

## Original Article

**Prevalence of sexually transmitted infections based on syndromic approach and associated factors among Iranian women**

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**Abstract**

**Background and purpose:** Reproductive and sexual health related problems constitute one third of health problems among women aged 15 to 44 years. Sexually transmitted infections are a significant challenge for human development. We aimed to assess the prevalence of STIs and identify factors associated with among Iranian women.

**Materials and Methods:** Through a cross-sectional study, 399 women aged 10-49 years were recruited. These were women who referred to urban and rural health centers in a city in Iran. Through a behavioral questionnaire, high-risk behaviors of the sample were asked about. Syndromic STIs were also assessed through clinical examination. T-test and multivariable Modified Poisson Regression was used to estimate the Prevalence Risk Ratios in Stata 13. P-values less than 0.05 were considered as statistically significant.

**Results:** About 64.2% of the participants had at least one of the STIs. STI prevalence was significantly higher among women who self-reported not using condoms in their last sexual contact (75% vs. 39.8%), whose spouse/sexual partners had extramarital sex (87.7% vs. 59.6%), whose SSP had a past-year history of illicit substance use (72.9% vs. 60.9%), and whose SSP had a history of incarceration (91.5% vs. 59.1%). In multivariable analysis, it was shown that having first sexual intercourse before 20 years of age, history of abortion in the past year, low family income, not using condom in last sexual contact, and the partner's incarceration history were identified as significant predictors.

**Conclusions:** The knowledge produced from the current research can serve as evidence for the promotion of interventions and healthcare services related to sexual and reproductive health for Iranian women and their SSPs. The findings from the current study also support research on improving strategies for STI diagnosis and STI management.

**Keywords:** Sexually Transmitted Infections; Women; High-risk behaviors; Iran

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## 1. Introduction

Every day, more than one million Sexually Transmitted Infections (STIs) occur worldwide due to various pathogens. According to a report by World Health Organization (WHO) in 2015, about 500 million people are affected every year by one of the four STIs, namely, Chlamydia, Neisseria gonorrhoea, Syphilis, and Trichomoniasis (1); about 10 million of the 500 million STIs occur in the Eastern Mediterranean region(2). Reproductive and sexual-health-related problems constitute one third of the health problems among women aged 15 to 44 years old (3,4). Epidemiological and biological evidence support that STIs can increase the likelihood of transmission of Human Immunodeficiency Virus (HIV) (5-7). Statistics indicate that the Middle East and North Africa region has become a worrying region with regard to the prevalence of HIV/AIDS. For instance, in 2013, about 230,000 people were living with HIV infection (PLWH); in 2014, 25,000 new infections and 15,000 deaths were due to STIs (7). Iran is one of the most populous countries in the MENA region and the trend of HIV infection is considerably growing in Iran. By the end of September 2014, 28,663 PLWH had been identified – though the identified cases make up only one-third of all existing cases. In 2014, the Iranian Ministry of Health (MOH) estimated a total number of 75,700 PLWH in Iran (8). In 2010, reports from the Iranian MOH showed that approximately 7% of the identified HIV cases in Iran were female (9) while in 2013, the identified cases increased to 10.7% of the total affected population (2). High risk sexual behavior refers to behaviors that increase the

risk of getting an STI e.g., having multiple sexual partners. In Iran, young adults are involved in high-risk sexual behavior such as inconsistent condom use. For instance, a recent study showed that 40% of Iranian students, who were single and had a history of sexual contact, reported using condom in their last sexual intercourse (10). Due to an increase in high-risk sexual behaviors(11) and the lack of knowledge on sexual and reproductive health in Iran, the role of Iranian women in sexual and reproductive health is becoming increasingly important.

The asymptomatic nature of STIs and its associated stigma are obstacles in effective controlling of STIs; obstacles specific to Iran are Iranian women's unwillingness to address STI-related health problems when referred to health clinics and lack of valid Iranian epidemiological databases. Thus, all these obstacles have resulted in under detection and underreporting of STIs (12, 13). Since the prevalence of STIs is a useful epidemiological indicator for high-risk sexual behaviors, knowing the prevalence of STIs among Iranian women would help in preventing STIs in Iran(16). A recent review study in Iran showed that there are limited studies on the prevalence of STIs; these limited information are from studies on high-risk subgroups or some specific groups with specific health conditions and not the general population; examples are among female sex worker(17,18), female prisoners (19), mixed pregnant and non-pregnant women(20), and women with cervicitis(21). Thus, generalizing findings from such studies to the general Iranian population would be erroneous (15).

Though the number of studies related to sexual health has been promising in Iran, there is still limitation with such research. The limitation is that discussing such like topics related to sex is a socio-cultural taboo in Iran and one of the main impediments in the propagation of sexual health education in Iran (23). Therefore, the overall aim of the current study was to: determine the prevalence of syndromic STIs and the factors associated with syndromic STIs among Iranian women. The present study investigated the high-risk sexual behaviors of women aged 10 to 49 years old and also studied the high-risk sexual behavior of the women's spouses and/or sexual partners (abbreviated as SSP) in a city in north of Iran.

## 2. Materials and Methods

A cross-sectional study was carried out on women aged 10 to 49 years who had attended health centers in one of the cities of Iran during the year 2012-2013. This city is a tourist attraction and is located near sea in the north of Iran in Mazandaran province and has a population of about 75,000 people.

The number of participants referred to health centers in this area within the time period of the study determined the sample size. In the current study, 399 women were recruited. They had referred to urban and rural health centers for health care services during one year and several months. The following were our inclusion criteria for our subjects: women had to be 10 to 49 years and not pregnant during the study, had sexual contact within the past 12 months, were living in the area of the study, and agreed to take part in the study. After verbal consent, a face-to-face interview was conducted considering the confidentiality of the collected

data. Among the study participants, there were seven subjects below 18 years: two of them below 15, two participants 15, and three others 17 years old. Parental consent was also obtained from those under 18 participants.

Data was collected by trained female interviewers; the interviewers used a questionnaire to collect the data on: (i) participants' demographic information, and (ii) high risk behaviors for both participants and their SSP. Since STIs are communicable diseases, the sexual behaviors of participants and their SSP were taken into account—thus participants were asked to provide information on behalf of their SSP.

Demographic information included age, age at first sexual intercourse, current marital status, family income, participant's residence status, participant's occupation, participant's SSP's occupation, and participant's educational attainment.

Next part of the questionnaire pertained to the high-risk behaviors: past-year extramarital sexual intercourse (for both the participants and their SSP) (yes vs. no); (ii) lifetime history of incarceration (for the SSPs only because incarceration rarely happens among women); (iii) any type of substance use in the past year (for both participants and their SSPs), and (iv) condom use in the participant's last sexual intercourse. Incarceration and non-injection substance use are not usually considered as STI-related risky behaviors; however, due to their key roles in creating other types of high-risk behaviors, they were considered as high-risk behaviors in the current study. For ethical reasons, the participants identified with high-risk behaviors underwent counseling sessions

and education on appropriate programs if necessary. Data was also collected on history of abortion in participants' life time, albeit there was no information on the type of abortion (legal or illegal).

Different approaches can be used by health systems for identifying STIs, such as the syndromic approach or etiologic approach. These approaches have been validated by WHO (24). In the syndromic approach, STIs can be identified based on clinical signs and symptoms observed by trained healthcare practitioners including physicians and midwives. In the etiologic approach, identification/diagnosis is based on laboratory testing. In resource-constrained areas – like Iran– where laboratory-based diagnostic methods are limited, STIs can be managed through the syndromic approach(24,25). After the data collection, eligible participants were clinically examined to identify the syndromic-based STIs. The physical examination of vagina and uterus were carried out by a physician and a midwife. Hence, the participants were examined for five main STIs including Trichomoniasis, Chlamydia, Gonorrhea, herpes simplex virus (HSV), and Syphilis. After clinical examination, two categories of participants were formed: women with at least one type of STIs versus women without any STIs.

The descriptive statistics including mean and standard deviation (SD) were found for continuous variables. At the same time, relative and absolute frequencies were used for categorical variables. For the prevalence of STIs, relative frequencies with 95% confidence intervals were also reported. Chi square test was, on the other hand, used to compare the

frequency of syndromic STIs within the categories of demographic variables and within categories of high-risk behaviors. Student t-test was used to compare the mean age of women with and without STIs. It is also for binary outcomes in cross-sectional studies that the associations of interest are usually assessed by logistic regression through reporting Odds Ratios (ORs). However, since the prevalence of the outcome in the current study was common, using ORs may overestimate the measure of association. So, the researcher used univariate and multivariable Modified Poisson Regression introduced by Zou {Zou, 2004 #26} using a Generalized Linear Model (GLM) to report the Prevalence Risk ratios (PRRs) with Poisson as family; the log link function was also applied. This approach provides a robust Standard Errors (SE), and then 95% CIs associated with PRs were reported. The variables with a conservative P-value less than 0.20 in univariate analysis entered the multivariable analysis. It should be noted that Stata 13 was used for all analyses and P values less than 0.05 were considered as statistically significant.

### 3. Results

The average age of participants was 31.9±8.4 years, and most participants (96%) were married, 42% of them had high school to diploma education, and 45.6% of the participants had monthly income above 200 USD. The detailed information is demonstrated in table 1. Out of 399 participants, 256 individuals (64.2%) had at least one of the STIs according to syndromic approach.

**Table 1.** Baseline characteristics and STIs prevalence for each sociodemographic variable among 399 women

Variables	Total (n=399)	Women with syndromic infection (n=256)	Women without syndromic infection (n=143)	P-value
Mean age (SD)	31.99±8.47	31.53±8.26	32.83±8.81	0.142
Age group				
<25	96(24)	63(65.6)	33(34.3)	0.558
25-35	155(38.8)	103(66.5)	52(33.5)	
>35	148(37)	90(60.8)	58(39.2)	
Age at first sex debut				
≤20	183(45.9)	144(78.7)	39(21.3)	<0.001
>20	216(54.1)	112(51.9)	104(48.1)	
Lifetime history of abortion				
Yes	65(16.3)	50(76.9)	15(23.1)	0.019
No	334(83.7)	206(61.7)	128(38.3)	
Residence status				
Urban	117(29.3)	72(61.5)	45(38.5)	0.482
Rural	282(70.6)	184(65.2)	98(34.8)	
Current marital status				
Married	383(96)	245(64.0)	138(36.0)	0.696
Other (Single, Widows, Divorced, Sigheh)	16(4)	11(68.8)	5(31.2)	
Participants' education level				
Illiterate	37(9.2)	23(62.2)	14(37.8)	0.397
Primary and secondary	156(39)	108(69.2)	48(30.8)	
High school and diploma	166(41.6)	100(60.2)	66(39.8)	
University education	40(10)	25(62.5)	15(37.5)	
Participants' occupation				
Housewife	349(87.5)	229(65.6)	120(34.4)	0.109
Others (employed, students and ...)	50(12.5)	27(54)	23(46)	
Family Income				
<200 USD	216(54.4)	164(64.1)	52(36.9)	<0.001
≥200 USD	181(45.6)	92(35.9)	89(63.2)	
SSP's Occupation				
Driver/ worker	334(83.7)	222(66.5)	112(33.5)	0.171
Others (employed, students, ...)	56(14)	28(50)	28(50)	

Table 1 shows the comparison of syndromic STI in categories of demographic variables and categories of high-risk behaviors. STI prevalence was higher among the participants who had first sexual contact before 20 years of age (78.8% vs.51.9%;  $P<0.001$ ), experienced an abortion in their lifetime (76.9% vs.61.7%;

$P=0.019$ ), and had low income (64.1% vs.35.9%;  $P<0.001$ ). It should also be noted that for other variables, no statistically significant difference was obtained. The STI prevalence was significantly higher among women who did not use condoms in their last sexual contact (75% vs. 39.8%,  $P<0.001$ ). When the

participants were asked about their SSP behaviors, those women who reported that their SSP had extramarital sexual relations (87.7% vs. 59.6%,  $P<0.001$ ), had a history of past-year illicit substance use (72.9% vs. 60.9%;  $P=0.004$ ), and had lifetime history of incarceration (91.5% vs. 59.1%,  $P<0.001$ ), and possessed significantly higher prevalence of syndromic STIs. The participants who reported

themselves to have had extramarital sexual contacts in the past year had also higher prevalence of STI (81.5% vs. 62.9%;  $P= 0.06$ ), but the higher prevalence was not statistically significant at a false positive rate of 0.05, as is shown in Table 2.

**Table 2.** High-risk variables and STIs prevalence for each risky behavior among 399 women in Iran

Variables	Total (n=399)	Women with syndromic infection(n=256)	Women without syndromic infection(n=143)	P value
<i>Participants' behaviors</i>				
Past-year extramarital sexual contact				0.061
Yes	27 (6.8)	22 (81.5)	5(18.5)	
No	372 (93.2)	234 (62.9)	138(81.5)	
Past-year illicit substance use				0.230
Yes	7(1.8)	6(85.7)	1(14.3)	
No	392(98.2)	250(63.8)	142(36.2)	
Condom use in last sexual contact				<0.001
Yes	123(30.8)	49(39.8)	74(60.2)	
No	276(69.2)	207(75.0)	69(25.0)	
<i>SSP participants' behaviors</i>				
Past-year Extramarital sexual contact				<0.001
Yes	65(16.3)	57 (87.7)	8(12.3)	
No	334(83.7)	199 (59.6)	135(40.4)	
Lifetime history of incarceration				<0.001
Yes	62(15.5)	57 (91.9)	5(8.1)	
No	337(84.5)	199 (59.1)	138(40.9)	
Past-year illicit substance use				0.004
Yes	72(18)	57 (79.2)	15(20.8)	
No	327(82)	199 (60.9)	128(39.1)	

**Table 3.** Demographic characteristics, personal and sexual partners' related predictors of syndromic STI infection among participants of the study

Variables	Crude analysis		Adjusted Analysis	
	PRs (95% CI)	P-value	PRs (95% CI)	P-value
Age group				
<25	1	-		
25-35	1.01 (0.84, 1.21)	0.893		
>35	0.93 (0.76, 1.12)	0.442		
Age at first sexual debut				
>20	1	-	1	-
<=20	1.52 (1.31, 1.76)	<0.001	1.35 (1.17, 1.55)	<0.001
Lifetime history of abortion				
No	1	-	1	-
Yes	1.25 (1.06, 1.46)	0.006	1.21 (1.05, 1.40)	0.007
Residence Status				
Town	1	-		
Rural	1.06 (0.89, 1.25)	0.492		
Current marital status				
Married	1	-		
Other (single, widows, divorced, sigheh*)	0.93 (0.66, 1.30)	0.677		
Participants' education level				
Illiterate	1	-		
Primary and secondary	1.11 (0.84, 1.46)	0.439		
High school and diploma	0.96 (0.73, 1.28)	0.826		
University education	1.00 (0.71, 1.42)	0.976		
Participants' occupation status				
Housewife	1	-	1	-
Others (employed, students and ...)	0.82 (0.63, 1.08)	0.153	0.94 (0.76, 1.17)	0.616
Family Income				
≥200 USD	1	-	1	-
<200 USD	1.49 (1.27, 1.75)	<0.001	1.36 (1.18, 1.58)	<0.001
SSP's occupation status				
Others (employed, students)	1	-	1	-
Driver/ worker	1.32 (1.01, 1.74)	0.041	1.15 (0.89, 1.48)	0.273
<i>Participants-related high-risk behaviors</i>				
Condom use in last sexual contact				
Yes	1	-	1	-
No	1.88 (1.50, 2.36)	<0.001	1.73 (1.38, 2.18)	<0.001
Past-year extramarital sexual contact				
No	1	-	1	-
Yes	1.29 (1.06, 1.57)	0.010	1.02 (0.86, 1.22)	0.781
Past-year illicit substance use				
No	1	-	1	-
Yes	1.34 (0.98, 1.83)	0.063	0.84 (0.64, 1.12)	0.255
<i>SSP's participants-related high-risk behaviors**</i>				
Past-year extramarital sexual contact				
No	1	-	1	-
Yes	1.47 (1.30, 1.67)	<0.001	1.64 (0.93, 2.91)	0.085
Lifetime history of incarceration				
No	1	-	1	-
Yes	1.56 (1.39, 1.75)	<0.001	1.24 (1.08, 1.43)	0.002
Past-year illicit substance use				
No	1	-	1	-
Yes	1.30 (1.12, 1.51)	<0.001	0.69 (0.39, 1.20)	0.194

\* The practice of temporary marriage; \*\* Spouses' or sexual partners' information was reported by the participants (Cooperative living)

As is shown in Table 3, after adjusting for potential confounders, only first sexual contacts before 20 years (PRR = 1.35; 95%CI =1.17, 1.55; P<0.001), history of an abortion (1.21; 95%CI =1.05, 1.40; P=0.007), low family income (1.36; 95%CI = 1.18, 1.58; P<0.001), and not using condom in last sexual contact (1.73; 95%CI =1.38, 2.18; P<0.001) were significantly associated with a 35%, 21%, 36% and 73% increased likelihood of STI, respectively. Those women whose SSP had a history of incarceration had 24% (1.24; 95% CI = 1.08, 1.43; P = 0.002) increase in likelihood of STI. Although those women whose SSP experienced past-year extramarital sex were 64% more likely to have STI (1.64; 95% CI =0.93, 2.91; P=0.085), it was not significant at a false positive rate of 0.05.

#### 4. Discussion

The findings of the current study showed that two thirds of the study participants had at least one of the five common STIs. STI prevalence was higher among women who had first sexual intercourse before 20 years, experienced an abortion, had low family income, and did not use condom in last sexual contact. Those women who reported that their SSP had extramarital sexual relations, illicit substance use in the past year and a history of incarceration had higher prevalence of STIs.

Various studies have shown various prevalence rates of STIs among women in different countries. In a study (2012) carried out among Indian women of 10 to 49 years old, the prevalence of STIs based on syndromic approach was 61.9% as compared to 33.1% based on etiologic approach. This also shows a big variation of two diagnostic methods (26). In

a study conducted in 2015, the STI prevalence assessed via syndromic approach among Iranian women was estimated to be 39.9% (27). Although most STIs symptoms are based on vaginal discharges, and itching and pain are the results of engaging in sexual contact, previous studies have displayed that complaints regarding vaginal discharges may not appropriately reflect infections (28, 29). This, in other words, could be interpreted as the concept that STIs might be over-estimated or over-diagnosed if we rely only on syndromic methods since suffering from a low sensitivity compared with laboratory approach. Therefore, using the syndromic approach along with the etiologic approach can provide a better picture of the STI prevalence. However, in areas where laboratory facilities are limited, healthcare practitioners would have difficulties using the etiologic approach. Although syndromic approach has low sensitivity, the syndromic approach is the best method for evaluating and assessing prevention programs for STIs in developing countries (30). Among demographic variables in the current study, low household family income was associated with the STIs. Previous studies support that socio-economic factors are as associated with increased risk of getting STIs (31-33). Poor women may have less access to health care services and consequently have an increased likelihood of getting an STI(32). In a study in the US (2013), women with lower level of income had higher likelihood of STIs (32). Education level was not associated with STIs in the current study; in the literature, findings from studies on the association between female education and risk of females getting STI has been inconsistent



(34). For example, in a Chinese study (2007), women with high education had no difference with illiterate women, while in another Chinese study (2003), it was reported that women with lower education had higher risk of getting STIs (35, 36). In spite of the inconsistency, it is plausible to think that education may lead to a decrease in high-risk sexual behaviors. The current study showed that there was no significant difference in STI prevalence between the participants who lived in rural and urban areas. A plausible explanation can be equal access to healthcare in urban and rural areas in Iran's primary healthcare system (37). In addition, the previous works in other countries have shown that the lack of access to medications in rural settings is associated with higher STI prevalence among the women living in those contexts (26). Another finding of the current study was the association between a history of incarceration for women's spouse (or sexual partner) and the likelihood of syndromic STIs. This result is in line with previous studies which had shown that incarceration can increase the likelihood of engaging in high-risk sexual behaviors, such as having multiple sexual partners; thus incarceration can be associated with an increased risk of getting STIs (38, 39). The background studies had also shown that women who had a history of incarceration were more likely to have multiple sexual partners (27). The present study had some limitations. Since the topic of high-risk sexual behaviors, especially among women, is very sensitive in Iran, social desirability bias could have led to underreporting of frequency of such behaviors, and then subsequently estimations tend to be underestimated. To

decrease the level of non-responses, trained female interviewers who were themselves the staff at the selected centers were recruited. However, due to the sensitivity of the topic, such biases might not totally mitigate the effect of social desirability bias. In the present study, the spouses' and sexual partners' high-risk sexual behaviors were assessed indirectly because the participants provided such information on behalf of their SSP, which may have resulted in underestimation or even overestimation for SSP. Also, due to the lack of resources, STIs were identified based on syndromic approach; whereas it was necessary to identify STIs through the etiologic approach. On the other hand, the syndromic approach for STI diagnoses and method of data collection were validated. Other studies had also reported its low sensitivity in comparison with laboratory/etiologic approach (40).

Overall, the prevalence of syndromic STIs was considerably high, and although STI management based on the syndromic diagnosis is yet to be validated through laboratory tests, it is a simpler, cheaper and time-saving method for clinical decision-making. The research findings also advocate the implementation of educational programs tailored to the women and their spouses or sexual partners who are involved in high-risk sexual behaviors. Also, it is found necessary to consider STD in different places with different economic matters.

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