

# Prevalence and Associated Factors of Genital and Sexually Transmitted Infections in Married Women of Iran

Elahe Ahmadnia, Roghieh Kharaghani, Azam Maleki\*, Azar Avazeh, Saeideh Mazloomzadeh, Tahereh Sedaghatpisheh, Ahmad Jalilvand and Behnaz Molae

Department of Midwifery, School of Nursing and Midwifery, Zanjan University of Medical Sciences, Zanjan, Iran

## ARTICLE INFO

### Article history:

Received: 23 February 2016

Accepted: 28 July 2016

### Online:

DOI 10.5001/omj.2016.88

### Keywords:

Genital Infection; Sexually Transmitted Diseases; Pap Smear; Iran.

## ABSTRACT

**Objectives:** This study aimed to determine the prevalence of genital and sexually transmitted infections and its related factors in married women in Iran. **Methods:** We conducted a cross-sectional study of 4 274 married women living in urban and rural areas of the Zanjan province from 2012 to 2013. We used stratified cluster sampling to select the participants. Data collection included demographic characteristics, reproductive status, and cervical cytology results. **Results:** The prevalence of lower genital infections and sexually transmitted infections were 20.1% and 7.4%, respectively. The most common vaginal infection was bacterial vaginosis with a prevalence of 8.5%, and the most common sexually transmitted infection was *Trichomonas vaginalis* (1.4%). The use of the intrauterine device (IUD) as a contraceptive, living in an urban area, and experiencing vaginal discharge were significantly related to genital tract and sexually transmitted infections. **Conclusions:** There was a high prevalence of genital infection among women living in Zanjab. Screening and treatment of genital infection are necessary to prevent adverse consequences in women who use an IUD or live in urban areas.

Cervicovaginal infections are common in clinical medicine, and one of the most important causes of illness in women of reproductive age. They can lead to mortality and complications such as miscarriage, cervical cancer, preterm delivery, and infertility,<sup>1</sup> and also contribute to high costs in the healthcare system every year.<sup>2</sup> A variety of infectious organisms can affect the female genital system and are divided into two main groups: sexually transmitted infection and overgrowth of vaginal flora.<sup>3</sup> Almost 95% of vaginitis are caused by one of the three microorganisms: *Candida albicans*, *Gardnerella vaginalis*, or *Trichomonas vaginalis*.<sup>4,5</sup> The prevalence of sexually transmitted infections dramatically varies across the world and is affected by demographic features such as population distribution, age, race, and socioeconomics.<sup>6</sup> According to a report by the World Health Organization (WHO), nearly 500 million new cases of sexually transmitted infections are added each year throughout the world caused by four agents of *Chlamydia trachomatis*, *Neisseria gonorrhoea*, syphilis, and trichomoniasis.<sup>7</sup> Hepatitis, syphilis, genital herpes, and acquired immune deficiency syndrome (AIDS) are among the most

fatal sexually transmitted diseases, and each can increase the odds of comorbidity.<sup>8,9</sup> Furthermore, the human papillomavirus (HPV) has been recognized as a risk factor for cervical cancer.<sup>10,11</sup>

Genital infections are often asymptomatic, yet they may be identified with such symptoms as vaginal discharge, burning, itching, and a foul smell.<sup>12</sup> These infections may be diagnosed in different ways.<sup>13</sup> Specific methods have been proposed to diagnose genital infections, but are mostly impracticable. Diagnosis of sexually transmitted infections requires available and cost-effective tests.<sup>14,15</sup> The Pap smear was first proposed by George Papa Nicolaou in 1943 for early detection of changes in cervical cells.<sup>12</sup> The Pap smear is not a specific or sensitive test for detecting genital infections but is used for women of childbearing age to screen for cervical cancer and identify genital infections. It is used to look for specific cellular changes caused by microorganisms and to observe the microorganisms present in specimens.<sup>16,17</sup> Many women undergo an annual Pap smear test,<sup>18</sup> which is a simple, quick, cheap, and painless method for diagnosing cervicovaginal infections.<sup>13,14</sup> It can also be used as an appropriate method to detect genital infections, especially in

\*Corresponding author: ✉malekia@zums.ac.ir

developing countries.<sup>19</sup> Using Pap smear finding to determine the amount of genital infection can benefit interventions in these countries.

Several studies have been conducted across the world to determine the prevalence of genital infections based on Pap smear samples. A study in India reported the prevalence of genital infections as 50.07%.<sup>13</sup> Another study from Pakistan found that 38.3% of women had at least one genital infection.<sup>12</sup> Both studies used Pap smear samples to determine the prevalence.

Various studies have been conducted in Iran to determine the prevalence of genital and sexually transmitted infections in different populations. However, the majority of these studies were conducted among high-risk populations or symptomatic women, or on those attending hospitals or specialist clinics and not on a large and representative population.<sup>20,21</sup> There is a need to identify the effect of genital infections on women's health and the demographic factors of those affected to identify the prevalence and risk factors of genital infections and conduct appropriate interventions. Therefore, we sought to determine the prevalence of genital and sexually transmitted infections in married women in Iran living in the Zanjan province and the associated risk factors.

## METHODS

We conducted a cross-sectional study of 4 274 married women living in urban and rural areas of the Zanjan province from 2012 to 2013. Zanjan is 21 773 square kilometers and has 1 015 734 residents. It is located in Northwestern Iran and has eight large cities and 978 villages. According to Iranian law and culture, women lose their virginity after marriage. Early marriage, especially in rural areas, is common. Our study population included 20–65-year-old, married, divorced, and widowed women living in urban and rural areas. A sample size of 4 861 women was estimated based on 8% prevalence of genital infections in Iran reported by Maria et al<sup>21</sup> with 99% confidence and accuracy of 0.01. We aimed for a sample size of 5 000 to cover possible withdrawals. Of the 5 000 prepared samples, 726 samples were excluded from the study due to unsatisfactory or inadequate specimens. Finally, 4 274 samples remained for interpretation and examination. To prevent the loss of Pap smear results, we did not

exclude smears that lacked associated demographic or reproductive data. The study protocol was approved by Zanjan University of Medical Sciences and Health Services (UNI20PRJ532 ID Code).

Women who had not performed a Pap smear test during the past eight weeks and were eligible to obtain Pap smear were included in the study.<sup>22</sup> Patients who married under the age of 18 for at least three years and those who had not had a hysterectomy and no history of cancer or chronic diseases were selected for inclusion by the stratified cluster sampling method. Those who did not fit the selection criteria for obtaining a cervical smear, or who were unwilling to participate in the study were excluded. To conduct the stratified cluster sampling method, each of the cities of Zanjan province (Zanjan, Soltanieh, Abhar, Khoramdeh, Tarom, Ijrood, Mahneshan, and Khodabande) were considered a cluster. Urban and rural clinics were classified based on population distribution in each cluster, and one to 10 health centers were selected based on their covered populations. In each center, samples were selected from medical records using systematic random sampling. The percentage of women of reproductive age, according to the last census, in each city were: 44% in Zanjan, 17% each in Khodabande and Abhar, 6% in Khoramdeh, 5% in Tarom, 4% each in Ijrood and Mahneshan, and 3% in Soltanieh. Selected subjects were called and invited to participate in the study. The data collection tool was a checklist of demographic and reproductive characteristics and cervical cytology results.

After obtaining written consent from each woman, their demographic and reproductive information was obtained via interviews with trained midwives. Specimens of the cervix were obtained using a cervical brush (Rovers Cervix Brush, Rovers Medical Devices B.V., The Netherlands) by the standard method.

An expert pathologist interpreted and reported the Pap smear findings, which included direct examination of specimens and cytological examination using conventional staining procedures, with an emphasis on identifying infectious agents in the samples. Of the samples, 99.6% were good quality.

The prevalence of genital and sexually transmitted infections in all samples was separately investigated according to infection type. For reporting mixed infections, which may occur during sampling, we considered criteria based on at least one or more

genital or sexually transmitted infection. Factors associated with genital infections and sexually transmitted infections (infected vs. uninfected) were assessed using univariate and multivariate logistic regression models. We included variables such as place of residence, contraceptive method, vaginal discharge, menopause, age at first intercourse, and education in the final model. Data were analyzed using SPSS Statistics (SPSS Statistics Inc., Chicago, US) version 17. A  $p$ -value  $< 0.010$  was considered statistically significant.

## RESULTS

The mean age of participants was  $35.6 \pm 9.3$ . The mean age of marriage and first intercourse were  $16.4 \pm 10.3$  and  $19.2 \pm 4.3$  years, respectively. The majority of participants were housewives (94.6%) and educated to primary and junior high school level (65.8%). About half of women lived in rural areas and half in urban areas. The majority (57.4%) had a monthly income of US\$ 58–142 [Table 1]. More than 96% of women had a history of pregnancy and childbirth. Almost 40% of women complained about vaginal discharge, and 26.3% had previously had a Pap smear [Table 2].

Of the participants in this study, 850 (19.9%) were infected with at least one genital infection and 168 (3.9%) with at least one sexually

**Table 1:** Demographic profile of Iranian women living in the Zanzan province (n = 4 274).

Variables	Frequency	Percentage*
<b>Employment status</b>		
Housewife	4 006	94.6
<b>Educational level</b>		
Uneducated	519	12.5
Primary and junior high school	2 743	65.8
High school and diploma	708	17.0
Graduate	197	4.7
<b>Monthly income, US\$</b>		
< 58	1 186	30.4
58–142	2 235	57.4
> 142	475	12.2
<b>Place of residence</b>		
Urban	2 130	51.9
Rural	1 973	48.1

\*Differences in number for each variable are due to loss of some demographic or reproductive data.

**Table 2:** Reproductive profile of Iranian women living in the Zanzan province (n = 4 274).

Variables	Frequency	Percentage*
<b>Previous pregnancy</b>		
Yes	4 095	96.8
<b>Amenorrhea</b>		
Yes	760	18.2
<b>Method of contraception</b>		
None	818	19.5
Intrauterine device (IUD)	791	18.9
Others	2 586	61.6
<b>Type of delivery</b>		
Nulliparous or data missing	140	3.3
Cesarean section (C/S)	937	22.7
Normal vaginal delivery (NVD)	2 876	68.1
C/S and NVD	273	6.5
<b>Menopause</b>		
Yes	410	9.8
<b>Currently breastfeeding</b>		
Yes	610	14.4
<b>Vaginal discharge</b>		
Yes	1 611	39.2
<b>Previous Pap smear</b>		
Yes	1 105	26.3
<b>Pap smear result</b>		
Normal	1 067	97.4
Abnormal	29	2.7
<b>Knowledge of Pap smear</b>		
Yes	1 605	38.7
<b>Cervicitis</b>		
Yes	539	14.9

\*Differences in number for each variable are due to loss of some demographic or reproductive data.

**Table 3:** Frequency of genital and sexually transmitted infections (n = 4 274).

Infection	Frequency	Percentage*
Bacterial vaginosis	351	8.2
Candidiasis	278	6.5
Trichomoniasis	59	1.4
Chlamydia	43	1.0
Papillomavirus	29	0.7
Gonorrhea	26	0.6
Herpes simplex virus	11	0.3
At least one sexually transmitted infection	168	3.9
At least one genital infection	850	19.9

\*Differences in number for each variable are due to loss of some demographic or reproductive data.

**Table 4:** Odds ratios (99% CI) of having genital and sexually transmitted infection by related factors (univariate regression analysis).

Variables		Sexually transmitted infection	p-value	Genital infection	p-value
Age, years		1.00 (0.98–1.02)	0.652	1.00 (0.99–1.00)	0.673
Marriage age, years		0.99 (0.98–1.01)	0.966	0.99 (0.99–1.00)	0.945
First intercourse age, years		1.05 (0.86–1.28)	0.633	1.00 (0.98–1.02)	0.492
Amenorrhea	No	1	0.632	1	0.681
	Yes	1.05 (0.86–1.28)		1.08 (0.71–1.65)	
Previous pregnancy	No	1	0.812	1	0.723
	Yes	1.11 (0.44–2.77)		1.08 (0.7–1.66)	
Delivery type	C/S and NVD	1	0.845	1	0.929
	Cesarean section (C/S)	1.19 (0.47–2.97)	0.477	0.99 (0.64–1.51)	0.969
	Normal delivery (NVD)	0.94 (0.30–2.89)	0.301	1.83 (0.66–1.83)	0.692
	No delivery	0.90 (0.34–2.38)		1.02 (0.65–1.59)	
Employment status	Employed	1	0.986	1	0.922
	Housewife	1.00 (0.50–2.00)		1.01 (0.72–1.41)	
Educational level	Graduate	1	0.877	1	0.346
	Primary and junior high school	1.24 (0.69–2.22)	0.451	0.94 (0.71–1.25)	0.704
	High school and diploma level	0.77 (0.30–1.98)	0.592	0.72 (0.47–1.11)	0.142
	Uneducated	1.04 (0.63–1.17)		0.89 (0.71–1.12)	
Monthly income, US\$	More than 58	1	0.871	1	0.378
	58–142	1.07 (0.62–1.85)	0.781	0.84 (0.64–1.10)	0.223
	More than 142	1.02 (0.71–1.48)		0.92 (0.77–1.09)	
Place of residence	Rural	1	0.003	1	< 0.001
	Urban	1.64 (1.19–2.28)		1.39 (1.19–1.62)	
Method of contraception	Others	1	0.631	1	0.349
	Intrauterine device	1.84 (1.28–2.64)	0.001	1.15 (1.25–1.82)	< 0.001
	None	0.89 (0.57–1.40)		1.10 (0.90–1.34)	
Menopause	No	1	0.491	1	0.065
	Yes	0.82 (0.47–1.43)		0.77 (0.58–1.01)	
Currently breastfeeding	No	1	0.964	1	0.292
	Yes	0.98 (0.64–1.52)		1.12 (0.90–1.39)	
Vaginal discharge	No	1	0.001	1	< 0.001
	Yes	3.39 (2.42–4.74)		2.14 (1.83–2.51)	
Previous Pap smear	Yes	1	0.424	1	0.946
	No	0.86 (0.59–1.24)		0.99 (0.84–1.19)	
Pap smear result	Normal	1	0.891	1	0.138
	Abnormal	1.14 (0.15–8.79)		1.84 (0.82–4.11)	
Knowledge of Pap smear	Yes	1	0.084	1	0.452
	No	1.32 (0.96–1.80)		1.06 (0.90–1.23)	
Cervicitis	No	1	0.474	1	0.961
	Yes	1.17 (0.75–1.80)		0.99 (0.79–1.24)	

transmitted infection. Bacterial vaginosis (8.2%) and trichomoniasis (1.4%) were the most common vaginal and sexually transmitted infections [Table 3]. Place of residence ( $p < 0.001$ ), contraceptive method ( $p < 0.001$ ), and vaginal discharge ( $p < 0.001$ )

were significantly related to the risk of vaginal and sexually transmitted infections [Table 4]. In women who used an IUD as a contraceptive, the odds of having genital infection was 1.48 times greater than other contraceptive types (99% CI 1.21–1.82;

**Table 5:** Odds ratios (99% CI) of having genital and sexually transmitted infection by related factors (multivariate regression analysis).

Variables		Sexually transmitted infection*	p-value	Genital infection**	p-value
Method of contraception	Others	1	0.932	1	0.176
	IUD	1.74 (1.17–2.59)	0.006	1.48 (1.21–1.82)	< 0.001
	None	1.02 (0.63–1.63)		1.15 (0.93–1.43)	
Place of residence	Rural	1	0.001	1	< 0.001
	Urban	1.85 (1.29–2.65)		1.46 (1.23–1.73)	
Vaginal discharge	No	1	< 0.001	1	< 0.001
	Yes	3.73 (2.60–5.35)		2.25 (1.90–2.65)	

\*Data adjusted by menopause, the age of first intercourse, education, and has knowledge about Pap smears.

\*\*Data adjusted by menopause, the age of first intercourse, and education.

CI: confidence interval; IUD: intrauterine device.

$p < 0.001$ ). The odds of having genital infection was 1.46 times greater in women living in urban areas compared to rural areas (99% CI 1.23–1.73;  $p < 0.001$ ), and 2.25 times greater in women with vaginal discharge (99% CI 1.9–2.65;  $p < 0.001$ ). Additionally, the odds of having a sexually transmitted infection in women who used an IUD as a contraception was 1.74 times greater than those using other contraceptive types (99% CI 1.17–2.59;  $p < 0.006$ ). The odds of having sexually transmitted infection was 1.85 times greater in women living in urban areas compared to rural areas (99% CI 1.29–2.65;  $p < 0.001$ ), and 3.73 times greater in women with vaginal discharge (99% CI 2.60–5.35;  $p < 0.001$ ) [Table 5].

## DISCUSSION

The overall prevalence of genital and sexually transmitted infections was 19.9% and 3.9%, respectively. The most common genital infections were bacterial vaginosis (8.2%), candidiasis (6.5%), and trichomoniasis (1.4%). In addition, women who used IUD as a contraceptive, lived in urban areas, and had vaginal discharge, had a greater risk of genital or sexually transmitted infections.

The prevalence of genital infections was consistent with a study conducted in Gorgan (19.3%),<sup>20</sup> but higher than that reported in the Ahwaz (10.4%), Khozestan (8.8%), and Kalantari (7.5%) provinces of Iran.<sup>1,21,23</sup> Inconsistencies in the prevalence of genital infections could be due to differences in social, cultural, and sexual behaviors as well as the clinical conditions of the population. In our study, the prevalence of genital infections was

higher than those living in urban areas and those with vaginal discharge.

The most common genital infections were bacterial vaginosis, candidiasis, and trichomoniasis, which is consistent with several other studies conducted in Iran, China, and India.<sup>1,4,13,24</sup> According to the results of various studies, the prevalence of *Gardnerella vaginalis* ranged from 8% to 75%, *Candida albicans* from 2.2% to 30%, and *Trichomoniasis vaginalis* from 0% to 34%.<sup>23,25</sup> Bacterial vaginosis is the most common cause of abnormal vaginal odor and discharge. It is due to a change in the type of bacteria found in the vagina and often occurs during pregnancy. It may cause premature labor and delivery, premature rupture of membranes, postnatal uterine infections, urinary tract infections, and postpartum endometritis.<sup>26</sup> It can also increase the risk of HIV infection.<sup>27</sup> We reported a prevalence of 8.2%, which was less than that reported in India (18.34%),<sup>13</sup> but greater than that reported in a study conducted in the Khuzestan province of Iran.<sup>21</sup>

*Candida albicans* is identified by observing thin-walled blastospores and pseudohyphae in Pap smears. The prevalence of candidiasis was reported at 16.11% in India and 6.5% in China.<sup>13,24</sup> We reported a prevalence of 6.5%, which is similar to results obtained in Ahwaz (8.2%)<sup>1</sup> and in Khuzestan (6%),<sup>21</sup> but lower than that in Gorgan (14.5%).<sup>20</sup> The higher prevalence of candidiasis in Gorgan may be due to the climate and higher humidity of this city compared to Zanjan. In many cases, candidiasis is asymptomatic and does not require antifungal treatment, but clinical examination is required to determine the need for treatment.<sup>28</sup>

Trichomoniasis was the most common sexually transmitted infection. The prevalence of trichomoniasis has been reported as 5.9% in India, 2.5% in China,<sup>13,24</sup> 1.4% in Ahwaz, and 3.6% in Gorgan.<sup>1,20</sup> A study in Jordan reported that 0.7% and 0.5% of women with trichomoniasis were symptomatic or asymptomatic, respectively.<sup>29</sup> Diagnosis of trichomoniasis is vital, as it may have adverse effects on pregnancy outcomes, including premature rupture of membrane, preterm delivery, and low birth weight.<sup>30</sup> It may also facilitate transmission of HIV infection and increase its risk.<sup>27</sup>

The prevalence of chlamydia infection was the second highest sexually transmitted infection in this study (1.0%). Previous studies found a higher prevalence in symptomatic and asymptomatic women compared to our results (0.6% and 0.5%, respectively).<sup>29</sup> Chlamydia is one of the most common sexually transmitted diseases in the United States. This infection is easily spread because it often causes no symptoms and may be unknowingly passed to sexual partners. If left untreated, chlamydia infection can cause pelvic inflammatory disease. Studies have also suggested that *Chlamydia trachomatis* is considered a potential cofactor in the development of cervical intraepithelial neoplasia (CIN).<sup>31</sup>

Our results showed that there were greater odds of infection in women using IUD as a contraceptive, living in urban areas, and in those with clinical symptoms.<sup>32</sup> This is consistent with the results obtained in other studies, which confirmed that lifestyle and socioeconomic factors are related to genital infection in Iran and other countries.<sup>21,24,33</sup>

According to the WHO, in countries where specific tests cannot be easily or economically performed, the Pap smear test, detecting patients' complaints, or a combination of both may be used to determine appropriate treatment. Although we did not use a specific method to detect a variety of vaginal infections, we used clinical examination to evaluate infection, which may enhance the accuracy of our results. Other strong points of this study included sampling from rural and urban areas and a large sample size. However, there were limitations. Firstly, the prevalence of the infections may be under-reported due to the poor sensitivity of Pap smear tests in detecting genital infections. Secondly, chronic diseases such as diabetes mellitus and other risk factors may not have been detected due to the self-reported nature of the study. Finally, we had cases of

incomplete demographic and reproductive data due to the self-reported nature of the study. Therefore, generalization of our results is limited. It seems that demographic, economic, and cultural changes in cities and the greater influence of media such as the internet and their inappropriate use exposes women to a higher risk of genital and sexually transmitted infections. Considering people's lifestyle changes and the importance of controlling the spread of sexually transmitted infections, we suggest introducing primary and secondary preventive interventions to raise awareness of transmission and disease control, provide condom use training, and vaccination and screening to vulnerable groups (especially women living in urban areas that use IUDs).

## CONCLUSION

A large proportion of married women living in Zanjan, Iran, suffered from genital and sexually transmitted infections. We identified many factors that affected the risk of getting infection including the use of IUDs and living in urban areas. Primary and secondary preventive and planning policies are needed to control the transmission of such infections.

### Disclosure

The authors declared no conflicts of interest. The study was funded by the Deputy of Research and Technology of Zanjan University of Medical Sciences, and the Zanjan province general governor.

### Acknowledgements

The authors would like to thank the Deputy of Research and Technology of Zanjan University of Medical sciences, and the Zanjan province general governor for their contribution to the study. We would also like to thank the staff of the health center for their collaboration, and women for their participation

## REFERENCES

1. Makvandi S, Zargar SHoushtari, S. H. The Relationship of Cervicovaginal Infections in PAP Smear Sampels with Some Factos In Ahvaz, IRAN; An Epidemiological Study. Jundishapur Journal Of Chronic Disease Care 2012;1(1):55-61.
2. Heller DS, Pitsos M, Skurnick J. Does the presence of vaginitis on a Pap smear correlate with clinical symptoms in the patient? J Reprod Med 2008 Jun;53(6):429-434.
3. Giraldo P, Araújo E, Junior J, Amaral RL, Passos, Goncalves A.K. The prevalence of urogenital infections in pregnant women experiencing preterm and full-term labor. Infect Dis Obstet Gynecol 2012;37(3):1-4.
4. Shobeiri F, Soltani F, Nazari M. [Microbial Study of Hormonal and Surgical Contraceptive Methods in Hamadan,Iran]. J Knowledge and Health shahrod Univ. Med Sci 2010;5(1):41-44.
5. Parhizgar S, Moshafaa AA. Prevalence of servical-vaginal infections in pap-smear samples, Yasouj,1998-2000.

- Armaghan-e-Danesh 2002;7:37-44.[IN PERSIAN].
6. Mayaud P, Mabey D. Approaches to the control of sexually transmitted infections in developing countries: old problems and modern challenges. *Sex Transm Infect* 2004 Jun;80(3):174-182.
  7. Rowley J, Toskin I, Ndowa F. Global incidence and prevalence of selected curable sexually transmitted infections. World Health Organization 2012.
  8. Marianne J. Principles of gender-specific medicine Academic press. Elsevier: USA, 2010.
  9. Maleki M, Javidi Z, Mashayekhi V, Meibodi T, Nahidi Y, Esmaeili H, et al. [HIV and syphilis serologic survey on clinical wart annal genital patients]. *Medical Journal of Mashad University of Medical Sciences* 2004;51(100):87-94.
  10. Muñoz N, Bosch FX, de Sanjosé S, Herrero R, Castellsagué X, Shah KV, et al; International Agency for Research on Cancer Multicenter Cervical Cancer Study Group. Epidemiologic classification of human papillomavirus types associated with cervical cancer. *N Engl J Med* 2003 Feb;348(6):518-527.
  11. Roberts L, Passmore JA, Mlisana K, Williamson C, Little F, Bebell LM, et al. Genital tract inflammation during early HIV-1 infection predicts higher plasma viral load set point in women. *J Infect Dis* 2012 Jan;205(2):194-203.
  12. Bukhari MH, Majeed M, Qamar S, Niazi S, Syed SZ, Yusuf AW, et al. Clinicopathological study of Papanicolaou (Pap) smears for diagnosing of cervical infections. *Diagn Cytopathol* 2012 Jan;40(1):35-41.
  13. Aparna N, Nirup NC, Chandhana B, Nishanth N, Harendra Kumar ML. Spectrum of infections in cervico-vaginal pap smears. *J Clin Biomed Sci* 2014;4(1):222-225.
  14. Levi AW, Harigopal M, Hui P, Schofield K, Chhieng DC. Comparison of Affirm VPIII and Papanicolaou tests in the detection of infectious vaginitis. *Am J Clin Pathol* 2011 Mar;135(3):442-447.
  15. Hoebe CJ, Rademaker CW, Brouwers EE, ter Waarbeek HL, van Bergen JE. Acceptability of self-taken vaginal swabs and first-catch urine samples for the diagnosis of urogenital Chlamydia trachomatis and Neisseria gonorrhoeae with an amplified DNA assay in young women attending a public health sexually transmitted disease clinic. *Sex Transm Dis* 2006 Aug;33(8):491-495.
  16. Konje JC, Otolorin EO, Ogunniyi JO, Obisesan KA, Ladipo OA. The prevalence of Gardnerella vaginalis, Trichomonas vaginalis and Candida albicans in the cytology clinic at Ibadan, Nigeria. *Afr J Med Med Sci* 1991 Mar;20(1):29-34.
  17. Escoffery CT, Sinclair PA, Guthrie W. Vaginitis emphysematosa associated with an abnormal Pap smear. *West Indian Med J* 2001 Sep;50(3):234-235.
  18. Nokiani FA, Akbari H, Rezaei M, Madani H, Ale Agha ME. Cost-effectiveness of pap smear in Kermanshah, Iran. *Asian Pac J Cancer Prev* 2008 Jan-Mar;9(1):107-110.
  19. West RR, O'Dowd TC, Smail JE. Prevalence of Gardnerella vaginalis: an estimate. *Br Med J (Clin Res Ed)* 1988 Apr;296(6630):1163-1164.
  20. Margdari Nezhad M, Mahasti Jouybari L, Sanagoo A, Haghdst Z, Mobasheri E. Prevalence of Cervico-vaginal Infections in Relationship with Some Factors In Pap Smear Sampling. *IJOGI* 2014;17(110):16-21.
  21. Maria C, Zahra R, Sara P. Prevalence of cervical-vaginal infections in the pap-smear samples in Iran. *Glob J Health Sci* 2014 Jan;6(1):201-206.
  22. Berek and Novak's Gynecology 15<sup>th</sup> Edition:Lippincott Williams and Wilkins, 2012.
  23. Kalantari N, Ghaffari S, Bayani M. Trichomonas, Candida, and gardnerella in cervical smears of Iranian women for cancer screening. *N Am J Med Sci* 2014 Jan;6(1):25-29.
  24. Dai Q, Hu L, Jiang Y, Shi H, Liu J, Zhou W, et al. An epidemiological survey of bacterial vaginosis, vulvovaginal candidiasis and trichomoniasis in the Tibetan area of Sichuan Province, China. *Eur J Obstet Gynecol Reprod Biol* 2010 Jun;150(2):207-209.
  25. Adad SJ, de Lima RV, Sawan ZT, Silva ML, de Souza MA, Saldanha JC, et al. Frequency of Trichomonas vaginalis, Candida sp and Gardnerella vaginalis in cervical-vaginal smears in four different decades. *Sao Paulo Med J* 2001 Nov;119(6):200-205.
  26. Gupta A, Garg P, Nigam S. Bacterial Vaginosis in Pregnancy (<28 Weeks) and its Effect on Pregnancy Outcome: A study from a Western UP City. *Indian Journal of Clinical Practice* 2013;23(11):740-744.
  27. McMillan A. The detection of genital tract infection by Papanicolaou-stained tests. *Cytopathology* 2006 Dec;17(6):317-322.
  28. Chandra S, Gaur D, Harsh M, Chaturvedi J, Kishore S. An unusual presentation of Aspergillus species in a routine cervicovaginal pap smear: a case report. *Acta Cytol* 2009 Mar-Apr;53(2):229-231.
  29. Mahafzah AM, Al-Ramahi MQ, Asa'd AM, El-Khateeb MS. Prevalence of sexually transmitted infections among sexually active Jordanian females. *Sex Transm Dis* 2008 Jun;35(6):607-610.
  30. Workowski KA, Berman SM; Centers for Disease Control and Prevention. Sexually transmitted diseases treatment guidelines, 2006. *MMWR Recomm Rep* 2006 Aug;55(RR-11):1-94.
  31. Madeleine MM, Anttila T, Schwartz SM, Saikku P, Leinonen M, Carter JJ, et al. Risk of cervical cancer associated with Chlamydia trachomatis antibodies by histology, HPV type and HPV cofactors. *Int J Cancer* 2007 Feb;120(3):650-655.
  32. Ghaemi E, Saeedi JK. Comparison of vaginalis in healthy subjects and patients with bacterial vaginosis. *J Tehran Univ Med Sci* 2002;51(1):74-79.[IN PERSIAN].
  33. Kosambiya J, Bhardwaj P, Chakraborty T, Desai V. RTI/STI prevalence among urban and rural women of Surat: A community-based study. *Indian J Sex Transm Dis* 2009; 30: 89-93.