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Multivariate Analysis of Risk Factors Associated with Genital Ulcer Disease among Incarcerated Males in Sindh

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Abstract

Objective: To evaluate the potential risk behaviors associated with the lifetime risk of self reported genital ulcer disease (GUD) among prison inmates.
Setting: Prison inmates from 14 prisons of Sindh Province.
Methods: A cross-sectional study was conducted on 3395 prison inmates during July to December, '1994. A questionnaire was used to assess the lifetime risk of self-reported GUD (whether or not the subject was ever affected with CUD up to present age) and to investigate demographic markers and risk behaviors for their possible association with lifetime risk of CUD using logistic regression analysis.
Results: The reported lifetime risk of CUD in the study sample was 11.4% (386/3395). In final multivariate logistic regression model the sexual behaviors which were independently associated with CUD were having sexual intercourse with female (adjusted OR = 1.7;95% CI: 1.3-2.3, P = 0.0002), sexual intercourse with a prostitute (adjusted OR = 1.5;95% Cl: 1.2-2.0, P = 0.0008), sexual intercourse with man (adjusted OR = 2.2;95% CI: 1.7-2.7, P = <0.001) and sexual intercourse with man during current incarceration (adjusted OR = 1.9;95% CI: 1.2-2.9, P = 0.0071).
Conclusion: Health education needs to re-enforce monogamous relationship for high risk groups such as in our study. Although infrequent condom use was not a risk factor for CUD in this study, yet based on the results of previous studies, promotion of condom use should be the component of health education program GPMA 50:115, 2000).

Introduction

Sexually transmitted diseases (STDs) have been identified as a major public health problem world over[1], particularly in developing countries, where resources for their management are limited[2]. The efforts to control STDs in developing countries are hampered by insufficient number of specialist STD clinics to cater for the needs of population, the non-availability of suitable diagnostic facilities and appropriate drugs[1,3]. Failure to provide effective treatment for patients with STDs will ultimately lead to continued spread of disease, high rates of complications and in additions enhanced rates of sexual transmission of human immunodeficiency virus (HIV)[4-10].
Among the STDs genital ulcer disçase (GUD) is a frequent problem in men attending the STDs clinics" and remained consistently high over the past ten years, contributing approximately 25% to the total case load seen in developing countries[12,13]. Sixty nine percent of all cases of GUD are in 20 to 34 year old age group and 3% in those older then 45 years[2]. The major causes of GUD include Treponema pallidum (syphilis), donovanosis (granuloma inguinale), genital herpes and Haemophilus ducreyi infection[1,11].
It has been shown that genital ulcers were significantly associated with HIV seropositivity in Nairobi[14,15]. Further studies in homosexual populations have confirmed the association of genital ulcers with HIV transmission[8]. GUD has been shown to be independently associated with immunosuppression among HIV positive women, but this relationship is complex and may be in part cause and part effect[16]. Nevertheless, there is convincing evidence that genital ulceration increases the

susceptibility to HIV infection and compared with men with other sexually transmitted diseases those with genital ulceration had increased risk of seroconversion against HIV[9].

The prevention programs for STDs transmission is becoming a priority of public health departments in developing coutnries[17]. Such prevention programs would have to be based on the knowledge of modifiable risk behaviors associated with acquisition of STDs among members of high risk segments of population. Previous studies have shown that risk of acquiring a STD increases with the number and type of sexual contacts and lack of condom use[18,19]. The differences have been shown in the risk behaviors associated with gonorrheal and chalmydial infection[20]. Contrary to these findings, risk factors for developing either GUD or any other STD were shown to be similar[2]. In another study, men with GUD compared to those with other STDs have had increased frequency of sexual intercourse with commercial sex workers, history of STD symptoms in the past 12 months and a recent sexual contact. Infrequent condom use was not a risk factor for this population[21,22]. However, other studies have shown the effectiveness of condoms in reducing the risk of STD transmission[23]. These inconsistent results of different studies regarding the risk factors for GUD in different populations prompted us to conduct the present study.

Some published data on different high risk groups concerning epidemiology of other STDs are available from Pakistan[24]. However, to our knowledge no study so far has determined the risk factors for GUD among incarcerated males, a known high risk group that may pose a risk of STDs transmission in general population on completing their prison term. The objective of this study therefore, was to identify the risk factors associated with GUD in a systematic sample of incarcerated male inmates from prison System of Sindh, Pakistan, using rnultivariate analysis.

Methods

Study Subjects and Data Collection

The study setting sampling technique used to select the study population has been described elsewhere, Briefly, 3395 male prison inmates were included in the present analysis. They were selected using one-in-three systematic sampling technique from among 10600, male prisoners incarcerated in judicial custody as indicted criminals in 14 prisons of Sindh during July 1994. The subjects interviewed comprised mainly of two self-identified ethnic groups. The subgroups were identified based on their mother-tongue i.e., Sindhi, Urdu. However, a small proportion also comprised other ethnic groups. Inmates were eligible to participate in the study, if they spoke Urdu, being a national language. Because of the varying literacy levels of the prison inmates, a structured risk behavior interview was administered to each study subject in confidence by trained research interviewer in a private area within the prison. The interview focused on seeking information on demographic, sexual and drug use behaviors during the subject's lifetime up to his present age. The questions on sexual behavior solicited information on number and type of sex partners, homosexuality both before and after incarceration, condom use and illicit drug use. Inmates were asked, if they had painful genital ulcer disease in the past (lifetime risk of genital ulcer disease occurrence i.e., if the respondent ever had this condition up to his present age). The question concerning the past history of genital ulcer disease was phrased to deliver a concise description of the common signs and symptoms associated with genital ulcers of different origins[11,25]. Specifically, the question asked was: have you ever had a painful genital ulcer disease?

Ethics and Confidentiality

Informed verbal consent of each study was sought and to ensure frank and complete answers, they were assured about complete confidentiality of all interview questionnaire responses. This study was approved by the Aga Khan University's Committee for Human Subjects Protection.

Data Analysis

For all analyses, the dependent variable, lifetime risk of genital ulcer disease occurrence had two categories: ever affected and never affected. We categorized the continuous variables such as age and duration of imprisonment into quartiles to reduce the influence of outliers. Frequencies (%) of demographic variables and sexual behaviors were computed[26]. The relationship between the dependent variable and the independent variables was examined by using two-way and multi-way contingency comparisons; the c^2 test was used to compare proportions[27]. The crude measure of association between a single putative risk factor and inmates genital ulcer disease status was expressed as the odds ratio (OR) and the corresponding 95% confidence intervals (CE) was derived by means of first-order Taylor series approximations method[26].

A multivariable logistic regression model was used to estimate the effect of each variable on the lifetime risk of genital ulcer disease adjusting for the effects of other variables in the model. For multivariate analysis, a full model was specified with all independent variables significantly ($p<0.1$) related with outcome variable in un ivariate analyses. Backward stepwi se multiple logistic regression analysis was carried out to arrive at the final multivariable model relating the variables simultaneously to the lifetime risk of genital ulcer disease[28]. in addition to significant ($p<0.1$) main effects, identified through univariable analyses, some interaction terms were considered for possible inclusion in the final model. Selection of the final model was based on parsimony, biological interpretability and statistical significance. The parameters of the logistic regression model were estimated by the maximum-likelihood method. The adjusted odds ratios (ORs) and their 95% confidence interval (Cis) were computed using the estimates of parameters of final logistic regression model and were the main focus for substantive interpretation of the model. In all the analyses 5% significance level (a=0.5) was used unless stated otherwise. All the analyses were carried out by using SPSS/PC windows version 7.5 (SPSS Inc. Chicago, IL. USA).

Results

The distribution of study subjects with respect to demographic variables including age, ethnicity, education, marital status, duration of imprisonment and reported risk behaviors is given in Table 1. The reported lifetime risk of GUD in the study sample was 11 .4% (386/3395). On unadjusted analysis being Sindhi and duration of imprisonment were significantly ($p<0.001$) associated with lifetime risk of GUD (Table 1). All risk behaviors considered except ever injected drugs, ever shared needles and ever having use condom during sexual intercourse were significantly ($p<0.001$) associated with lifetime risk of GUD for this study population in univariate analysis (Table 1).

Table 1. Frequency distribution, bivariate odds ratio and their associated 95% confidence limits of demographic variables and sexual risk behaviors from a cross-sectional study of lifetime risk of genital ulcer disease (GUD) among prison, inmates, Sindh, July, 1994 (n=3395).

Variables	Number (%) of inmates		Odds ratio	
	GUD affected	Total	Point estimate	95% confidence limits
Demographic variables				
Age (months)				
<23	98 (11.6)	846	1.00	-
23-<26	83 (12.1)	686	1.05	(0.77,1.44)
26-<33	121 (12.0)	1006	1.04	(0.79,1.39)
33+	84 (9.8)	857	0.83	(0.61,1.13)
Ethnicity (mother tongue)				
Urdu	151 (9.2)	1659	1.00	-
Sindhi	227 (13.5)	1687	1.54	(1.24, 1.92)
Others	7 (14.3)	49	1.65	(0.73, 3.74)
Education (years in school)				
0	191 (11.2)	1711	1.00	-
1-4	59 (14.2)	416	1.32	(0.96, 1.80)
5-10	103 (11.2)	916	1.01	(0.78, 1.30)
>10	33 (9.4)	352	0.82	(0.56, 1.21)
Marital status				
Unmarried	161 (10.3)	1561	1.00	-
Married	214 (12.2)	1754	1.20	(0.97, 1.50)
Separated/Widowed	11 (13.8)	80	1.39	(0.72, 2.67)
Duration of imprisonment (months)				
<3	74 (8.8)	843	1.00	-
3-<9	99 (11.7)	846	1.38	(1.00, 1.89)
9-<24	101 (12.0)	841	1.42	(1.03, 1.95)
24+	111 (13.1)	845	1.57	(1.15, 2.15)
Risk behaviors				
Do you inject drug intravenously?				
No	372 (11.4)	3274	1.00	
Yes	14 (11.6)	121	1.02	(0.58, 1.80)
Do you share needles?				
No	380 (11.3)	3349	1.00	
Yes	6 (13.0)	46	1.17	(0.49, 2.78)
Do you have sexual intercourse with a female?				
No	83 (6.2)	1349	1.00	
Yes	303 (14.8)	2046	2.65	(2.06, 3.41)
Do you have sexual intercourse with more than one female?				
No	127 (7.1)	1791	1.00	
Yes	259 (16.1)	1604	2.52	(2.01, 3.16)
Do you have sexual intercourse with a prostitute?				
No	219 (8.7)	2503	1.00	
Yes	167 (18.7)	892	2.40	(1.93, 2.99)
Do you have sexual intercourse with a man?				
No	201 (8.1)	2496	1.00	
Yes	185 (20.6)	899	2.96	(2.38, 3.67)
Do you have sexual intercourse with more than one man?				
No	242 (9.0)	2695	1.00	
Yes	144 (20.6)	700	2.63	(2.09, 3.29)
Did you have sexual intercourse with a man prior to incarceration?				
No	238 (9.0)	2652	1.00	
Yes	148 (19.9)	743	2.52	(2.01, 3.16)
Did you have sexual intercourse with a man during current incarceration?				
No	352 (10.7)	3284	1.00	
Yes	34 (30.6)	111	3.54	(2.42, 5.59)
Do you think that any of your sexual partner has more than one sexual partners?				
No	218 (9.4)	2309	1.00	
Yes	168 (15.5)	1086	1.76	(1.41, 2.18)
Do you think that any of your sexual partners injects drugs?				
No	368 (11.1)	3322	1.00	
Yes	18 (24.7)	73	2.63	(1.53, 4.52)
How often do you use condom during sexual intercourse?				
A/O	28 (11.5)	243	1.00	
Never	358 (11.4)	3152	0.98	(0.65, 1.48)

** = Twenty inmates have incomplete data on duration of imprisonment.
***A/O = Always/Occasionally.

Table 2. Multivariable logistic regression model of risk factors associated with lifetime risk of genital ulcer disease occurrence among prisons' inmates, Sindh, July, 1994 (n = 3375)*.

Variable	b**	Se	Adjusted odds ratio		
			Point Estimate	95% CI***	p value
Do you have sexual intercourse with a female?					
No			1.00	-	
Yes	0.552	0.148	1.73	1.30, 2.32	0.0002
Do you have sexual intercourse with a prostitute?					
No			1.00	-	
Yes	0.427	0.127	1.53	1.19, 1.97	0.0008
Do you have sexual intercourse with a man?					
No			1.00	-	
Yes	0.766	0.122	2.15	1.70, 2.73	<0.001
Did you have sexual intercourse with man during current incarceration?					
No			1.00	-	
Yes	0.612	0.227	1.85	1.18, 2.88	0.0071
Constant	-2.875				
Hosmer-Lemeshow $\chi^2 = 4.50$ (df = 5, p value = 0.479)					

* Twenty of the inmates had missing observations on duration of imprisonment, therefore, sample size reduced to 3375 for multivariable model.

** b = Partial logistic regression coefficient, Se = standard error of b;

*** CI = Confidence interval.

Multivariable 'ogistic regression model

The sexual behaviors which were independently associated with GUD in final multivariable logistic regression model were having had sexual intercourse with female (adjusted OR = 1.7;95% CI: 1.3-2.3, P = 0.0002), had a sexual intercourse with a prostitute (adjusted OR = 1.5;95% CI 1.2-2.0, P = 0.0008), had a sexual intercourse with man (adjusted OR = 2.2;95% CI: 1.7-2.7, p = <0.001) and sexual intercourse with man during current incarceration (adjusted OR 1 .9;95% Cl: 1.2-2.9, p = 0.0071). Finally ethnicity and duration of imprisonment were not significantly associated with GUD.

Discussion

Recent evidence suggests that STDs facilitate the transmission of HIV[29]. Among the STDs GUD has been recognized as a major factor in HIV transmission[8,30] and a proportion of HIV infections in men attributable to GUD as high as 75-98% has been reported in Africa[31]. Recently, effective treatment of GUD and other STDs has been shown to reduce the incidence of HIV infection in Africa[29]. The etiology of GUD varies both geographically and temporally[33-34]. The primary agents causing GUD in STD clinic patients are Treponema pallidum, Haemophilus ducreyi and herpes simplex virus[35]. Laboratory tests for the detection of these organisms are relatively insensitive, costly, technically sophisticated, time consuming and are often not available in clinics where GUD patients are seen in developing countries[36,37]. These difficulties in assessing the etiologic causes of GUD in the developing countries are further compounded by the high incidence of all the sexually transmitted causes of GUD, mixed infections and atypical presentation of long-standing diseases[38]. Aforementioned diagnostic limitations have been partly overcome by the introduction of syndromic approach to GUD diagnosis and management worldwide. WHO has recommended this syndromic approach for GUD diagnosis in

areas with limited resources[39] and therefore, was employed in the present study.

It is known that the STDs are directly related to the patterns of sexual behavior and these patterns differ significantly within continents and even within countries[40], we therefore, investigated the sexual behaviors associated with GUD among incarcerated male inmates in criminal justice system in Sindh, Pakistan using a cross-sectional study design.

In our final multivariate logistic regression model, the risk factors associated with GUD included independent effects of sexual intercourse with a female, sexual intercourse with a commercial sex worker, sexual intercourse with a man and sexual intercourse with a man during current incarceration. These findings consistent with those of other studies conducted in developing and developed countries[21,22], revealed that men continue to engage in risky sexual practices by having unprotected sex with commercial sex workers and ultimately with casual sex partners and their wives in case of married inmates.

Furthermore, the subjects in our study are quite heterogeneous with respect to their sexual behaviors. It has shown that the heterogeneity in sexual behavior as measured by the rate of sex partner change adds substantially to the reproductive rate of the causative agents and thus the likely future rate of growth of an epidemic[40]. Thus characterization of the heterogeneity of sexual behavior plays an extremely influential role in determining both the course of STDs epidemic and choice of control strategy[41].

Infrequent use of condom was not a risk factor for GUD in our study population. However, other studies have shown the effectiveness of condoms in reducing the risk of STDs transmission[23].

The results of this and previous studies[42], showed that there is high prevalence of STDs among the incarcerated. Thus, health care providers at correction system need to increase the efforts at STDs prevention and treatment in the criminal justice system, which may help in suppressing the HIV epidemic. The health education needs to re-enforce monogamous relationships and the use of condoms to reduce the risk of STDs transmission.

The treatment seeking behaviors in these study subjects with GUD is of great concern and could not be addressed in this study. The factors influencing these behaviors may be socio-economic in nature including inability to afford treatment, failure to perceive that they have illness that requires treatment. Further research is required on the factors, which could possibly influence such decisions and to devise possible strategies to change the risky behaviors.

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