Research Article

Clinical and Laboratory Positive Predictive Value of Symptom Management of STI in Iran: A Community-Based Survey

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Abstract

Background: The correct diagnosis of sexually transmitted infections (STIs) is the first step in the monitoring and management of these diseases.

Objectives: This study was conducted to investigate the clinical and laboratory positive predictive value (PPV) of STI symptom management in Iran.

Methods: This cross-sectional study was conducted on 5986 individuals (aged 18 to 50 years) from the general population of Marovdasht (Iran) in several stages: (1) self-reported symptoms of sexually transmitted diseases, (2) evaluation by a doctor, and (3) laboratory examination.

Results: Among the population sample, 686 (17.68%) individuals reported at least one of the predefined symptoms. The clinical-based PPV of syndromes in men and women were 67.74 (62.34 - 73.14) and 85.36 (82.76 - 87.96), respectively. In men and women, the highest PPV was observed for abnormal discharge from the anus 32.35 (25.35 - 39.35) and abnormal secretions from the cervix 59.39 (56.39 - 62.39), respectively. The laboratory-based PPV for men and women was 0 and 5.04 (3.04 - 7.4), respectively.

Conclusions: The clinical and laboratory-based PPV of STI symptoms in the general population is extremely low. Accordingly, a syndromic-based screening or monitoring approach for STIs is not a reliable tool for screening or monitoring in the Iranian general population. We suggest focusing on special (core) groups for monitoring STIs using laboratory-based methods.

Keywords: Sexually Transmitted Infections, Clinical Symptoms, Diagnostic Values, Positive Predictive Value, General Population.

1. Background

Sexually transmitted infections (STIs) are common infectious diseases and public health challenges worldwide. Among the many aspects of epidemiology and controlling STIs, timely diagnosis and treatment are highly important (1). However, in developing countries and populations with limited laboratory services, the diagnosis of STIs is challenging, expensive, and often inaccessible (2).

A widely used alternative to laboratory-based diagnosis is symptom-based diagnosis. The symptom-based diagnosis approach for STIs involves identifying predefined syndromes using a flowchart designed for the diagnosis of these diseases (3). These charts are simple, easy to implement by non-STI specialists, and can be integrated into primary health care settings, allowing for contact tracing, partner management, and counseling (4). Symptom-based treatment and management are also fast and cost-efficient when laboratory tests are not available, allowing for immediate treatment to begin (5). However, the symptom-based approach to STIs surveillance often leads to overdiagnosis and overtreatment (6). There is no consensus on the performance of syndrome-based STI diagnosis, as several studies from different countries have reported conflicting results (2). Symptom management of STIs using algorithms based on self-

reported symptoms is sometimes the only available option in many low- and middle-income countries. However, our knowledge about the validity of this approach is severely limited (1, 3).

Considering the advantages of the syndrome-based strategy in diagnosing STIs in developing countries, there is a long-standing need to evaluate the validity of this approach (6, 7).

2. Objectives

The aim of this population-based study (urban, rural) is to determine whether this approach is a suitable tool for screening STIs in the general population of Iran by measuring the clinical and laboratory positive predictive values (PPV) of the symptom-based approach for the diagnosis of STIs in Iran.

3. Methods

3.1. Setting

In 2019, this cross-sectional study was conducted on 3879 individuals (aged 18 - 50 years) who were randomly selected from the general population of Marvdasht county, Iran.

3.2. Data Collection

The study was conducted in three steps: (1) self-reporting of STI symptoms, (2) evaluation of the patients by a trained physician, and (3) laboratory confirmation of the clinically diagnosed patients (Figure 1). More details about sampling and methods have been provided in previous studies (8, 9).

3.3. Laboratory Testing Methods

PCR and NAAT (PCR) diagnostic tests were used in this study.

3.4. Data Analysis

Descriptive statistics, including mean, median, and percentage, were used to summarize the data. The positive predictive value of the symptom-based diagnosis strategy was defined. Data analysis was performed using STATA version 13.1.

4. Results

4.1. The Prevalence of Sexually Transmitted Infections-Associated Symptoms, Clinical Exam, and Laboratory Test Results

In total, 3879 individuals with an average age of 34.28 ± 8.74 participated in this study. Among the population sample, 686 (17.68%) individuals reported at least one of the predefined symptoms, of which 217 (9.7%) were male and 469 (28.7%) were female. Among the patients who were referred to the physician, 192 (68.82%) were confirmed by the doctor to have symptoms. The details are presented in Table 1.

The results of Table 2 show that most of the participants in the study are married and have a high school education. Additionally, 69.96% of the participants reported being sexually active, and their average age is 34.28 years.

Of the people who were referred to the physician, 3.52% had a history of premarital sex, and 3.96% had a history of extramarital sex. Additionally, 34.17% of the participants reported using condoms during intercourse. Of the total participants, 13.62% reported a history of anal sex, and 12.90% reported a history of oral sex (Table 3).

4.2. Positive Predictive Value

The results showed that, in general, the clinical-based PPV for STI syndromes in men and women are 67.74 (62.34 - 73.14) and 85.36 (82.76 - 87.96), respectively. In men, the highest PPV is associated with abnormal discharge from the anus, 32.35 (25.35 - 39.35), and in women, it is related to the presence of abnormal secretions from the cervix, 59.39 (56.39 - 62.39). The laboratory-based PPV of STI syndromes is 0 for men and 5.04 (3.04 - 7.4) for women (Table 4).

5. Discussion

The current study is the first of its kind to assess the accuracy of symptom-based monitoring of STIs in Iran. A significant number of participants in the sample reported experiencing the defined symptoms, with a higher prevalence of symptoms observed among female participants.

The results of our study suggest that the self-reported symptom-based PPV in the population was considerably low, especially in men. This indicates that approximately 32.66% of individuals who reported symptoms did not have the disease based on the physician's physical examination. Since the PPV of any test is influenced by the prevalence of the disease in a given population, the accuracy of symptom-based diagnosis is heavily dependent on the infection prevalence. Using a syndrome-based diagnosis strategy is more effective when the prevalence of infections is high (3, 8, 10).
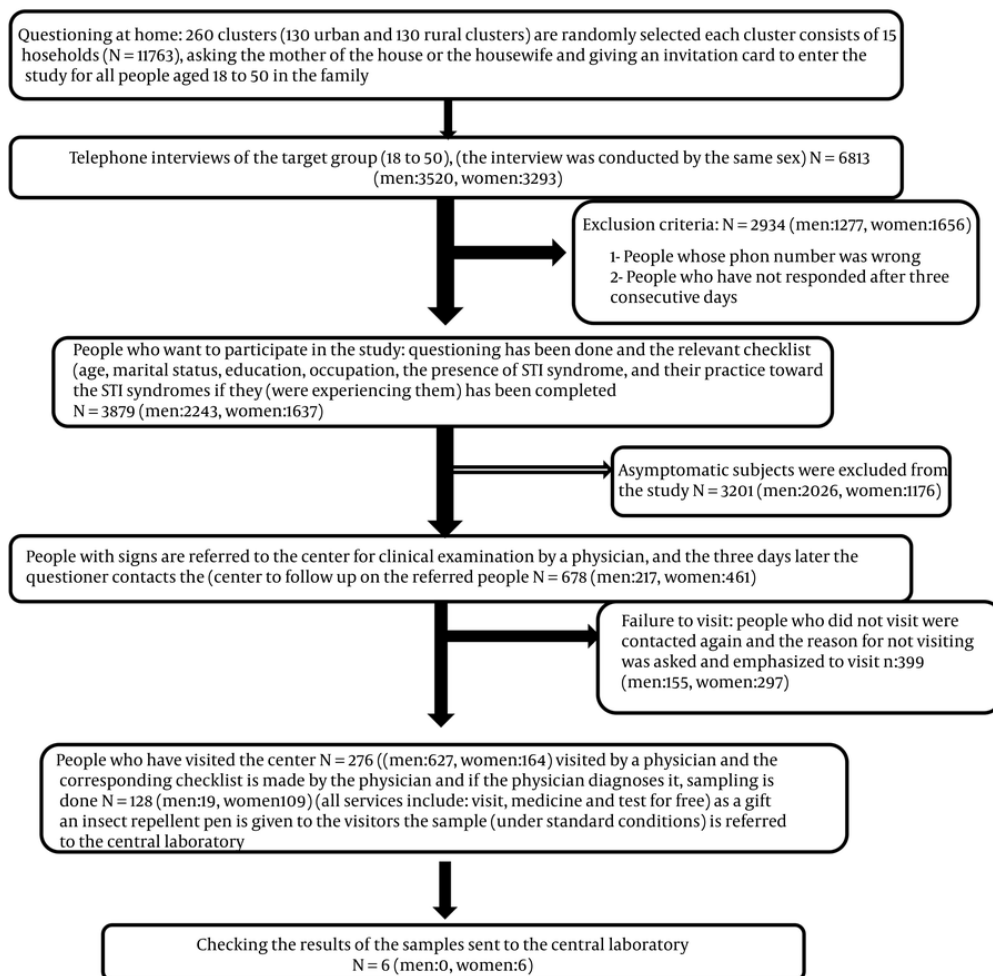
Figure 1. Step by step process of studying

Table 1. Summary of the Results [a]

Letter Name	Total People Aged 18 - 50	Men 18 to 50 Years Old	Women 18 to 50 Years Old
Total	6813 (57.92)	3520 (51.67)	3293 (48.33)
Entered the study	3879 (56.94)	2243 (63.86)	1637 (49.71)
Having at least one of the syndromes	678 (17.48)	217 (9.67)	461 (28.16)
Referred to the physician	279 (41.15)	62 (7.37)	164 (35.57)
Confirmed by a physician	192 (68.82)	42 (67.74)	140 (85.37)
Referred to the physician	128 (66.67)	19 (45.24)	109 (77.66)
Confirmed by a laboratory	6 (4.69)	0	6 (5.50)

[a] Values are expressed as No. (%).

The PPV based on laboratory test results in this study was extremely low. In other words, about 95% of

Table 2. Demographic Characteristics of the Participants [a]

Variables	Male	Female	Total
Residency			
Urban	1119 (49.9)	961 (58.7)	2080 (53.62)
Rural	1124 (50.1)	675 (41.3)	1799 (46.37)
Marital status			
Single	737 (32.9)	334 (20.3)	1071 (27.84)
Married	1493 (66.7)	1208 (75.2)	2701 (70.24)
Widow/divorced	9 (0.4)	64 (4)	73 (1.89)
Education			
Literate	39 (1.8)	85 (5.2)	124 (3.30)
Primary	372 (17.5)	410 (25.2)	782 (20.84)
Secondary	555 (26.1)	290 (17.8)	845 (22.52)
High school	698 (32.8)	511 (31.4)	1209 (32.22)
Academic	461 (21.7)	331 (20.3)	792 (21.10)
Job			
Worker	308 (14.8)	-	308 (8.30)
Employee	170 (8.2)	81 (5)	251 (6.76)
Farmer	298 (14.3)	-	298 (8.03)
Housewife/unemployed	188 (9)	1390 (85.5)	1578 (42.53)
Free	926 (44.4)	74 (4.6)	1000 (26.95)
Soldier/student	177 (8.5)	81 (5)	258 (6.95)
Retired	17 (0.8)	-	17 (0.45)
Having any kind of sexual contact	1752 (78.1)	962 (63.5)	2714 (69.96)
Age	34.75 ± 8.79	33.81 ± 8.91	34.28 ± 8.85

[a] Values are expressed as No. (%) or mean ± SD.

Table 3. Demographic Characteristics of People with Symptoms Who Referred to the Physician

Variables	Population Men	Women	Total
Job			
Selfe employed	32 (51.60)	6 (3.65)	38 (16.81)
Unemployed	8 (13)	1 (0.6)	9 (3.98)
Student/soldier	3 (4.3)	8 (4.8)	11 (4.86)
Housewife/worker	13 (30.96)	149 (90.53)	162 (71.68)
Farmer/rancher	6 (9.67)	-	6 (2.65)
History of sexually transmitted diseases			
Yes	4 (6.45)	8 (5)	12 (4.30)
Age	31 ± 12.12	27.50 ± 13.2	29.25 ± 12.66
Received treatment	3 (75)	4 (9.8)	7 (58.33)
Sexual status			
With spouse only	44 (71)	139 (84.2)	183 (80.61)
Before marriage sex	6 (9.67)	2 (1.2)	8 (3.52)
Extramarital affair	8 (12.9)	1 (.06)	9 (3.96)
Homosexuality	-	-	-
Have no sex	4 (6.5)	23 (13.9)	27 (11.89)
Average sex per week	1.47 ± 0.97	1.74 ± 1.03	1.60 ± 1.01
Number of sexual partners	1.58 ± 3	1 ± 0.12	1.29 ± 1.56
Anal intercourse			
Yes	9 (15)	29 (18.6)	38 (13.62)
Oral sex			
Yes	9 (14.5)	27 (17.3)	36 (12.90)
Method of prevention			
Condom	13 (28.88)	27 (26.2)	40 (34.18)
Tablet	3 (6.6)	12 (11.65)	15 (12.82)
IUD	4 (8.8)	6 (5.89)	10 (8.54)
Tubectomy and vasectomy	9 (20)	13 (12.62)	22 (18.80)
Natural	16 (35.55)	27 (26.2)	30 (25.64)
A history of sexually transmitted disease in the sexual partner			
Yes	11 (20)	8 (5.8)	19 (6.81)

individuals diagnosed as positive through symptom-based medical examination were negative in laboratory testing. This low predictive value results in a large number of individuals being falsely diagnosed as positive, leading to inappropriate treatment (11). This, in turn, contributes to increased antibiotic resistance, financial burden (12), and the stigma and social discrimination associated with STIs (12-14).

Table 4. Positive Predictive Value (Clinical and Laboratory) of Syndromes

Variables	Self-reporting N (PCI for P)	Doctor's Examination [a]	Confirmed by a Physician Clinically PPV%	Laboratory Based; PPV%
Men				
Skin rash	17 (0.76) (0.44 - 1.21)	3 (4.84) (1.01 - 13.50)	17.64 (8.6 - 26.4)	-
Genital/perineal/perianal warts	0	0	0	-
Ulcers in the genital area	7 (0. 3) (0.13 - 0.64)	1 (1.61) (0.04 - 8.66)	14.28 (4.28 - 24.28)	-
Enlargement of the lymph nodes in the groin	0	0	0	-
Enlargement of lymph nodes in areas other than the groin	0	0	0	-
The presence of abnormal secretions from the genital tract	107 (4.77) (3.93 - 5.74)	18 (29.03) (18.20 - 41.95)	16.82 (13.82 - 19.82)	-
Swelling or redness of the scar	52 (2.32) (1.74 - 3.03)	9 (14.52) (6.86 - 25.78)	17.30 (13.3 - 21.03)	-
Abnormal discharge from the anus	34 (1.52) (1.05 - 2.11)	11 (17.74) (9.20 - 29.53)	32.35 (25.35 - 39.35)	-
Total for all syndromes	217 (9.67) (8.48 - 10.97)	42 (67.74) (54.66 - 79.09)	67.74 (62.34 - 73.14)	0
Total	2243	62	42	19
Women				
Skin rash	20 (1.22) (0.75 - 1.88)	5 (3.05) (1 - 6.97)	25 (6.90 - 34.4)	-
Genital/perineal/perianal warts	5 (0.31) (0.10 - 0.71)	2 (1.23) (0.15 - 4.39)	4 (1.30 - 6.7)	-
Ulcers in the genital area	46 (2.81) (2.06 - 3.73)	19 (11.59) (7.12 - 17.50)	41.30 (37.9 - 44.7)	-
Enlargement of the lymph nodes in the groin	26 (1.59) (1.04 - 2.32)	6 (3.66) (0.13 - 7.89)	23.07 (15.37 - 30.77)	-
Enlargement of lymph nodes in areas other than the groin	17 (1.04) (0.61 - 1.66)	90 (54.88) (46.93 - 62.65)	23.52 (13.27 - 33.72)	-
Abnormal discharge from the vagina [b]	201 (12.28) (10.73 - 13.97)	79 (48.17) (40.31 - 56.09)	42.85 (39.85 - 45.85)	-
Abnormal secretions from the cervix [b]	133 (8.12) (6.85 - 9.55)	6 (3.66) (1.35 - 7.79)	59.39 (56.39 - 62.39)	-
Abnormal discharge from the anus	13 (0.79) (0.42 - 1.35)	31 (19.14) (13.39 - 26.05)	46.15 (32.45 - 59.85)	-
Cervical examination result (abnormal)	-	-	-	-
Bimanual examination result (abnormal)	-	-	-	-
Total for all syndromes	461 (28.16) (25.99 - 30.41)	140 (85.37) (79.01 - 90.39)	85.36 (82.76 - 87.96)	5.04 (3.04-7.4)
Total	1637	164	140	109

[a] Only people who went to the doctor were examined.

[b] Most women had both symptoms of discharge from the cervix and vagina.

5.1. Strengths and Limitations

This is a population-based survey with a relatively large sample size. One of the most significant limitations in studying STIs is the high social stigma surrounding these diseases ([8]), which may reduce participation rates and lead to reporting bias in the study. Additionally, a substantial percentage of STI cases are asymptomatic, and because asymptomatic individuals were not examined in this study, there is a possibility that the findings may underestimate the true prevalence of STIs ([14], [15]).

5.2. Conclusions

The clinical and laboratory PPV of symptom-based STI management in the study population is alarmingly low. Therefore, the syndrome-based approach is not a suitable method for screening or monitoring STIs in the general population. However, this method may be more appropriate if used in high-risk groups where access to and cooperation with diagnostic facilities is severely limited.

Acknowledgements

Footnotes

and Victoria Momenabadi; analysis and interpretation of data: Masoumeh Sadat Mousavi; drafting of the manuscript: Masoumeh Sadat Mousavi; critical revision of the manuscript for important intellectual content: Mohammad Fararouei; statistical analysis: Masoumeh Sadat Mousavi; administrative, technical, and material support: Mohammad Fararouei and Masoumeh Sadat Mousavi; study supervision: Masoumeh Sadat Mousavi.

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