

Prevalence of Commonly Encountered Sexually Transmitted Infections Among Imprisoned Incarcerated Women

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Background: Sexually transmitted infections are major causes of morbidity among incarcerated women. However, little is known about the prevalence of these infections among female prisoners in Iran.

Objectives: This cross-sectional study, assessed the prevalence of sexually transmitted infections among a group of women imprisoned in Adelabad Prison, Shiraz, Iran.

Patients and Methods: Over a 6-month period, we screened 129 female inmates in Adelabad Prison, Shiraz, Iran for sexually transmitted infections by appropriate clinical and routine laboratory assessments. Infected inmates were treated and followed up free of charge by the prison medical staff.

Results: All inmates had evidence of at least one sexually transmitted infection. Chlamydial infection was the most common infection, which detected in 44 (34%) inmates, followed by candidiasis in 34 (26%), trichomoniasis in 26 (20%), syphilis in 8 (6%), and finally gonorrhea in 6 (4.5%) inmates. The least common infection was HIV infection, which was present in only 1 out of 129 subjects. In addition, 1 out of 58 (1.72%) serologically examined prisoners had hepatitis B, and 4 cases from 58 (7%) had evidence of hepatitis C, one of them was a drug addict and the other 3 had histories of past tattooing.

Conclusions: Because of high rate of sexually transmitted infections (STIs) in incarcerated women, it is necessary to conduct a comprehensive screening program, treatment, follow-up, and partner notification in order to reduce the frequency of STIs in this high-risk, vulnerable group of females.

Keywords: Prevalence; Sexually Transmitted Infections; Prisons; Screening; Incarcerated

1. Background

Incarcerated women are at high risk for sexually transmitted infections (STI), which if left untreated can lead to adverse complications such as preterm delivery, infertility, pelvic inflammatory diseases, ectopic pregnancy, and even increased HIV transmission (1, 2). Overall, chlamydial infection, trichomoniasis, and gonorrhea are the most common STIs among American women (3), who are generally affected by STI at higher rates than men. Two of these infections (chlamydia and gonorrhea) are most commonly found in females less than 25 years of age, both in the general population and among incarcerated women (4). However, trichomoniasis occurs more frequently in the older age group. Sexually active female adolescents are at a particularly high risk for STIs, especially chlamydial infection (5). Risk behaviors such as unprotected sex, sex for drugs or money, and multiple sex partners are quite common among incarcerated women (6). Therefore, incarceration provides a proper setting to screen these women at high-risk for STIs.

2. Objectives

Data regarding the prevalence of STIs among women in the Iranian general population is scarce. (7, 8). In addition, there is little information regarding the prevalence of STIs among incarcerated women in Iran. Therefore, we have conducted this cross-sectional study to clarify a number of these unanswered issues.

3. Patients and Methods

3.1. Sample Population

Over a 6-month period, we screened all 129 female inmates of Adelabad Prison (Shiraz, Iran) for the presence of STIs. Infected inmates were reported to the prison officials, then they were treated and followed up free of charge by the prison medical staff. The study protocol was approved by the Ethics Committee of Shiraz University of Medical Sciences and the officials of Adelabad Prison.

3.2. Data Collection

Each subject participated in a private, structured, and face-to-face interview with a trained female physician who was not a member of the prison's regular clinic staff. The aim of the study was explained and all prisoners voluntarily accepted to be enrolled. The interview covered demographic information, sexual history, drug and alcohol use, information on the number of male sex partners and genitourinary symptoms, including genital ulceration and discharge. Subsequently, a thorough pelvic examination was performed by an expert midwife who obtained the adequate number of endocervical samples for appropriate laboratory studies.

To diagnose STIs, we obtained serum samples for serologic studies of syphilis, HIV, hepatitis B, and hepatitis C. Because of the limited resources, serologic studies for hepatitis B and C were performed in only 58 subjects. In addition, we used the wet-mount, Gram and Giemsa stains as well as direct immunofluorescent study and cytology to diagnose STIs. A wet-mount preparation from the endocervical discharge was immediately searched for actively moving *Trichomonas vaginalis* (a parasitic protozoa). In another wet-mount sample 10% KOH solution was added in order to determine the presence of *Candida pseudohyphae* at 1 hour and after 24 hours.

The bioMerieux kit (France) was used as a direct immunofluorescent study to visualize the presence of chlamydia elementary bodies. Specimens were stained by the Giemsa stain to look for the presence of chlamydia inclusion bodies, *Trichomonas protozoa* and *Candida pseudohyphae*. Gram-negative intracellular diplococci were assessed by the Gram and Giemsa stains.

3.3. Analyses

All statistical analyses were performed with SPSS software version 12 (Chicago, IL, USA). Frequency and percentages were used for demographic, social, and clinical findings as well as STIs. We used the chi-square and Fisher exact test for comparison of parameters between the groups whenever needed.

4. Results

4.1. Demographic and Social Characteristics

Participants' age ranged 14-60 y (mean \pm SD: 31.7 \pm 9.2 y). A total of 75 prisoners were illiterate or almost illiterate and 62% were married (Table 1). The youngest age at first sexual intercourse was 7 years; however, all of them had experienced sexual intercourse by the age of 21.

4.2. Clinical Characteristics

There were 19 subjects who deferred pelvic examinations, 9 were menstruating and/or were going to be released from jail. The remaining 10 claimed to be virgin; however, they were symptomatic and had vaginal dis-

charge. We obtained samples from this group for staining and culture. The majority of remaining captives (n = 110, 87%) had one or more genitourinary signs and symptoms (Table 2). These signs and symptoms were most frequently found in the age group of 14-35 years (n = 76, 59%) and those who were illiterate or less educated (n = 99, 77%).

Table 1. Demographic and Social Characteristics of Female Prisoners

Characteristics	Frequency	
	Number	Percent (%)
Total	129	100
Age, y		
14-35	92	71.3
≥ 36	37	28.7
Education		
Illiterate	49	38.0
Almost illiterate	26	20.2
Elementary and guidance school	48	37.0
High school diploma	5	3.9
Bachelor of science	1	0.8
Marital status		
Married	80	62
Divorced	16	12.4
Widowed	24	18.6
Single	9	7.0
Drug addiction	46	35.6
IV drug abuse	10	7.7
Cigarette smoking	41	31.4
Alcohol use	9	7.0
Multiple partners	36	27.9

Table 2. Prevalence of Clinical Findings by Pelvic Examination

Clinical finding	Frequency	
	N = 110 ^a	Percent (%)
Vaginal discharge	81	73.6
Vaginal inflammation	74	67.3
Inflammation and redness of cervical os	66	60.0
Cervical os ulcer	51	46.4
Cervical os discharge	50	45.4
Genital ulcer	38	34.5
Adnexal tenderness	28	25.4
Limited adnexal motion	22	20.0
Cervical os vesicle	17	15.4

^a N = number of subjects who underwent pelvic examinations

4.3. Sexually Transmitted Infections (STI)

All prisoners (100%) had signs and symptoms of at least one STI. The most frequently encountered infections were chlamydia followed by candidiasis and trichomoniasis (Table 3). HIV was the least frequent infection reported in one out of 129 subjects. In addition, one out of 58 (1.72%) serologically examined prisoners had evidence of hepatitis B. Hepatitis C infection was observed in four out of 58 (7%) prisoners, one of whom was an intravenous drug addict and three who had histories of tattooing.

Table 3. The Prevalence of Sexually Transmitted Infections (STI) Among Female Inmates

STI	Frequency	
	N = 129 ^a	Percent (%)
Chlamydia	44	34.10
Candidiasis	34	26.35
Trichomoniasis	26	20.15
Syphilis	8	6.20
Gonorrhea	6	4.65
HIV infection	1	0.77

^a N= Number of participating subjects

4.4. Chlamydia

Chlamydia was the most commonly encountered STI among incarcerated females (n=44, 34%). This infection was more frequent among drug addicts than non-addicts ($P = 0.01$). There was no association between cigarette smoking and frequency of this disease.

The most commonly observed physical findings were vaginal inflammation (60.2%), vaginal discharge (59%), cervical ulcers (48.7%), and genital ulceration (43.6%). The presence of vaginal discharge was the only finding significantly associated with this infection ($P = 0.01$).

4.5. Candidiasis

Candidiasis, the next most common STI, was found in 34 patients. This STD was most frequent among the younger age group compared. The difference between the groups was statistically significant ($P = 0.02$; Table 4). Age had no influence upon the frequency of other STIs.

The presence of a number of historical parameters or physical findings was significantly associated with the frequency of candidiasis compared to other STIs. Overall, 16 patients had histories of purulent vaginal discharge. From these, 9 (56.3%) had candidiasis ($P < 0.002$). Additionally, limitation of adnexal movement was observed in 13 (38.2%) women and adnexal tenderness was noted in 15 (44.1%) of those with candidiasis. These findings were significantly higher for limited adnexal movement ($P = 0.01$) and adnexal tenderness ($P < 0.002$) compared with individuals infected with other STIs (Table 5).

Table 4. Frequency of Candidiasis in Different Age Groups^a

Age range, y	Frequency	
	n/N	Percent
14-25	16/29	55.2
26-35	13/46	28.3
36-45	5/24	20.8
≥ 46	0/11	00.0
Total	34/110	31.0

^a n = Number of diseased persons; N = Number of persons who were tested in each group.

Table 5. Parameters That Positively Impacted the Frequency of Candidiasis

Parameter	Frequency (%)	P Value
Purulent vaginal discharge	56.3	< 0.002
Limitation of adnexal movement	38.2	= 0.01
Adnexal tenderness	44.1	< 0.002
History of purulent genital discharge in sexual partners	40.0	< 0.05

4.5. Trichomoniasis

Of inmates, 26 (20%) suffered from trichomoniasis. This disease was most prevalent among women younger than 25 years (39%), were illiterate (20%), and divorced (25%).

The frequency of disease was 13.6% among addicts which was not statistically significant compared with non-addicts. The most common clinical finding was vaginal discharge (88.3%). There were four (15%) patients who reported a history of genital discharge in their male sexual partners. *Trichomonas vaginalis* had a significant association with cervical os ulceration (72%; $P = 0.04$), adnexal pain (39%; $P = 0.01$), and limited adnexal motion (28%; $P = 0.03$).

4.6. Syphilis

A total of 8 inmates had a positive serologic test for syphilis, 6 of whom were in the 36-45 years age group. Although cervical ulceration, purulent discharge and urinary burning sensation were present in 4 of these cases, none had evidence of vaginal ulcerations. One patient; however, reported a history of genital ulceration and discharge in her male partner.

4.7. Gonorrhea

This was the least frequent of all primary STIs. Only 6 subjects were tested positive for gonorrhea, one of whom was a drug addict. Cervical discharge and vaginal ulceration were present in 5 (83%) inmates. There was a significant association between cervical discharge ($P < 0.05$), vaginal ulceration ($P < 0.001$) and gonorrhea.

5. Discussion

This was one of the first studies that examined STI prevalence among female prisoners in Shiraz, Iran. The main finding of this study was that all inmates ($n = 129$, 100%) had one or more of the STI signs and symptoms. Overall, incarcerated women are among the subpopulation of females at high risk for STIs. Recent data indicate that the prevalence of some STIs such as chlamydia and gonorrhea in female prisoners is much higher than the general population (2). Commercial sex, elevated rates of substance use, exchanging drugs for sex, and hazardous drinking are quite common in detained women and are important risk factors for STIs.

5.1. Chlamydial Infection

This study reported that chlamydial infection was the most common infection observed. This result supported the results of other studies (5, 6). The prevalence of chlamydial infection (34%) among our studied cohort was much higher than the reported among married women (17%) in Tehran, Iran (7). The overall prevalence of chlamydial infection varied according to age, social behaviors, sexual activities, and geographic location of the patients (9).

The high prevalence of chlamydia infection in our studied group underscored the importance of chlamydia screening in the detained women in this area.

There were 26 (59%) inmates with vaginal discharge who were symptomatic. However, most women with chlamydial infection are asymptomatic; early detection and treatment have remained challenging. The disease is easy to diagnose and treat with a single dose of either erythromycin or azithromycin. Therefore, early diagnosis and treatment are quite essential to reduce disease transmission and late complications, which may include cervical cancer (10), as well as enhancement of susceptibility to and transmission of HIV in both men and women (11).

5.2. Candidiasis

Candidiasis was observed in 34 (26%) inmates, most of whom were younger than 46 years of age ($P = 0.02$). Although the frequency of vulvovaginal candidiasis has been reported to range from 15.7% to 53% among females who refer to STD clinics in the US (12) and Europe (13), its sexual transmission has been questioned (13). The high frequency of candidiasis among our female prisoners merits careful attention and concern, mandating diagnostic and therapeutic strategies for eradication of this infection in this neglected group of women.

5.3. Trichomoniasis

Infection caused by *Trichomonas vaginalis*, the most common curable STI worldwide, was the third most frequent infection ($n = 26$, 20%) in this study. Cervical ulceration, adnexal pain, and limitation of motion were

significantly associated with this infection. Nijhawan et al. in their study, conducted on 387 newly incarcerated women in the Rhode Island Department of Corrections, (1) found a 14% prevalence of trichomoniasis by APTIMA transcription-mediated amplification testing. Although 77% of their patients reported illicit drug and or heavy alcohol use, these researchers determined that only the black race, more than 1 year since the last Papanicolaou test, and presence of vaginal symptoms were the main predictors of infection (1).

Addiction was present in 13.6% of the participants of the present study; however, there appeared to be no association with the infection. Although incarcerated females are at a particularly high risk for trichomoniasis, few studies have used routine screening for this infection in high-risk populations (1). In general, its high frequency, ease to treat, and high cure rate (14) make its screening a recommendable strategy for high-risk groups such as the present study's subjects.

5.4. Syphilis

The frequency of syphilis was low ($n = 8$, 6.2%) in our patients, which approximated that reported in female prisoners (0%) in Isfahan, Iran (15) and Spain (10%) (16). The disease frequency appears to be much higher in male prisoners (90%) than females (16). Many of these subjects have been diagnosed through screening, which highlights the important role for disease diagnosis in prison settings.

5.5. Gonorrhea

The prevalence of gonorrhea has been reported to range from 0.2% to 17% among female prisoners (17). The low prevalence of gonorrhea in our subjects might be attributed to the following reasons: first, and most importantly, our main diagnostic tool was limited to a staining procedure; second, appropriate culture media were not available because of the limited resources, third, prior antibiotic treatments might have contributed to these results. The disease duration is somewhat shorter than chlamydial infection (18) and may result in a relative reduction in gonorrhea prevalence.

5.6. HIV

There was a very low prevalence of HIV in the present study. This result has confirmed results that have been reported by other investigators (15, 19, 20). However, because the frequency of sexually transmitted HIV-infection is increasing in Iran, screening for HIV is strongly recommended and continuously performed in order to avoid widespread HIV infection.

5.7. Implications

Compared with the general population, incarcerated people are more likely to be infected with STIs (21) as a

result of their involvement in high-risk groups that have a high STI prevalence (22). The high frequency of STIs among these female prisoners highlighted the potential influence of disease prevention and treatment efforts in prison settings, which might impact the general population.

This has clearly shown the need for implementation of appropriate educational interventions. Such interventions can provide incarcerated women with skills and knowledge to identify and maintain healthier sexual relationships, which will decrease both acquisition and spread of the disease in the general community.

5.8. Study limitations and Strengths

Our study has some major limitations. The main limitation was the inadequacy of the study sample and the characteristics of diagnostic tests that were used. The low frequency of gonorrhea could have been partially attributed to the lack of appropriate culture media for the growth of the organism. In addition, we were unable to establish validity of the self-reported data. We had limited information about the characteristics of participants' sexual partners, their actual numbers, social behavior, condom use, and underlying STIs. We attributed this, in part, to our cultural characteristics and moral beliefs.

Moreover, this study was limited to one single prison; hence the obtained data could not be generalized to other sites in Fars Province or the entire country. Strengths of this study include the analysis of trichomoniasis, which is often overlooked in STI studies (23). Candidiasis has been shown to be more frequent among the younger inmates. This study found higher rates of chlamydial infection than in the general population, which signified the importance and need for tighter screening and treatment efforts in this underserved incarcerated population.

Because of high rates of STIs in incarcerated women, it is necessary to have comprehensive screening, treatment, follow up and partner notification in order to reduce the frequency of STIs in this high-risk, vulnerable group of females.

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