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Risk behaviours associated with urethritis and genital ulcer disease in prison inmates, Sindh, Pakistan

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السلوكيات المحفوفة بالخطر المرتبط بالتهاب الإحليل والقرحة التناسلية بين السجناء في السند بباكستان

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الخلاصة: قمنا بتقييم الاختلافات الوبائية فيما يتعلق بالديموغرافيات ومعاقرة المخدّرات والسلوكيات الجنسية المرتبطة بالاختطار المتوقع طوال العمر للإصابة بالتهاب الإحليل، ومرض القرحة التناسلية، وبالتهاب الإحليل ومرض القرحة التناسلية معاً بين 3395 سجيناً من الذكور في السند. وقد أوضح تحليل التحوّف اللوجستي المتعدد المتغيرات أن العوامل المرتبطة بالتهاب الإحليل ومرض القرحة التناسلية منفردين هي: ممارسة الجنس مع نساء متعددات، واللواطة، والانتماء العرقي (المتحدثون باللغة السندية مقارنة باللغة الأردية). أما العوامل الإضافية المرتبطة بالتهاب الإحليل وحده فكانت ممارسة الجنس مع البغايا، واللواطة، وممارسة الجنس مع قرينات يتناولن المخدرات حقناً. وقد تضمنت السلوكيات المحفوفة بالخطر المتوقع طيلة فترة الحياة للإصابة بالتهاب الإحليل ومرض القرحة التناسلية معاً ممارسة الجنس مع البغايا، واللواطة، أو مع شركاء يتناولون المخدرات حقناً، والانتماء العرقي. وقد كانت هذه الترابطات أكثر ثباتاً مقارنة بالتهاب الإحليل أو مرض القرحة التناسلية كلٍّ على حدة.

ABSTRACT We evaluated the epidemiological differences with respect to demographics, drug use and sexual behaviours associated with lifetime risk of urethritis, genital ulcer disease (GUD) and urethritis and GUD together among 3395 male prisoners in Sindh. Factors associated with urethritis and GUD alone were sex with multiple females, sex with men, and ethnicity. Additional factors associated with urethritis alone were sex with prostitutes, sex with partners having multiple partners and sex with partners believed to be injecting drugs. Behaviours associated with lifetime risk for urethritis and GUD together were sex with multiple females, sex with prostitutes, sex with men, sex with partners believed to be injecting drugs and ethnicity. These relationships were consistently stronger compared to urethritis or GUD alone.

Comportements à risque associés à l'urétrite et à l'ulcération génitale chez des détenus à Sindh (Pakistan)

RESUME Nous avons évalué les différences épidémiologiques en ce qui concerne les caractéristiques socioéconomiques, la toxicomanie et les comportements sexuels associés au risque à vie d'urétrite, d'ulcération génitale ainsi que d'urétrite et d'ulcération génitale ensemble chez 3395 détenus de sexe masculin à Sindh. Les facteurs associés à l'urétrite ou l'ulcération génitale seule étaient les rapports sexuels avec plusieurs femmes, les rapports sexuels avec des hommes et l'ethnicité. Les rapports sexuels avec des prostituées, avec des partenaires ayant eux-mêmes plusieurs partenaires et avec des partenaires soupçonnés de prendre des drogues par voie intraveineuse étaient d'autres facteurs associés à l'urétrite seule. Les comportements associés au risque à vie d'urétrite et d'ulcération génitale ensemble étaient les rapports sexuels avec plusieurs femmes, avec des prostituées, avec des hommes, avec des partenaires soupçonnés de prendre des drogues par voie intraveineuse et l'ethnicité. Ces associations étaient systématiquement plus fortes par rapport à l'urétrite ou l'ulcération génitale seule.

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Introduction

The prevention of sexually transmitted infections (STIs) is now becoming a priority of public health departments in most developing countries because evidence suggests that STIs may facilitate the transmission of human immunodeficiency virus (HIV) [*1,2*]. STIs are primarily spread by a class of behaviour that is inherently resistant to change because it is highly motivated and greatly varied both within and between social and ethnic groups [*3*]. A strategy of primary prevention based on sexual behavioural change combined with the provision of adequate clinical services is vital for the control of STIs [*4*]. In primary care clinics in developing countries STIs are the most common presenting complaint among people aged 18 years and older and contribute approximately 25% to the total case load [*5–7*].

Genital ulcer disease (GUD) has been shown to be the most prevalent condition, with urethritis ranked second. Furthermore, 69% of all GUD cases are seen in the 20–34-year-old age group. Although GUD caused by syphilis, chancroid or herpes was first implicated in facilitating HIV transmission, the non-ulcerative STIs have also now been shown to be associated with HIV transmission [*1,8,9*]. Recently, an association has been reported between a history of urethral discharge and HIV infection [*10–12*]. Furthermore, biological evidence to support these observational studies has also been generated describing the role of gonococcal and chalmydial urethritis in enhancing HIV shedding [*13–15*].

However, there are few studies that have comparatively analysed the sexual behavioural history of men with urethritis or GUD. It is not known whether men with GUD have the same risk behaviours as men with urethritis. The specific objective of this study, therefore, was to evaluate the epidemiological differences with respect to demographics, drug use and sexual behaviour associated with lifetime risk of urethritis, GUD and urethritis together with GUD among prison inmates in Sindh. Elucidation of such differences might prove helpful in designing control strategies for these multifaceted reproductive tract syndromes. Furthermore, as noted earlier, the previous studies have shown that both these conditions facilitate HIV transmission, and it is likely that control of these two conditions may prevent the sexual transmission of HIV.

Methods

Study subjects and data collection

A total of 3395 male prison inmates were included in the present analysis. They were selected using a one-in-three systematic sampling technique from among 10 600 male prisoners incarcerated in judicial custody as indicted criminals in 14 prisons of Sindh during July 1994. The prisoners interviewed mainly comprised 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. A structured risk behaviour interview was administered to each study participant in confidence by a trained research interviewer in a private area within the prison after seeking formal verbal consent. The interview focused on seeking information on demographics, and lifetime sexual and drug use behaviours. The questions on sexual behaviour solicited information on number and type of sex partners, sex with men both before and after incarceration, condom use and illicit drug use.

To assess the lifetime occurrence of urethritis (i.e. if the participant had ever had this condition up till now), inmates were asked if they had experienced painful purulent urethral discharge in the past. The question concerning the past history of urethritis was phrased to deliver a concise description of the common signs and symptoms associated with gonococcal and non-gonococcal urethritis [*16–18*]. Specifically, the question asked was: have you ever had a painful, purulent urethral discharge a few days after sexual intercourse? Also, to record the lifetime occurrence of GUD, participants were asked, if they had had painful genital ulcers in the past (i.e. if the participant had ever had this condition up till now). The question concerning the past history of GUD was phrased to deliver a concise description of the common signs and symptoms associated with genital ulcers of different origins [*19,20*]. Specifically, the question asked was: have you ever had painful genital ulcers?

This study was approved by the Aga Khan University's Committee for Human Subjects Protection.

Data analysis

For all analyses, the dependent variable, STI, had four categories: ever affected with urethritis, ever affected with GUD, ever affected with urethritis and GUD, and never affected with either of these two reproductive tract syndromes. We categorized the age (years) and duration (months) of imprisonment into quartiles to reduce the influence of outliers. Frequencies (%) of demographic variables and sexual behaviours were computed [*21*]. The relationship between the dependent variable and the independent variables was examined by using two-way and multi-way contingency comparisons [22]. The crude measure of association between each demographic variable and a single putative risk behaviour and inmates' STI status was evaluated using univariate polychotomous logistic regression and expressed as the odds ratio (OR) and the corresponding 95% confidence intervals (CI) [22].

A multivariable polychotomous logistic regression model was used to estimate the effect of each variable on the lifetime risk of STIs, adjusting for the effects of other variables in the model. For multivariable analysis, a full model was specified with all independent variables significantly ($P \leq 0.01$) related with STI status in univariate analyses. Backward stepwise multiple logistic regression analysis was carried out to arrive at the final multivariable model relating the variables simultaneously to the lifetime risk of STI [22]. A variable was excluded from the model if its exclusion reduced the variance of the ORs but did not modify the size of the ORs by more than 0.2 or about 10% of the size of the ORs for the remaining variables in the model. The parameters of the polychotomous logistic regression model were estimated by the maximum likelihood method and adjusted ORs and their 95% CIs were computed using the parameters' estimate of final polychomotous logistic regression model. In all the analyses, a 5% significance level was used unless stated otherwise. All the analyses were carried out using *SPSS*, version 10.

Results

Patient characteristics and lifetime risk of STIs

The reported lifetime risk of urethritis alone, GUD alone and of both urethritis and GUD was 14%, 5% and 6% respectively. The distribution of 3395 participants with

respect to demographic variables is given in Table 1. The age (years) quartiles < 23, 23–25, 26–33 and 33+ were made up of 25%, 20%, 30% and 25% of the inmates respectively. The participants were evenly distributed in two main ethnic groups and in the quartiles of duration (months) of imprisonment. Fifty per cent (50%) of the participants had no formal school education and there were nearly equal proportions of unmarried and married participants with a small proportion who were divorced or widowed. Table 2 shows the distribution of the participants with respect to risk behaviours.

Bivariate analysis

Bivariate analysis of selected demographic variables for their association with lifetime risk of all three categories of STI revealed significant association of age ($P = 0.023$), ethnicity ($P < 0.001$) and duration of imprisonment ($P = 0.002$) (Table 3). Bivariate analysis of risk behaviours showed that of

Table 1 **Prevalence of urethritis, genital ulcer disease (GUD), and urethritis and GUD among prison inmates by demographic characteristics ($n = 3395$)**

Characteristic	No.	Urethritis		GUD		Urethritis and GUD		Neither	
		No.	%	No.	%	No.	%	No.	%
Total		489	14	169	5	217	6	2520	74
Age (years)									
<23	846	98	20	42	25	56	26	650	26
23–<26	686	112	23	42	25	41	19	491	20
26–<33	1006	167	34	52	31	69	32	718	29
33+	857	112	23	33	20	51	24	661	26
Ethnicity (mother tongue)									
Urdu	1659	217	44	62	37	90	42	1290	51
Sindhi	1687	265	54	103	61	124	57	1195	47
Others	49	7	1	4	2	3	1	35	1
Education (years)									
0	1711	251	51	87	52	104	48	1269	50
1–4	416	60	12	28	17	31	14	297	12
5–10	916	123	25	38	23	65	30	690	27
>10	352	55	11	16	10	17	8	294	11
Marital status									
Unmarried	1561	220	45	65	39	96	44	1180	47
Married	1754	253	52	99	59	115	53	1287	51
Separated/widowed	80	16	3	5	3	6	3	53	2
Duration of imprisonment (months)									
<3	843	106	22	31	18	43	20	663	27
3–<9	846	113	23	43	25	56	26	634	25
9–<24	841	135	28	55	33	46	21	605	24
24+	845	135	28	40	24	71	33	599	24

Table 2 **Prevalence of urethritis, genital ulcer disease (GUD), and urethritis and GUD among prison inmates by risk behaviours ($n = 3395$)**

Risk behaviour	No.	Urethritis		GUD		Urethritis and GUD		Neither	
		No.	%	No.	%	No.	%	No.	%
Total		489	14	169	5	217	6	2520	74
Injecting drugs intravenously	121	22	5	5	3	9	4	85	3
Sharing needles	46	8	2	4	1	2	1	32	1
Sex with a female	2046	406	83	123	73	180	83	1337	53
Sex with a more than one female	1604	340	70	96	57	163	75	1005	40
Sex with a prostitute	892	212	43	54	32	113	52	513	20
Sex with a man	899	224	46	64	38	121	56	490	19
Sex with more than one man	700	185	38	47	28	97	45	371	15
Sex with a man prior to incarceration	743	196	40	51	30	97	45	399	16
Sex with man during current incarceration	111	28	6	10	6	24	11	49	2
Sex partner had more than one sex partners	1086	271	55	64	38	104	48	647	26
Sex partner injected drugs	73	24	5	4	2	14	7	31	1
Condom use during sex (never)	243	45	9	11	7	17	8	170	7

all the risk behaviours considered, intravenous (IV) drug use, sharing of needles and condom use were significantly associated with lifetime risks of urethritis alone, GUD alone, and urethritis and GUD. However, the participants' beliefs about sex partners being injecting drug users was not associated with GUD on univariate analysis (Table 3).

Multivariate polychotomous logistic regression model

Table 4 shows the multivariate adjusted ORs (aORs) of urethritis alone, GUD alone, and urethritis and GUD (i.e. relative odds of urethritis alone, GUD alone or urethritis and GUD versus neither of these conditions in lifetime) among prison inmates. Factors associated with urethritis alone and GUD alone (with respective ORs and their 95% CIs) were sex with multiple females, sex with men and ethnicity (Sindhi versus Urdu speaking). Additional factors associated with urethritis alone were sex with prostitutes, sex with a partner believed to have more than one partner and sex with partner believed to be injecting drugs.

Behaviours associated with lifetime risk of urethritis and GUD together were sex with multiple females, sex with prostitutes,

Table 3 **ORs and 95% CI from univariate polychotomous logistic regression analysis of risk behaviours and demographic variables for urethritis and genital ulcer disease (GUD) among prison inmates**

Lifetime history of risk behaviour	Urethritis OR	Urethritis 95% CI[a]	GUD OR	GUD 95% CI	Urethritis and GUD OR	Urethritis and GUD 95% CI
Demographic variables						
Age (years)						
<23	1.0	–	1.0	–	1.0	–
23–<26	1.5	1.1–2.0	1.3	0.9–2.1	1.0	0.6–1.5
26–<33	1.5	1.2–2.0	1.1	0.7–1.7	1.1	0.8–1.6
33+	1.1	0.8–1.5	0.8	0.5–1.2	0.9	0.6–1.3
Education (years)						
0	1.0	–	1.0	–	1.0	–
1–4	1.0	0.8–1.4	1.4	0.9–2.1	1.3	0.8–1.9
5–10	0.9	0.7–1.1	0.8	0.5–1.2	1.2	0.8–1.6
>10	1.1	0.8–1.5	0.9	0.5–1.5	0.8	0.5–1.3
Ethnicity (mother tongue)						
Sindhi	1.3	1.1–1.6	1.8	1.3–2.5	1.5	1.1–2.0
Others	1.2	0.5–2.7	2.4	0.8–6.9	1.2	0.4–4.1
Marital status						
Unmarried	1.0	–	1.0	–	1.0	–
Married	1.1	0.9–1.3	1.4	1.0–1.9	1.1	0.8–1.5
Separated/widowed	1.6	0.9–2.9	1.7	0.7–4.4	1.4	0.6–3.2
Duration of imprisonment (months)						
<3	1.0	–	1.0	–	1.0	–
3–<9	1.1	0.9–1.5	1.5	0.9–2.4	1.4	0.9–2.1
9–<24	1.4	1.1–1.9	2.0	1.3–3.2	1.2	0.8–1.8
24+	1.5	1.1–1.9	1.5	0.9–2.4	1.8	1.2–2.8
Risk behaviours						
Injecting drugs intravenously	1.4	0.9–2.2	0.9	0.4–2.4	1.2	0.6–2.5
Sharing needles	1.3	0.6–2.8	1.9	0.7–5.4	0.7	0.2–3.0
Sex with a female	4.3	3.4–5.6	2.4	1.7–3.4	4.3	3.0–6.2
Sex with more than one female	3.4	2.8–4.2	2.0	1.5–2.7	4.6	3.3–6.3
Sex with a prostitute	3.0	2.4–3.7	1.8	1.3–2.6	4.3	3.2–5.6
Sex with a man	3.5	2.9–4.3	2.5	1.8–3.5	5.2	3.9–7.0
Sex with more than one man	3.5	2.8–4.4	2.2	1.6–3.2	4.7	3.5–6.3
Sex with a man prior to incarceration	3.6	2.9–4.4	2.3	1.6–3.3	4.3	3.2–5.7
Sex with a man during current incarceration	3.1	1.9–4.9	3.2	1.6–6.4	6.3	3.8–10.4

Table 3 **ORs and 95% CI from univariate polychotomous logistic regression analysis of risk behaviours and demographic variables for urethritis and genital ulcer disease (GUD) among prison inmates** *(concluded)*

Lifetime history of risk behaviour	Urethritis		GUD		Urethritis and GUD	
	OR	95% CI*	OR	95% CI	OR	95% CI
Sex partner had more than one partner	3.6	2.9–4.4	1.8	1.3–2.4	1.7	2.0–3.5
Sex partner injected drugs	4.4	2.4–7.1	2.0	0.7–5.6	5.5	2.9–10.6
Condom use during sex (never)	1.4	1.0–2.0	1.0	0.5–1.8	1.2	0.7–2.0

OR = odds ratio.
CI = confidence interval.

sex with men, sex with partner believed to be injecting drugs and ethnicity. These relationships were consistently stronger compared to urethritis alone or GUD alone.

Discussion

Although the standard method still may be used to compare the several disease subgroups in pairs, the polychotomous logistic regression approach has the advantage that it allows simultaneous estimation of the disease-specific parameters and direct hypothesis testing involving multiple disease categories. This is especially useful for assessing whether different disease types have different risk factors [22]. Therefore, the use of polychotomous logistic regression allowed simultaneous comparison of a series of risk behaviours for their associa-

Table 4 **Final multivariate polychotomous logistic regression model of risk behaviours and demographic variables for urethritis and genital ulcer disease (GUD) among prison inmates**

Lifetime history of risk behaviour	Urethritis		GUD		Urethritis and GUD	
	aOR	95% CI	aOR	95% CI	aOR	95% CI
Sex with more than one female	1.8	1.4–2.4	1.4	1.0–2.0	2.2	1.5–3.3
Sex with a prostitute	1.4	1.1–1.8	1.3	0.9–2.0	2.3	1.6–3.3
Sex with a man	2.2	1.8–2.8	1.9	1.4–2.8	3.3	2.4–4.4
Sex partner had more than one partner	2.0	1.6–2.6	1.2	0.8–1.8	1.0	0.7–1.4
Sex partner injected drugs	2.2	1.2–3.8	1.5	0.5–4.3	3.1	1.5–6.1
Ethnicity (mother tongue)						
Sindhi	1.5	1.2–1.9	1.8	1.3–2.6	1.6	1.2–2.2
Others	1.5	0.6–3.6	2.7	0.9–8.0	1.6	0.5–5.5

aOR = adjusted odds ratio.
CI = confidence interval.

tion with the lifetime risk of urethritis alone, GUD alone, and urethritis and GUD together.

Both GUD [*23,24*] and urethritis [*25,26*] have been repeatedly shown to facilitate HIV transmission. In particular, a significant potential risk of blood-to-blood contact during sexual intercourse exists in patients with GUD. In this study, by focusing on sexual behaviours and these two major STI syndromes, i.e. urethritis and GUD, we have documented that men in prisons are at a high risk for the acquisition and transmission of STIs. Inmates in our study who reported a lifetime occurrence of urethritis and GUD together compared to those who reported either urethritis alone or GUD alone tended to have much stronger associations with high-risk sexual behaviours including sexual intercourse with multiple females, sexual intercourse with prostitutes, sexual intercourse with men and sexual intercourse with partners believed to be injecting drugs.

The inmates who reported a lifetime occurrence of GUD alone tended to be Sindhi and reported to have had sex with men. The risk factors for acquiring either GUD or any other STI are reported to be similar. However, Wellington et al. [*27*] reported that men with GUD compared with those having other STIs tended to go often to commercial sex workers. We could not confirm these findings in our study. Going to prostitutes is considered a culturally and socially undesirable behaviour in this society and may have been underreported in the present study. Also it has been shown that the etiology of GUD varies both geographically and temporally [*28–30*]. The three primary agents associated with GUD are *Treponema pallidum*, *Haemophilus ducreyi* and herpes simplex virus (HSV) and it may well be that the prevalence of these pathogens was very low in our study population and the risk behaviours did not turn out be significant for GUD in this population. Furthermore, Sindhi inmates in our study mainly came from the rural areas of Sindh, where they may have more opportunities for male-to-male sex.

The inmates who reported to have had a lifetime occurrence of urethritis also tended to be Sindhi, and reported to have had sexual intercourse with multiple females, sex with prostitutes, sexual intercourse with men, sexual intercourse with a partner believed to have multiple sexual partners and sexual intercourse with partners believed to be injecting drug users. Compared to inmates with GUD, those who reported urethritis were involved in multiple risky sexual behaviours. Beltrami et al. [*31*] found a prevalence of urethritis of 13% among prisoners in New Orleans, United States who were likely to report at least two sex partners. Direct comparison of our results with the published data on sexual behaviours of inmates is difficult. In comparing such data, geographic and cultural factors, specific time period of behavioural variables and condom use patterns must be considered.

It has been noted that among men presenting to STI clinics, 4% of *Chlamydia trachomatis* infections and 70% of *Neisseria gonorrhoeae* infections were associated with urethral discharge [2]. Thus this condition is quite common among sexually active man who practice unsafe sex with multiple sex partners.

In one study [*32*], no significant age, racial or behavioural differences between *C. trachomatis*-positive and *C. trachomatis*-negative groups were found, which is contrary to our findings. We found that Sindhi were more likely to have increased lifetime risk for urethritis and GUD together. This difference could partly be attribut-

ed to the level of diagnosis, i.e. laboratory versus clinical.

In this study condom use was not associated with any of the syndromes. It has been reported that intact condoms, properly used in every episode of sexual intercourse protect against STI transmission between the mucosal surface [*33*], while others have found no apparent protective effect of repeated condom use in heterosexual and homosexual men [*34*]. Individuals, particularly those at high risk for STIs, may be prone to over-reporting condom use in response to these behavioural questions. This may explain why condom use did not appear to be protective in our study.

Intervention measures to reduce STIs by bringing about behavioural change in high risk groups such as in our study, who engage in unprotected intercourse with multiple sexual partners, may have a substantial impact on the overall control of STIs. Furthermore, the prison inmates have the characteristics of core groups of STI transmitters and their incarceration provides a window of opportunity for an STI control programme to be introduced.

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