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Prevalence study of genital tract infections in pregnant women referred to health centers in Iran

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Aim: Background and aim: Pregnancy has its own complications such as premature rupture of membranes, preterm delivery, premature birth, low-birth-weight children, and infection. This study aimed to determine the prevalence rate of reproductive tract infections among pregnant women.

Materials and methods: In this cross-sectional study, 85 randomly selected pregnant women referred to the ambulatory care facilities of Ardal County, Iran, were recruited via a systematic classified random sampling. Questionnaires, clinical examination by midwives, and laboratory assessments were used to gather the required data.

Results: According to the laboratory tests, 71.76% of samples were infectious. *Candida albicans* (35.76%), *Escherichia coli* (17.97%), and *Streptococcus* (13.06%) were the most observed infections, with a higher prevalence rate of reproductive tract infections during the second half of pregnancy compared to the first half.

Conclusion: Since the prevalence rate of vaginal infections was high among pregnant women, and apparent symptoms and clinical examinations alone could not be used for diagnosing these infections, considering vaginal tests during pregnancy in addition to other routine tests could be helpful.

Key words: Reproductive tract infections, pregnant women, ambulatory care facilities

1. Introduction

Reproductive tract infections are one of the most serious public health issues in both developed and developing countries (1). Around 150,000,000 cases of reproductive tract infections in Southeast Asia and 65,000,000 cases in African countries occur annually (1,2). Many of the women who visit ambulatory care facilities suffer from vaginal infections (3,4). Studies have found a high prevalence of reproductive tract infections. Tolosa et al. reported a 24.4% prevalence of reproductive tract infections among pregnant women (3). In another study, it was reported that around 90% of reproductive tract infections were caused by *Candida albicans* (CA), bacterial vaginosis (BV), and *Trichomonas vaginalis* (TV) (5). *Chlamydia trachomatis* is associated with premature labor and hence could be a health risk factor, especially for young women (6). Romoren et al. considered screening for cervical infections in pregnant women as an essential indicator of public health. In their study, the prevalence of vaginal chlamydia infection among pregnant women was 8% (7). In Chico et al.'s study, however, chlamydia infection prevalence was 6.1% (8). Kamara et al., in a study in Jamaica, found that the prevalence of TV and BV among pregnant women was respectively 18% and 44.1%, and of those women, 30.7% were positive for *Candida*, too (1). The data showed high rubella and cytomegalovirus infection rates among women in Turkey prior to childbearing age (9). Furthermore, Sutton et al. found the prevalence of TV infection among women in the United States to be 3.1% (10). However, Cotch et al. reported that about 12.6% of pregnant women in Louisiana, USA, were infected by TV (11). The prevalence of bacterial vaginosis, *Candida* sp., mixed infections (bacterial vaginosis + *Candida* sp.), TV, and *Actinomyces* sp. was 7.76%, 2.81%, 0.32%, 0.13%, and 0.27%, respectively (12). Romoren et al. also found the prevalence of TV and BV infections to be about 19%

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and 38%, respectively, although the patients did not show any symptoms (13). Lachenauer et al. pointed to the high prevalence of group B *Streptococcus* among 441 pregnant women (35.6% by type 8, 24.7% by type 6, and 39% by more traditional serotypes) (14).

The above-mentioned studies highlight the controversy about the prevalence of reproductive tract infections among pregnant women. To find an answer for this controversy, this research was conducted to determine the prevalence of reproductive tract infections among pregnant women.

2. Materials and methods

In this cross-sectional study, we recruited, via systematic classified random sampling, 85 pregnant women who were referred to the ambulatory care facilities of Ardal County, Iran, in 2010. Due to the asymmetric dispersion of the pregnant women covered in the county, we applied the sampling in 2 phases. In the first phase, we scheduled stratified proportionate random sampling from the list of the names of the pregnant women, and in the second phase, systematic sampling was conducted. The period of the study for each patient was the entire duration of pregnancy.

We collected data through a questionnaire, clinical examination, and laboratory sampling. After a pregnant woman had visited a health center, she was checked for infections (bacterial or fungi) and then asked to fill out a questionnaire (including general information and medical biography). Finally, a midwife carried out clinical examinations and samples of vaginal secretion were taken for a conclusive diagnosis through the following procedure. In order to obtain a moist smear, we used a sterile swab to take samples from vaginal secretion. A drop of physiology serum was then dropped on a lamella and the swab was rubbed on it. We gave it a lamella number and placed it inside a pleat containing moist, sterile cotton to keep its moisture. The pleat was then closed. In order to diagnose for other diseases, we took another lamella using the following method. Using a new sterile swab, another sample of vaginal secretion was taken and placed as a thin layer on a lamella. After it dried, the details were written on it and the lamella was placed inside a box specially made for carrying lamellae. A third swab was used to get more samples of vaginal secretion and placed inside a test tube containing tryptic soy broth growth medium. The details of the patient were written on it and the samples were immediately sent to the university's Molecular and Cellular Research Center Laboratory. We diagnosed the kind of infection using warm coloring methods, moist lamella testing, blood agar cultivation, and eosin methylene blue. Finally, the questionnaire data and the lab results were analyzed by SPSS 11.5 using Spearman correlation, chi-square test, and t-test.

3. Results

The mean age of the pregnant women was 26.27 ± 5.28 (range: 17 to 38) years (Table 1). With regard to the time of pregnancy, 35.29% of the women were in the first half of their pregnancy (up to 20 weeks) and 64.71% in the second half (20 to 40 weeks). Of these women, 38.8% had no other children, 28.2% had 1, 18.8% had 2, 9.4% had 3, and 4.8% had 4 or more. The percentage of women who had primary school, junior high school, high school diploma, and higher academic education was 3.5%, 25.9%, 62.37%, and 8.23%, respectively. With regard to their husbands, 1.2% had no education, 3.5% had primary school, 20% had junior high school, 68.3% had high school diploma, and 7% had higher academic education. Furthermore, 78.8% of the women were treated by rural ambulatory care facilities and the rest (21.2%) by urban ambulatory care facilities.

Table 1. Basic characteristics of pregnant women in Ardal County.

Characteristics	
Age (mean ± SD*; years)	26.27 ± 5.28
Pregnancy stage (mean ± SD; weeks)	24.20 ± 7.75
0 to 20 weeks	30 (35.29%)
20 to 40 weeks	55 (64.71%)
Place of residence	
Urban	18 (21.18%)
Rural	67 (78.82%)
Number of children	
0	33 (38.8%)
1	24 (28.2%)
2	16 (18.8%)
3	8 (9.4%)
> 4	4 (4.8%)
Education	
Illiterate	0
Primary	3 (3.5%)
Junior high school	22 (25.9%)
Diploma	53 (62.37%)
University	7 (8.23%)
Husband's education	
Illiterate	1 (1.2%)
Primary	3 (3.5%)
Junior high school	17 (20%)
Diploma	58 (68.3%)
University	6 (7%)
Health coverage	
Rural center	67 (78.8%)
Urban center	18 (21.2%)

* SD: Standard deviation.

The data gathered from the questionnaires showed that 21.18% of women had no symptoms of infection, whereas this figure was 41.2% and 28.24% based on midwives' opinion and laboratory results, respectively (Table 2). *Candida albicans* was the most common cause of reproductive tract infections. Clinical and vaginal examinations by the midwives showed that 81.2% had no clinical findings. Of the symptomatic samples, 3.5% had erythema, 10.6% edema, and 4.7% both erythema and edema clinical findings. Examination of vaginal secretion by midwives showed that 28.2% had no secretion.

There was no statistically significant association between infection and place of residence (P = 0.279) (Table 3). However, there was a significant relationship between infection and pregnancy stage (P = 0.035).

Table 2. Symptom characteristics of pregnant women in Ardal County in 2010.

Characteristics	
Symptoms (questionnaire)	
None	18 (21.18%)
1	30 (35.3%)
2	13 (15.29%)
3	11 (12.94%)
> 4	13 (15.29%)
Clinical findings (midwives' opinion)	
None	69 (81.2%)
Erythema	3 (3.5%)
Edema	9 (10.6%)
Erythema and edema	4 (4.7%)
Secretions (midwives' opinion)	
None	24 (28.24%)
1 characteristic	40 (47.06%)
2 characteristics	15 (17.65%)
3 characteristics	6 (7.06%)
Infection (midwives' opinion)	
No	35 (41.2%)
Yes	50 (58.8%)
CA	30 (35%)
TV	14 (17.5%)
BV	4 (4.3%)
Cervicitis	2 (2%)
Infection (laboratory results)	
No	24 (28.2%)
Yes	61 (71.8%)
CA	24 (28.2%)
TV	4 (4.7%)
CA + TV	2 (2.4%)
S	10 (11.8%)
SA	2 (2.4%)
CT	4 (4.7%)
E. coli	12 (14.1%)
E. coli + CA	3 (3.5%)

CA: *Candida albicans*, TV: *Trichomonas vaginalis*, S: *Streptococcus*, SA: *Streptococcus agalactiae*, CT: *Chlamydia trachomatis*.

Table 3. Relation between different characteristics of pregnant women in Ardal County in 2010.

Characteristics		P-value
Urban		
No infection	7 (38.89%)	
With infection	11 (61.11%)	
Rural		0.279
No infection	19 (28.36%)	
With infection	48 (71.64%)	
Infection and pregnancy stage		
No infection	22.08 ± 7.88	0.035
With infection	25.9 ± 7.46	

4. Discussion

There is controversy on the prevalence of reproductive tract infections among pregnant women. Our findings showed that there was a meaningful relationship between the stage of pregnancy and the reproductive tract infection rate. In other words, the prevalence of infections increased with the stage of pregnancy. The prevalence of reproductive tract infections was higher among the women in the second half of pregnancy compared to those in the first half of pregnancy. In a city in Iran, the prevalence of trichomoniasis in pregnant women was 5.9% (15). The increase in secretions, difficulty in movement, and, therefore, less attention to personal hygiene could be considered as the main reasons for infections during the second half of pregnancy.

In our study, most of the women and their husbands had a diploma or lower level of education. According to the information gathered from the questionnaires, 78% had symptoms of infections. If pregnant women had more education, it would increase their awareness of vaginal infections and their consequences for pregnancy, hence improving prevention and early diagnosis. The importance of teaching vaginal infection prevention methods and its consequences for pregnant women, especially those with no prior children, is of great significance. It is necessary to improve the knowledge of pregnant women and their husbands, which was emphasized by Collier et al. (16).

A higher percentage of *Candida albicans* in our study corresponds with the results of studies by Chalechale et

al. (6) and Kamara et al. (1). Valkenburg-van den Berg et al. showed that group B *Streptococcus* was still a microbial pathogen among pregnant woman (17). Cotch et al. found a 12.6% rate of *Trichomonas vaginalis* infection in pregnancy (11), while the prevalence of this infection was about 4.7% in our study. The observed difference could be probably related to the 2 studies considering different weeks of pregnancy.

In our study, 11.8% of infections were *Streptococcus*, and Valkenburg-van den Berg et al. reported a 13% prevalence for this infection in Asian women (17). The reason for this difference could be the higher rate of infections during the last months of pregnancy, which Valkenburg-van den Berg et al.'s study focused on. Another reason is that this infection causes premature birth, which means that many of these patients had been referred to maternity wards, rather than the ambulatory care facilities that were the focus of our study.

Of the pregnant women, 2.35% of them had *Gardnerella vaginalis*. Tolosa et al. reported the prevalence of bacterial vaginitis as 12.3%, 98.9% cases of which were positive for *Gardnerella vaginalis* (3). This difference might be due to the fact that Tolosa et al.'s research focused only on bacterial vaginitis, but our study considered all infections.

Midwives had diagnosed 59.8% of infections among the women whereas the laboratory results showed a 71.76% rate. Using the Spearman test and calculation of correlation coefficients, we found that the midwives' diagnosis was not usually correct. This could be one of the reasons for pregnant women repeatedly coming back to the ambulatory care facilities and complaining about symptoms of vaginal infections. This finding coincides with the results of the study by Callahan et al. (18).

Considering the fact that 60% of the pregnant women's husbands had diploma or lower level of education and that most of them were probably farmers and seasonal workers, if they were to receive proper training about the symptoms of infections and how to deal with them, a significant effect on their views and actions concerning hygiene could be expected.

Even though most of the problems related to pregnancy have been taken into account in the new version of the combined national care system for pregnancy in Iran, the prevalence of reproductive tract infections among pregnant women remains high. Therefore, testing vaginal secretions, among other routine examinations, and especially in the second half of pregnancy, seems to be a necessary preventive method and helpful for early diagnosis of infections. Furthermore, in order to increase the knowledge and performance of the health care staff and the pregnant women, healthcare systems can hold practical classes in addition to up-to-date theoretical classes.

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