non-cervicitis N=225 | Cervicitis N=121 | P-value |
|----------------------------------|----------------------|------------------|---------|
| Age (mean ± SD)                  | 32.1± 8.5 years      | 32.0± 8.4 years  | 0.42    |
| Age at time of first sexual intercourse (mean ± SD) | 20.0± 4.4 years | 19.9± 3.7 years | 0.81    |
| Educational status, N (%)        |                      |                  |         |
| Under high school diploma        | 72 (32)              | 34 (28.1)        | 0.37    |
| Diploma                          | 86 (38.2)            | 43 (35.5)        |         |
| Bachelor’s degree                | 20 (8.9)             | 18 (14.9)        |         |
| Master’s degree                  | 47 (20.9)            | 26 (21.5)        |         |
| Income, N (%)                    |                      |                  | 0.92    |
| <600 $                           | 52(23.1)             | 30(24.8)         |         |
| 600-1 million $                  | 67(29.8)             | 32(26.4)         |         |
| 1-2 million $                    | 80(35.6)             | 44(36.4)         |         |
| >2 million $                     | 26(11.6)             | 15(12.4)         |         |
| Occupation, N (%)                |                      |                  | 0.39    |
| Housekeeper                      | 168(74.7)            | 84(69.4)         |         |
| Employed                         | 17(7.6)              | 15(12.4)         |         |
| Proletarian                      | 13(5.8)              | 5(4.1)           |         |
| Self-employed                    | 27(12)               | 17(14)           |         |
| Smoking, N (%)                   |                      |                  | 0.50    |
| Yes                              | 9(4)                 | 4(3.3)           |         |
| No                               | 216(96)              | 117(96.7)        |         |
| Waterpipe smoking, N (%)         |                      |                  | 0.20    |
| Yes                              | 39(17.3)             | 16(13.2)         |         |
| No                               | 186(82.7)            | 105(86.8)        |         |
The coital frequency per week (P=0.004) and method of delivery (P=0.02) were significantly associated with the prevalence of cervicitis (Table 2).

Table 2. Factors related to sexual activity and fertility in women referred to health centers in the city of Shahroud in 2016

| Variables                              | Not cervicitis | Cervicitis | P-value |
|----------------------------------------|----------------|------------|---------|
|                                        | N=225          | N=121      |         |
| Coital Frequency per week              |                |            |         |
| None                                   | 33(14.7)       | 17(14)     | 0.004   |
| 1                                      | 38(16.9)       | 41(33.9)   |         |
| 2                                      | 84(37.3)       | 35(28.9)   |         |
| 3≤                                     | 70(31.1)       | 28(23.1)   |         |
| Number of children                     |                |            | 0.83    |
| None                                   | 74(32.9)       | 34(28.1)   |         |
| 1                                      | 64(28.4)       | 38(31.4)   |         |
| 2                                      | 62(27.6)       | 35(28.9)   |         |
| 3≤                                     | 25(11.1)       | 14(11.6)   |         |
| Method of delivery                     |                |            | 0.02    |
| Caesarean section                      | 69(30.7)       | 25(20.7)   |         |
| Natural childbirth                     | 83(36.9)       | 69(51.2)   |         |
| Family planning method                 |                |            | 0.38    |
| None                                   | 17(7.6)        | 7(5.8)     |         |
| Natural                                | 104(46.2)      | 56(46.3)   |         |
| Condom                                 | 43(19.1)       | 29(24)     |         |
| Pill                                   | 22(9.8)        | 5(4.1)     |         |
| Ampoule                                | 2(0.9)         | 2(1.7)     |         |
| Intrauterine device                    | 26(11.6)       | 11(9.1)    |         |
| Tubal ligation                         | 8(3.6)         | 8(6.6)     |         |
| Vasectomy                              | 3(1.3)         | 3(2.5)     |         |
| Time to use the family planning method |                |            | 0.75    |
| None                                   | 12(5.3)        | 6(5)       |         |
| A few months                           | 44(19.6)       | 19(15.7)   |         |
| One year                               | 30(13.3)       | 13(10.7)   |         |
| Two years                              | 18(8)          | 9(7.4)     |         |
| Three years and more                   | 121(53.8)      | 74(61.2)   |         |
| History of infertility                 |                |            | 0.43    |
| Yes                                    | 18(8)          | 95(78.5)   |         |
| No                                     | 207(92)        |            |         |
| History of abortion                    |                |            | 0.53    |
| Yes                                    | 48(21.3)       | 26(21.5)   |         |
| No                                     | 177(78.7)      | 95(78.5)   |         |
| History of gynecological infections    |                |            | 0.27    |
| Yes                                    | 165(73.3)      | 93 (76.9)  |         |
| No                                     | 60(26.7)       | 28(23.1)   |         |
| Sexual engagement outside marriage     |                |            | 0.58    |
| Yes                                    | 8(3.6)         | 4(3.3)     |         |
| No                                     | 217(96.4)      | 117(96.7)  |         |
| Antibiotics use in the past month      |                |            | 0.17    |
| Yes                                    | 71(31.6)       | 45(37.2)   |         |
| No                                     | 154(68.4)      | 76(62.8)   |         |
Frequency of dysuria, vaginal discharge and dyspareunia among non-cervicitis subjects was 26.7%, 46.7% and 31.1%, respectively. Most subjects with cervicitis (58.7%) had vaginal discharge. Moreover, 3.1% of non-cervicitis subjects and 7.4% of subjects with cervicitis had history of genital herpes (Table 3). Obesity was more common among non-cervicitis subjects (18.2 %) compared to subjects with cervicitis (12.4 %).

### Table 3: Clinical symptoms and characteristics of women with and without cervicitis referred to health centers in the city of Shahroud in 2016

| Symptoms                  | Non-cervicitis | Cervicitis | P-value |
|---------------------------|----------------|------------|---------|
|                           | N=225          | N=121      |         |
| Dysuria                   | Yes            | 60(26.7)   | 29(24)  | 0.34    |
|                           | No             | 165(73.3)  | 92(76)  |         |
| Vaginal discharge         | Yes            | 105(46.7)  | 71(58.7)| 0.02    |
|                           | No             | 120(53.3)  | 50(41.3)|         |
| Spotting after intercourse| Yes            | 19(8.4)    | 11(9.1) | 0.49    |
|                           | No             | 206(91.6)  | 110(90.9)|        |
| Dyspareunia               | Yes            | 70(31.1)   | 37(30.6)| 0.51    |
|                           | No             | 155(68.9)  | 84(69.4)|         |
| History of genital herpes | Yes            | 7(3.1)     | 9(7.4)  | 0.04    |
|                           | No             | 218(96.9)  | 112(92.6)|        |
| Oral sex                  | Yes            | 94(41.8)   | 49(40.5)| 0.45    |
|                           | No             | 131(58.2)  | 72(59.5)|         |

### DISCUSSION

In this study, the frequency of cervicitis was 35% among 346 women referred to health centers of Shahroud. The findings also indicated that coital frequency, natural childbirth, vaginal discharge and herpes were associated with frequency of MPC. Recent studies in the US estimated the prevalence of cervicitis to be 5% among students, 10% among women referred to family clinics and more than 20% among women with STI (12). Another study in the US reported the prevalence of cervicitis to be 23% in the state of California, US (13). Similar studies in Mozambique (14) and China (15) estimated the prevalence of cervicitis to be 29.4% and 25.87%, respectively.

The frequency of cervicitis in our study (35%) is slightly higher than that of in the US and other studies. This could be due to several factors including consumption of antibiotics, presence of genitourinary infection, having multiple sex partners, number of subjects, diagnostic method, age of patients, race, culture, and geographical area (1, 14).

In a study by Marrazzol et al. in Washington, US, no significant correlation was observed between prevalence of cervicitis and use of vaginal douche, smoking, race and the frequency of sexual intercourse (6). Except for the frequency of sexual intercourse, we also found that the mentioned variables are significantly correlated to the prevalence of cervicitis. In Nairobi, factors including being single, age below 20 years, having multiple sex partners in the past three months and uterine secretion were found to be correlated with STI (16). Our study was performed only on married women, and there was a significant relationship between cervicitis and uterine secretion. However, other variables such as having multiple sex partners were not investigated due to cultural reasons or information withhold.

Inconsistent with our findings, in a study by Kyriakis et al., low educational and socioeconomic status were predictive
factors for STI (17). Similar to our findings, another study also found a significant correlation between genital herpes and cervicitis (5).

CONCLUSION
The results show that the prevalence of cervicitis in married women in Shohroud (northeastern Iran) is significantly correlated with vaginal discharge and history of genital herpes. It is suggested to perform similar studies in other parts of the country to determine the prevalence of cervicitis in Iran.

ACKNOWLEDGEMENTS
The authors would like to express appreciation to all participants in the study, the Vice Chancellor for Research Affairs at the Shahroud University of Medical Science for his spiritual support, and the Clinical Research Development Unit (CRDU) of 5th Azar Hospital at Golestan University of Medical Science.

CONFLICT OF INTEREST
The authors declare that there is no conflict of interest.

AUTHORS’ CONTRIBUTIONS
Bahare Ameri (BA), Moussa Abolhassani (MA) and Fatemeh Mehravar (FM) contributed to the conception and design of the study, the acquisition of data and analysis and interpretation of data. FM drafted the manuscript. All authors read and approved the final manuscript.

REFERENCES
1. Newman L, Rowley J, Vander Hoorn S, Wijesooriya NS, Unemo M, Low N, et al. Global estimates of the prevalence and incidence of four curable sexually transmitted infections in 2012 based on systematic review and global reporting. PloS one. 2015;10(12):e014334.
2. Lusk MJ, Konecny P. Cervicitis: a review. Current opinion in infectious diseases. 2008;21(1):49-55.
3. Manhart LE, Critchlow CW, Holmes KK, Dutro SM, Eschenbach DA, Stevens CE, et al. Mucopurulent cervicitis and Mycoplasma genitalium. The Journal of infectious diseases. 2003;187(4):650-7.
4. Ujević B, Habek J, Habek D. Prevalence of infection with Neisseria gonorrhoeae or Chlamydia trachomatis in acute mucopurulent cervicitis. Archives of Industrial Hygiene and Toxicology. 2009;60(2):197-203.
5. Marrazo JM, Martin DH. Management of women with cervicitis. Clinical infectious diseases. 2007;44(Supplement_3):S102-S10.
6. Da Ros CT, da Silva Schmitt C. Global epidemiology of sexually transmitted diseases. Asian journal of andrology. 2008;10(1):11-10.
7. McCormack WM, Augenbraun MH. Vulvovaginitis and cervicitis. Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases (Eighth Edition): Elsevier; 2015. p. 1358-71. e2.
8. Marrazo JM, Wiesenfeld HC, Murray PJ, Busse B, Meyn L, Krohn M, et al. Risk factors for cervicitis among women with bacterial vaginosis. The Journal of infectious diseases. 2006;193(5):617-24.
9. Wen D, Lan D. The newly diagnosis and treatment strategy for the chronic cervicitis [J]. Chinese Journal of Practical Gynecology and Obstetrics. 2008;1:002.
10. Aleta S, AKya A, Salimi A, Ahmadi K. The Frequency of Herpes Simplex Type 2 Infection in Women with Cervicitis in Kermanshah city in 2011. Journal of Zanjan University of Medical Sciences & Health Services. 2014;22(9).
11. Naji EN. Cytological and Microbial Investigation of Cervicitisby Endocervical Cytobrushe Smear in Some Iraqi Women Patients. Journal of Global Pharma Technology. 2018.
12. Khajehkarramedini M, Hashemi SA, Naderinasab M, Meshkat Z, AmelJamehdar S. Frequency of Chlamydia trachomatis infection in cervical and urethral samples referred to Ghaem Hospital of Mashhad. The Iranian Journal of Obstetrics, Gynecology and Infertility. 2011;13(6):17-21.
13. Taylor SN, Lensing S, Schwebke J, Lillis R, Mena LA, Nelson AL, et al. Prevalence and treatment outcome of cervicitis of unknown etiology. Sexually transmitted diseases. 2013;40(5).

14. Menéndez C, Castellsagué X, Renom M, Sacarlal J, Quintó L, Lloveras B, et al. Prevalence and risk factors of sexually transmitted infections and cervical neoplasia in women from a rural area of southern Mozambique. Infectious diseases in obstetrics and gynecology. 2010;2010.

15. YongJun G, Juntai W, Hui D. Analysis on Census Results for Married Women Cervicitisin 5605 Cases. Chinese Journal of Medicinal Guide. 2012;1:023.

16. Fonck K, Kidula N, Jaoko W, Estambale B, Claeys P, Ndinya-Achola J, et al. Validity of the vaginal discharge algorithm among pregnant and non-pregnant women in Nairobi, Kenya. Sexually transmitted infections. 2000;76(1):33-8.

17. Kyriakis KP, Hadjivassiliou M, Paparizos VA, Fletetakis A, Stavrianeas N, Katsambas A. Incidence determinants of gonorrhea, chlamydial genital infection, syphilis and chancroid in attendees at a sexually transmitted disease clinic in Athens, Greece. International journal of dermatology. 2003;42(11):876-81.