Public Health

Prevalence of and Risk Factors for Self-reported Sexually Transmitted Infections in Slovenia in 2000

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Aim To estimate the prevalence of self-reported sexually transmitted infections (STIs) and examine the associations between self-reported STIs and sociodemographic and behavioral factors among sexually active Slovenians aged 18-49 years.

Methods Data were collected during 1999-2001 from a probability sample of the general population at respondents' homes by a combination of face-to-face interviews and anonymous self-administered questionnaires. Statistical methods for complex survey data were used to account for stratification, clustered sampling, and weighing.

Results The proportion of sexually active Slovenian population that reported ever being diagnosed with an STI, excluding pelvic inflammatory disease and vaginal discharge for women, was 5.5% for men and 5.1% for women. Gonorrhea was the most commonly self-reported STI among men (3.7%) and hepatitis B among women (1.7%). Independent risk factors associated with self-reported STIs included having concurrent heterosexual relationships during lifetime [adjusted odds ratio (AOR) for men 3.3 (CI 1.3-8.6) and for women 2.3 (CI 1.0-5.3)], ever having paid for sex for men (AOR 4.0, CI 1.5-10.7), and having at least 10 lifetime heterosexual partners for women (AOR 4.7, CI 1.7-13.0).

Conclusion Our estimates of lifetime prevalence of self-reported STIs in a probability sample of Slovenian men and women aged 18 to 49 indicate a substantial national burden of STIs. The results could be used in shaping national STI prevention and control policies and strategies. Identification of risk factors associated with self-reported STIs provide a basis for targeting prevention and control efforts to individuals at higher risk.

To shape adequate sexual and reproductive health policies, especially on sexually transmitted infections (STIs) and human immunodeficiency virus (HIV) prevention, treatment, and care, it is crucial to understand sexual behavior of the population and epidemiology of STI and HIV. Yet, by 1999 no national sexual behavior survey had been conducted in Slovenia. Two fertility surveys did not collect much information on sexual behavior patterns relevant for STI and HIV epidemiology (1-3). To fill these gaps, the Institute of Public Health of the Republic of Slovenia (IPHRS) conducted the first national survey of sexual lifestyles, attitudes, and health related to HIV and other STI.

Surveillance of STIs in Slovenia is largely based on mandatory notification of all diagnosed cases by clinicians. The newly diagnosed early syphilis reported rates declined from 2.1 to 0.1 per 100 000 general population during the 1980s and the early 1990s, increased to above 1.2 per 100 000 population during the period from 1994 to 1999, and declined again to 0.5 per 100 000 population in 2004. The increase between 1994 and 1999 was to a large extent due to cases acquired in the Russian Federation and newly independent states and resulting secondary cases (4). The reported incidence rates of gonorrhea decreased from 126.2 per 100 000 populations in 1980 to less than 20.0 per 100 000 population in the 1990s and further to as low as 2.3 per 100 000 in 2004. The reported incidence rates of genital chlamydia increased from 5.2 per 100 000 in 2000 to 12.9 per 100 000 in 2003 and declined to 7.6 per 100 000 in 2004.

Reported incidence rates data for all STIs, except for newly diagnosed early syphilis, substantially underestimate the true burden of STIs. To complement available surveillance information on STIs, one of the objectives of the first National Survey of Sexual Lifestyles, Attitudes, and Health was to estimate the self-reported lifetime rates of STIs (ie, the proportion of people who report ever being diagnosed with a STI) and to examine the associations between self-reported STIs and selected sociodemographic and behavioral risk factors among sexually active Slovenians aged 18-49 years.

Participants and methods

We performed a stratified two-stage probability sampling. Individuals aged 18-24 years were sampled with twice the probability than older subjects to obtain sufficient precision for estimates among young adults, while still keeping appropriate age span of respondents for the baseline description of sexual behaviour, attitudes and self reported STIs in the general population. The sampling frame was designed using the list of enumeration areas provided by the Central Population Registry. The Slovenian Central Population Register includes basic demographic information on all Slovenian citizens, including institutionalized and homeless citizens, and those living abroad. It is almost completely up-to-date and provides an excellent sampling frame. Within each of the 12 statistical regions of Slovenia, communities were implicitly stratified according to their type and size as follows: rural communities with less than 2000 inhabitants, non-rural communities with less than 2000, communities with 2000-9999, communities with 10 000-100 000, and two cities with more than 100 000 inhabitants. The entire sampling frame included 9850 primary sampling units of approximately 120 inhabitants aged 18-49 years. A total of 270 primary sampling units were sampled independently from the 12 regions, with probability, defined as the sum of the number of individuals aged 25 to 49 years and twice the number of individuals aged 18 to 24, proportional to the size of the eligible population. On average, 10 individuals aged 18-49 years were randomly selected from each unit.

Data were collected between November 1999 and February 2001 at respondents' homes by a combination of face-to-face interviews and

anonymous self-administered pencil and paper questionnaires. Methods adapted from the British National Survey of Sexual Attitudes and Lifestyles conducted in 1990 were thoroughly piloted in Slovenia (5,6). They were very similar to the methods used in the second British survey conducted in 2000 (7,8).

In the anonymous self-administered questionnaire, respondents were asked about their sexual behavior and whether they had been diagnosed with any of the following infections: gonorrhea, syphilis, genital herpes, chlamydia, genital warts (human papilloma virus), hepatitis B, vaginitis (trichomoniasis, various yeast and bacterial infections) and pelvic inflammatory disease (PID) for women and non-specific urethritis (inflammation of urethra with discharge) for men. Questions about HIV infection were not asked, as its prevalence in the general Slovene population is very low (9). Questions about respondents' sociodemographic characteristics were asked face-to-face.

Weights were computed to adjust for oversampling of the 18-24 year age-group and the differences in survey response between different regions, types, and sizes of communities. A multidimensional calibration procedure was applied to adjust for any remaining differences between the achieved sample and available Slovenian population estimates according to statistical regions, types of communities, and gender and age groups, based on Central Population Registry data for the year 2000.

Statistical methods for complex survey data, STATA, Release 7.0 (STATA Corp., College Station, TX, USA) were used to account for stratification, clustered sampling, and weighing. Weighted proportion estimates with 95% confidence intervals (95% CI) were computed separately for men and women. Tests for heterogeneity of proportions were computed by the usual Pearson χ^2 test, however, based on F statistics with noninteger degrees of freedom using a second order Rao and Scott correction accounting for the survey design. The weighted bases for percentages quoted in tables are rounded to the nearest integer. In addition to these weighted estimates for the numbers of individuals, unweighted counts of individuals are also given in all tables.

Vaginitis and PID were omitted from the analyses of associations between self-reported STIs and selected sociodemographic and behavioral risk factors because substantial proportion of those infections may not have been sexually acquired. Cases of non-specific urethritis and hepatitis B were included, although some may also not have been sexually acquired.

Univariate analyses of association between self-reported STIs and explanatory variables were performed by logistic regression to obtain pseudo-maximum likelihood estimates of odds ratios (OR) together with 95% CI, and results of adjusted Wald tests for significance using all available data. When the proportions increased or decreased systematically, tests for trend in proportions were computed using the logistic regression.

Variables were included in a series of logistic regression multivariate models if they were associated with the outcome at the significance level of $P<0.1$ in univariate analyses or were significantly associated with the outcome in the equivalent multivariate model for the other gender. Variables that remained statistically significant ($P<0.05$) in the multivariate analyses for either gender were retained in the final models for both genders. Records with missing data for any of the variables in the final multivariate logistic regression models were excluded from the final models (complete-subject analysis). Pseudo-maximum likelihood adjusted odds ratios (AOR) with 95% CI for all variables left in the final models and the results of adjusted Wald F tests for significance were computed.

Ethical approval was obtained from the Medical Ethics Committee at the Ministry of Health

of the Republic of Slovenia and of the London School of Hygiene and Tropical Medicine.

Results

We interviewed 849 men and 903 women aged 18-49 years. Overall, survey response was 67.0%, 63.3% among men and 70.9% among women. For both genders, the response decreased with age. In men it decreased from 71.3% in 18 to 19 year group to 58.9% in 45 to 49 year group, and in women from 77.8% in 18 to 19 year group to 65.4% in 45 to 49 year group. Inhabitants of the two Slovenian cities with the population of more than 100 000, Ljubljana and Maribor, were less likely to participate than those from smaller communities. A total of 775 sexually experienced men and 845 sexually experienced women responded to questions about STIs. The proportions of those reporting ever being diagnosed with any STI are given in Table 1. Overall, 5.5% (95% CI, 3.7%-8.1%) of men and 5.1% (95% CI, 3.6%-7.1%) of women reported that they were diagnosed with at least one STI (excluding vaginal discharge and PID for women). Very few of these men and women reported more than one STI in their lifetime (4.0% of men and 2.8% of women). Gonorrhea in men (3.7%, 95% CI 2.3%-6.0%) and genital chlamydia in women (1.1%, 95% CI 0.5%-2.3%) were the most commonly reported bacterial STIs. Hepatitis B and genital warts in men (0.4%, 95% CI 0.0-1.6%) and hepatitis B in women (1.7%, 95% CI 1.0-2.8%) were the most commonly reported viral STIs.

Table 2 shows the prevalence of self-reported STIs according to selected sociodemographic characteristics and behavioral risk factors, as well as the results of univariate analysis of association. Lifetime prevalence of self-reported STIs among men raised from 1.5% in 18 to 29 year-olds to 10.1% in 40 to 49 year-olds (test for trend *P*<0.001). In contrast, the proportion of women aged 18 to 28 who reported being diagnosed with at least one STI was almost as high as the proportion of those aged 40 to 49 (4.1% and 5.1%, respectively). Both men and women with at least 10 heterosexual partners in their lifetime had much higher lifetime prevalence of STIs than those with fewer than 5 partners (12.1% in comparison with 1.7% in men and 19.0% in comparison with 4.2% in women). In addition, both men and women who were engaged into concurrent heterosexual relationships at least once had much higher lifetime prevalence of self-reported STIs than those who did not (11.4% in comparison with 1.8% in men and 11.5% in comparison to 4.1% in women). Finally, there was a higher lifetime prevalence of STIs in men who ever paid for sex to women (23.0% vs 4.4%) and men who had their first heterosexual intercourse before the age of 16 (10.3% vs 4.6%). There was no substantial variation in lifetime prevalence of self-reported STIs with respect to educational level of

Table 1. Lifetime prevalence of self-reported STIs among sexually experienced individuals aged 18 to 49 in Slovenia, 1999-2001*

STIs	Men				Women			
	proportion %	95% CI	UWT	WT	proportion %	95% CI	UWT	WT
Gonorrhea	3.7	2.3-6.0	757	681	0.6	0.2-1.7	842	689
Syphilis	NE				0.2	0.0-1.4	841	689
Chlamydia	0.3	0.0-1.5	754	680	1.1	0.5-2.3	834	682
Non-specific urethritis	0.4	0.0-1.6	751	676	NA			
Any bacterial STI	4.7	3.1-7.2	745	671	2.2	1.2-3.7	797	650
Genital herpes	0.3	0.0-1.3	752	679	0.7	0.3-1.9	837	686
Genital warts	0.4	0.0-1.6	752	674	0.4	0.1-1.4	842	689
Hepatitis B	0.4	0.0-1.6	752	679	1.7	1.0-2.8	838	683
Any viral STI	1.1	0.5-2.6	730	656	3.0	2.0-4.6	798	649
Any STI (except for vaginal discharge & PID)	5.5	3.7-8.1	734	663	5.1	3.6-7.1	790	643
Vaginal discharge	NA				37.9	34.1-41.8	839	686
PID	NA				17.1	14.3-20.4	811	660

*Abbreviations: STIs – sexually transmitted infections; PID – pelvic inflammatory disease; UWT – unweighted count; WT – weighted count; NE – no estimate; NA – not applicable; CI – confidence interval.

Table 2. Self-reported STIs among sexually experienced individuals aged 18 to 49 in Slovenia 1999-2001, according to demographic and behavioral characteristics and results of univariate analysis*

Characteristic	Men						Women					
	proportion %	95% CI	UWT	WT	odds ratio	(P value)† 95% CI	proportion (%)	95% CI	UWT	WT	odds ratio	(P value)† 95% CI
Age group:						(<0.001)‡						(0.572)‡
18-29	1.5	0.6-3.8	382	245	1	(0.039)	4.1	2.4-7.0	391	238	1	(0.451)
30-39	5.1	2.4-10.7	172	213	3.5	1.1-11.4	5.7	3.1-10.4	218	205	1.4	0.6-3.4
40-49	10.1	6.2-16.0	208	221	7.2	2.4-21.7	5.1	2.8-9.3	210	214	1.3	0.6-2.8
Marital status:												
married/cohabitation	6.8	4.3-10.7	381	413	1	(0.088)	5.1	3.4-7.6	513	473	1	(0.805)
other	3.3	1.6-6.6	381	266	0.5	0.2-1.1	4.6	2.3-9.2	306	184	0.9	0.4-2.2
Education:§												
<1st stage secondary	8.4	3.6-18.5	93	80	1	(0.447)	3.4	1.3-8.9	133	123	1	(0.288)
1st stage secondary	3.9	1.8-8.1	243	216	0.4	0.1-1.5	2.5	0.8-7.4	148	119	0.7	0.2-3.3
2nd stage secondary or higher school	5.1	2.8-9.0	370	321	0.6	0.2-1.6	6.6	4.5-9.7	459	344	2.0	0.7-5.9
recognized 3rd level	8.7	3.2-21.7	55	61	1.0	0.3-4.2	3.8	0.9-14.1	78	69	1.1	0.2-6.5
Community size:												
≤100 000	5.7	3.7-8.6	658	566	1	(0.585)	4.8	3.3-6.9	681	525	1	(0.746)
>100 000	4.1	1.3-12.3	104	113	0.7	0.2-2.5	5.6	2.5-12.1	138	132	1.2	0.5-3.0
Heterosexual partners lifetime:						(<0.001)‡						(0.009)‡
1-4	1.7	0.6-4.5	383	330	1	(<0.001)	4.2	2.8-6.3	644	508	1	(0.003)
5-9	4.5	2.0-9.7	158	136	2.7	0.7-10.4	4.4	1.7-11.3	115	104	1.1	0.4-3.1
≥10	12.1	7.4-19.1	200	195	8.1	2.5-25.6	19.0	9.4-3.5	45	35	5.4	2.0-14.3
Concurrency lifetime:												
no	1.8	0.8-3.8	452	390	1	(<0.001)	4.1	2.7-6.1	658	527	1	(0.004)
yes	11.4	7.3-17.2	243	236	7.2	3.0-17.1	11.5	6.5-19.7	121	96	3.1	1.5-6.5
Ever paid for sex to a woman:												
no	4.4	2.8-6.7	707	625	1	(<0.001)						
yes	23.0	10.9-42.2	33	34	6.6	2.6-16.7						
Age at first heterosexual intercourse:												
≥16	4.6	2.9-7.3	632	575	1	(0.041)	5.0	3.5-7.2	749	603	1	(0.744)
<16	10.3	5.4-18.9	127	101	2.4	1.0-5.5	4.1	1.3-12.4	70	54	0.8	0.2-2.9

*Abbreviations: STIs – sexually transmitted infections (any of the following: gonorrhea, syphilis, chlamydia, genital herpes, genital warts, non-specific urethritis, hepatitis B); UWT – unweighted count; WT – weighted count; CI – confidence interval.
†P value for testing the significance of association between self-reported STIs and explanatory variables obtained by logistic regression to obtain pseudo-maximum likelihood estimates of odds ratios together with 95% confidence interval.
‡P value for test for trend.
§<1st stage secondary education – elementary school not completed or completed but no secondary level education completed; 1st stage secondary – 1.5 to 3 years craftsmen program completed; 2nd stage secondary or higher school – 4 to 5 years technical secondary school or general secondary school completed or higher school completed; Recognized 3rd level – graduated from university or MS or PhD degree.

either men or women, marital status, and the size of communities they lived in.

Table 3 shows the results of multivariate analyses of association of self-reported STIs with selected behavioral and demographic characteristics. Concurrent heterosexual relationships were an independent risk factor for self-reported STIs for both men and women (AOR 3.3, 95% CI 1.3-8.6 and 2.3, 95% CI 1.0-5.3, respectively). In addition, adjusted odds for self-reported STIs were higher among women with at least 10 heterosexual partners during lifetime (AOR 4.7, 95% CI 1.7-13.0), and among men who reported having ever paid for sex to a woman (AOR 4.0, 95% CI 1.5-10.7). Finally, the adjusted odds of reporting STIs were almost five times higher in 40 to 49 years old men than in 18 to 29 years old (AOR 4.9, 95% CI 1.6-15.2).

Discussion

Our results showed that more than 5% of the sexually active Slovenian population aged 18 to 49 reported being diagnosed with an STI at least once in their life. Identified risk factors for self-reported STIs included concurrent heterosexual relationships, ever having paid for sex for men, and having at least 10 heterosexual partners during lifetime for women. Methodological strengths of our study included the use of reliable general population sampling frame, two-stage probability sampling strategy, sufficiently high survey response, well-piloted data collection methods adapted from the National Sexual Attitudes and Lifestyles Survey in Britain (5), and weighing the data. The limitations of our survey include validity constraints of self-reported in-

Table 3. Risk factors associated with self-reported STIs among sexually experienced individuals aged 18 to 49 in Slovenia, 1999-2001; results of multivariate analysis*

Risk factor	Proportion %	95% CI	UWT	WT	Odds ratio	(P value) 95% CI†	Adjusted odds ratio	(P value) 95% CI†
Men								
concurrency lifetime:								
no	1.8	0.8-3.9	441	380	1	(<0.001)	1	(0.013)
yes	11.4	7.2-17.5	230	220	7.0	2.9-16.7	3.3	1.3-8.6
≥10 heterosexual partners lifetime:								
no	2.7	1.4-5.0	498	435	1	(<0.001)	1	(0.076)
yes	12.3	7.3-20.1	173	166	5.1	2.2-11.9	2.3	0.9-5.9
ever paid for sex to a woman:								
no	4.2	2.7-6.6	643	572	1	(<0.001)	1	(0.006)
yes	27.3	13.1-48.4	28	29	8.5	3.3-22.3	4.0	1.5-10.7
age group:						(0.001)‡		
18-29	1.7	0.7-4.1	346	223	1	(0.071)	1	(0.024)
30-39	5.0	2.2-11.2	147	189	3.1	0.9-10.6	2.6	0.7-9.0
40-49	10.0	5.9-16.3	178	188	6.5	2.2-20.0	4.9	1.6-15.2
Women								
concurrency lifetime:								
no	4.1	2.7-6.1	657	527	1	(0.004)	1	(0.044)
yes	11.5	6.5-19.7	121	96	3.1	1.5-6.5	2.3	1.0-5.3
≥10 heterosexual partners during lifetime:								
no	4.4	2.9-6.4	738	593	1	(<0.001)	1	(0.003)
yes	22.7	10.8-41.6	40	30	6.5	2.4-17.7	4.7	1.7-13.0
age group:						(0.600)‡		
18-29	4.4	2.5-7.5	370	224	1	(0.459)	1	(0.498)
30-39	6.0	3.3-10.9	207	194	1.4	0.6-3.4	1.8	0.7-4.5
40-49	5.4	2.9-9.7	201	205	1.2	0.5-2.8	1.4	0.6-3.3

*Abbreviations: STIs – sexually transmitted infections (any of the following: gonorrhea, syphilis, chlamydia, genital herpes, genital warts, non-specific urethritis, hepatitis B); UWT – unweighted count; WT – weighted count; CI – confidence interval. Only individuals with information on all risk factors in the table were included in analyses.
†P value for testing the significance of association between self-reported STIs and explanatory variables obtained by multivariate logistic regression to obtain pseudo-maximum likelihood estimates of adjusted odds ratios together with 95% confidence intervals.
‡P value for additional test for trend.

formation, and possible participation biases inherent to all behavioral surveys.

Since only a certain proportion of STIs is symptomatic, the true burden of STIs in Slovenia is even higher than suggested by our results (10-12). Our estimate included only the individuals with at least one STI, who had access to diagnostic testing, were found to be positive, were informed about the diagnosis, and reported the result in the questionnaire. Our survey indicated a substantial burden of genital chlamydial infection (4.7% sexually experienced men and women 18 to 24 years old were infected at the time of the survey) in contrast with the extremely low lifetime self-reported rates and reported incidence rates from mandatory notification surveillance system (13). In addition, the relatively high level of self-reported PID (17.1%) suggests that rates of gonorrhea and genital chlamydia were higher than shown by routine surveillance rates. Substantial difference in self-reported lifetime prevalence of hepatitis B between women (1.7%)

and men (0.4%) could be partly explained by the screening program for pregnant women.

Comparing self-reported lifetime prevalence of STIs in sexually experienced Slovenians aged 18-49 years to the results of the equivalent British National Survey of Sexual Attitudes, and Lifestyles conducted during the same period, we can conclude that all rates are lower for the Slovenians, except for gonorrhea in men (3.7% in Slovenia vs 1.2% in Britain) and syphilis in women (0.2% vs 0.1%) (7,14). In contrast, an American study conducted among sexually active women, reported a higher proportion of self-reported bacterial STIs (6%) than our study, but a lower proportion of PID (8%) (15). Finally, Women's Health Australia study found higher self-reported lifetime prevalence of chlamydia (1.7%), genital herpes (1.1%), and genital warts (3.1%) in comparison to our results (16).

Various data collection methods were used in national HIV and STI-related sexual behavior surveys. Face-to-face interviewing was used in

surveys coordinated by the World Health Organization and surveys conducted in the Netherlands (17,18). Self-administered questionnaires were used in Germany and Spain, and in postal surveys in Norway and Croatia (18-21). Computer-assisted telephone interviewing (CATI) was used in Belgium, France, Germany, Scotland, Switzerland, and the US (18,22-25), A combination of face-to-face interview with self-administering of more sensitive questions was used in the first survey in Britain, Finland, Germany, Portugal, and the US (5,18,26). The second British national survey used a combination of computer-assisted personal interviewing (CAPI) and computer-assisted self-interviewing (CASI), with respondents keying responses to questions displayed on the screen (7).

It has been shown that respondents were more willing to reveal socially censured information in confidentially self-administered questionnaires or video-computer-assisted self-interviewing than in a face-to-face interview (27). Studies comparing computer-assisted self-interviewing with pencil and paper self-administration of identical questions demonstrated the potential of computer-assisted self-interviewing to improve the quality of data and to increase respondents' willingness to report sensitive types of behavior (28). In contrast, the pilot study for the second national British survey found no evidence of computer-assisted self-interviewing increasing reporting risk behavior when compared with pencil and paper self-administration of the same questions, but did demonstrate improved item response and data consistency (29). In our constrained resources setting, we decided to adapt the data collection method used in the national Sexual Attitudes and Lifestyles survey conducted in 1990 and 1991 in Britain, to a combination of face-to-face interview and self-administration of more intimate questions using pencil and paper (5). Anonymous self-administration might have contributed to an improved validity of self-reported information.

By means of weighing we accounted for the stratified, two-stage sampling strategy, over-sampling of young people, as well as differences in response according to key demographic variables and improved the representativness of our survey sample data.

Limitations to our survey include validity constraints of self-reported information and possible participation biases inherent to all behavioral surveys. Social desirability bias may have accounted for underreporting. Some studies are concerned with the reliability of self-reported data on STIs (30,31). Interestingly, an American study among adolescents reported that self-reported STIs before the baseline interview was the best predictor of self-reported STIs one year after the baseline interview (32).

To conclude, our results indicate a substantial national burden of STIs and inform national STI prevention and control policies and strategies. Identification of risk factors associated with self-reported STIs provides a basis for targeting prevention and control efforts to individuals at higher risk for STIs.

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