HIV and other sexually transmitted infections among men, transgenders and women selling sex in two cities in Pakistan: a cross-sectional prevalence survey

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Abstract

Objectives: The extent and possibilities of spread of the HIV epidemic are not fully understood in Pakistan. A survey was conducted among men, women and transgender populations selling sex in Rawalpindi (Punjab) and Abbottabad (North West Frontier Province) in order to inform evidence-based programme planning.

Methods: A cross-sectional survey was performed with participants recruited through respondent-driven sampling. Male and transgender sex workers were analysed in three gender groups; women were analysed as one group. Behavioural surveys were conducted and clinical specimens collected. Laboratory tests looked for evidence of acute infection (gonorrhoea, Chlamydia, syphilis, Trichomonas) and infection over the lifetime (HIV, herpes simplex virus-2, syphilis). Predictors of infection were explored using univariable and multivariable logistic regression.

Results: The prevalence of HIV was low in 917 male and transgender sex workers and absent in 533 female sex workers in the study. High levels of current sexually transmitted infections were found, predominantly among transgender sex workers. Risk behaviours were common and knowledge of HIV was extremely low. Multivariable analysis found a large number of factors associated with higher levels of infection, including experience of forced first sex. Protection against risk was low, but those sex workers who reported using condoms at last sex had lower rates of infection.

Conclusions: The HIV epidemic is currently in its early stages among people who sell sex, but there may be potential for a much greater spread given the levels of other sexually transmitted infections found and the concomitant low levels of both protective knowledge and risk-reducing behaviours. Action is needed now to avert an epidemic. Framing interventions by upholding the recognition and protection of human rights is vital.

Introduction

Pakistan is currently classified as having a "concentrated HIV epidemic",[1] a situation which warrants urgent and effective actions to protect vulnerable populations. Defining and measuring the extent of risk and vulnerability in key ("core") populations are vital steps in designing (and delivering) effective interventions.[2] There is little published evidence available within Pakistan to describe the full extent of epidemic spread of HIV and other sexually transmitted infections (STIs) among key or other population groups.[3]

This study was commissioned by the National AIDS Control Programme (NACP) for their development of evidence-informed programme planning and priority setting. A rising incidence of HIV among injecting drug users (IDUs) has previously been noted in Pakistan,[4] but there is only limited evidence of an HIV epidemic among others traditionally considered to be at risk (eg, people who sell sex). A 2006 survey in Karachi found 23% of 400 IDUs were HIV positive compared with 1/160 IDUs tested in 2003 in the same city.[4] The prevalence of HIV among men selling sex in the same survey was 4%, while none of the female sex workers (FSW) were infected. Other surveys in Pakistan have found a wide HIV prevalence range among IDUs, ranging from 1% in Gujranwala to 30% in Karachi and 51% in the city of Sargodha.[5-7]

Our paper focuses on those populations who are at risk of HIV and other STIs through selling sex. We undertook a cross-sectional survey in two cities (one large, one small) which were selected in collaboration with the NACP. The bio-behavioural survey built on the findings of qualitative research[8] and provided direct evidence for mathematical modelling,[9] investigating the situation of human rights[10] and policy analysis of the recommendations,[11] all of which are described elsewhere in this supplement. The survey was undertaken to describe the extent of STI and HIV epidemics in the two cities and associated behaviours including risk taking

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and protection from risk; it contributes to the evidence base required for programme planning and resource allocation at the national level.

Methods

Surveys were conducted between August and September 2007 in two cities-Rawalpindi (population 1.8 million) in Punjab and situated adjacent to the administrative capital of Pakistan (Islamabad), and Abbottabad (population 140 000) in North West Frontier Province (Figure-1). The eligibility criteria were men, women and transgender populations who had sold sex (in exchange for money or other resources) within the last 30 days. Exclusion criteria included age, 18 years, incapable of or unwilling to give informed consent and currently pregnant.

In-depth qualitative research preceded the surveys and directly influenced their focus. For example, it was shown that FSW were largely "home-based", a category of sex work of growing importance with the advent of mobile phones for communication with clients and "gatekeepers". Qualitative findings directed us to recruit male and transgender sex workers (MTSW) in three separate groups: khusra (transgender biological males who dress mostly as women, often known as hijra, a small number may undergo gender reassignment through use of hormones or surgery), khotki (biological males who dress publicly as men but have a "female soul" and feminised traits) and bantha (biological males with a male gender identity). These groups vary in terms of organisational and support networks.8 All three groups of MTSW were interviewed using the same survey instrument.

Respondents were recruited using respondent-driven
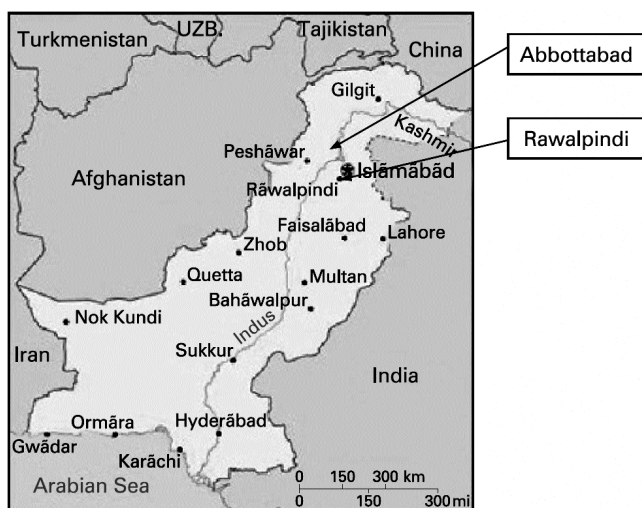

Figure-1: Map of Pakistan.

sampling (RDS) and were interviewed at fixed sites located in a rented house (Rawalpindi) and a community education centre (Abbottabad) using hand-held Personal Digital Assistants (PDA, Hewlett Packard).[12-14] Survey staff in both cities included people experienced in working with vulnerable populations in Pakistan. Initial recruits (who were diverse in terms of key characteristics of the four population groups) served as "seeds" for an expanding chain of referrals, with respondents from each wave referring respondents from subsequent waves. Monetary incentives were given to participants and for recruiting others.

Two informed consents were obtained from each participant- for the interview, and for clinical examination and collection of biological samples.

Every woman had a pregnancy test before recruitment. Women found to be pregnant were immediately referred to the local voluntary counselling and testing centre and advised to seek testing for both HIV and syphilis; they did not take further part in the survey.

Clinical samples were collected by trained doctors from all participants (20ml urine, 5ml venous blood, finger prick blood for point of care syphilis testing). Rectal swabs were collected from MTSW; vaginal and cervical swabs were collected from FSW. Point of care syphilis testing (Determine, Abbott Diagnostics) was carried out at the time of recruitment, and those who were positive were offered immediate treatment with benzathine penicillin. All participants were offered presumptive treatment for gonorrhoea and Chlamydia infection. Basic medical care for minor ailments was provided free to all participants. Anyone who required urgent and/or specialised medical care was immediately referred to a local public sector tertiary-level hospital.

Clinical specimens were transported (using cold chain methods) on a daily basis to the laboratory of the Sindh Institute for Urology and Transplantation, Karachi. Cervical samples from women and urine and rectal samples from men and transgender individuals were tested for Chlamydia trachomatis and Neisseria gonorrhoeae with Roche Amplicor PCR (Roche Diagnostics, Mannheim, Germany). Samples showing inhibition were heat-inactivated at 95uC for 10 min and retested. Vaginal samples were tested for Trichomonas vaginalis using in-house PCR (provided by the London School of Hygiene and Tropical Medicine).15 Serum samples were screened for antibodies to HIV-1 and HIV-2 by microparticle enzyme immunoassay (AxSYM, Abbott Diagnostics, Wiesbaden, Germany) and positive results confirmed by Vironostika HIV Uni-Form ll plus O, EIA

(Biomerieux, Boxtel, The Netherlands); herpes simplex virus 2 (HSV-2) (HerpeSelect 2 ELISA IgG, Focus Diagnostics, Cypress, California, USA); quantitative rapid plasma reagin (RPR) (SYPHILIS (SYP-RPR), Randox Laboratories, Co Antrim, UK) and Treponema pallidum haemagglutination test (TPHA) (SYPHILIS (SYP-TPHA), Randox Laboratories). All RPR-positive samples were titrated. The laboratory participated in external quality control organised by the Health Protection Agency (UK) for the duration of the study.

HIV testing was anonymised, but serological specimens were linked to survey data by a bar code. While participants were not able to find out their individual HIV results via this process, those who wished to know their HIV status were referred to local centres able to offer testing and follow-on care. All participants were asked to return after 3 weeks to collect their STI laboratory results and receive treatment if they had not already been treated (presumptively or otherwise) for an aetiologically diagnosed and curable infection.

Statistical Methods:

Chlamydia, gonorrhoea, T vaginalis and current syphilis (RPR titre >1:8/TPHA+) were analysed together to identify variables associated with current infection in FSW. For MTSW we did not include Trichomonas in the analysis of current infections. Evidence of infections over the lifetime were explored separately for HIV/HSV-2 combined and the presence of latent syphilis (RPR2/TPHA+ or RPR (1:4/TPHA+). All variables were explored using univariable and multivariable logistic regression. Statistical significance was assessed using the Wald statistic. Stata 10 (Stata Corp, College Station, Texas, USA) was used for all analyses.

Multivariable analysis followed a conceptual framework approach.[16] This involved classifying variables into six groups (sociodemographic indicators, recent sexual risk, past sexual behaviour, drug related, knowledge and contact with services and context of sex work), with the analysis conducted in three stages: (1) separate univariate models explored each of the variables alone with the outcome; (2) variables associated with the outcome in univariate analysis to a significance level of p(0.2 were included in separate multivariable models for each group; and (3) variables reaching a significance level of p(0.2 in each of the multivariable models were then included in one overall multivariable model. In addition, variables excluded at the first stage were added at the second and third stage models to assess their association with the outcome variable in the presence of other variables.

Results
Participation:

We recruited 540 FSW (431 in Rawalpindi, 109 in Abbottabad) and 915 MTSW (812 and 103, respectively, in each city); 80% of MTSW in Abbottabad were banthas compared with 30% in Rawalpindi (see Table-1 for gender distribution between cities). Few people (N=27) declined to participate. Seven women were ineligible to participate (five found to be pregnant on initial testing and two for other reasons). Incomplete collection of the RDS data meant that we were unable to adjust the sample proportions for network size or recruitment biases.

Characteristics:

The median age of FSW was 30 years and the majority (91%) were married with children (98%). The MTSW were younger (mean ages ranged from 21 years for banthas to 27 years for khusra) and a small number (10-19%) were married (to women). While most sex workers lived with their families, over 80% of khusra reported living in daira (communal household with other khusra). High levels of violence in the last year were reported by all groups: among FSW, 66% reported violence from husbands and 38% from clients; for MTSW, police and clients were the most common perpetrators of violence. Sexual health indicators showed that most women (63%) reported recent symptoms of possible STIs and, although 32% of FSW had sought care from an allopathic provider in the last year, only a small number had ever had an HIV test. Smaller numbers of transgender (29%) and male (20%) sex workers reported recent symptoms and, again, although between one-quarter and almost two-fifths had sought care from allopathic providers, very small numbers had ever had an HIV test (Table-1).

Table-2 reports on risk behaviours and risk reduction measures. FSWs reported first sexual experience at a median age of 16 years while, for MTSW, sexual debut was younger. First sex was forced among 5% of FSW, rising to 18% among the khusra. Bantha had been selling sex for a mean of 6 years while women and khusra had been selling sex for a mean of 14 years and 12.5 years, respectively. Numbers of clients in the past week ranged from three (bantha) to seven (khusra), with the proportion of new clients in a week higher among the MTSWs than the FSWs. Reports of condom use varied according to time frame ("last sex with a client" or "always used in last month with client") and the type of sex being sold (vaginal, oral, anal). The MTSW reported consistently low rates of condom use.

Only small numbers of respondents had ever injected drugs themselves, but IDUs were relatively common as

clients, partners or husbands.

Prevalence of infections:

Infections were found more frequently among MTSW than FSW. No cases of HIV were found in Abbottabad, and a small number of MTSW (0.5% of bantha and 2.4% of khusra) were found to be HIV positive in Rawalpindi. Serological evidence of herpes infection was found in

Table-1: Characteristics of female, male and transgender sex workers in Rawalpindi and Abbottabad.

Characteristics of participants	Female sex workers	Male sex workers		
		Bantha*	Khotki†	Khusra††
Number of participants	540	278	368	269
Rawalpindi	431	195	364	253
Abbottabad	109	83	4	16
Sociodemographic characteristics				
Age groups (years)				
18/19	20 (4%)	128 (46%)	121 (33%)	37 (14%)
20–24	75 (14%)	100 (36%)	137 (37%)	68 (25%)
25–29	124 (23%)	24 (9%)	60 (16%)	67 (25%)
30–34	127 (24%)	18 (7%)	30 (8%)	43 (16%)
35+	191 (36%)	8 (3%)	20 (5%)	54 (20%)
Mean (median) age (years)	30.6 (30)	21.6 (20)	23.1 (21.5)	27.4 (26)
Currently married	490 (91%)	39 (14%)	69 (19%)	28 (10%)
No formal education	345 (64%)	81 (29%)	150 (41%)	131 (49%)
Has children	462 (98%)	31 (11%)	57 (16%)	25 (9%)
Has employment outside sex trade	301 (59%)	217 (83%)	221 (61%)	50 (19%)
Lives with family	478 (91%)	254 (92%)	254 (69%)	27 (10%)
Lives in daira	NA	1 (0.4%)	47 (12.8%)	219 (81.4%)
Lives elsewhere	47 (9%)	21 (7.6%)	67 (18.2%)	23 (8.6%)
Environmental characteristics				
Ever been in jail	22 (4%)	12 (4%)	44 (12%)	25 (9%)
Violence from neighbour in past year	123 (24%)	20 (7%)	31 (8%)	51 (19%)
Sexually violated by neighbour in past year	72 (14%)	61 (22%)	163 (44%)	91 (34%)
Violence from client in past year	196 (38%)	30 (11%)	103 (28%)	73 (27%)
Sexually violated by client in past year	108 (21%)	43 (16%)	67 (18%)	86 (32%)
Violence from police in past year	23 (5%)	43 (16%)	44 (12%)	73 (27%)
Sexually violated by police in past year	42 (8%)	NA	NA	NA
Violence from husband in past year	317 (66%)	NA	NA	NA
Sexually violated by husband in past year	157 (34%)	65 (24%)	127 (35%)	106 (39%)
Provided free sex to police in past year	187 (35%)			
Sexual health				
Uses modern method of contraception	334 (64%)	Not asked	Not asked	Not asked
Lifetime history of abortion	288 (60%)	NA	NA	NA
Reported any symptom of possible STI in past month	317 (63%)	58(21%)	68 (19%)	79 (29%)
Genital discharge in past year	349 (67%)	15 (5%)	31 (8%)	37 (14%)
Burning pain on urination in past year	240 (46%)	85 (31%)	109 (30%)	90 (33%)
Genital ulcers in past year	100 (19%)	6 (2%)	43 (12%)	27 (10%)
Anal problem in past year	33 (6%)	20 (7%)	60 (16%)	55 (20%)
Sought care from allopathic provider for STI-like symptoms in past year	173 (32%)	70 (25%)	102 (28%)	103 (38%)
Ever had an HIV test	12 (6%)	2 (1%)	18 (5%)	39 (14%)
Ever had an HCV test	33 (6%)	7 (3%)	9 (3%)	11 (4%)
Knowledge of HIV				
Ever heard of HIV	182 (35%)	96 (35%)	133 (36%)	108 (40%)
Aware of risk of injecting	Variable corrupted	94 (34%)	125 (34%)	99 (36%)
Aware of risk of unprotected sex	Variable corrupted	94 (34%)	132 (36%)	103 (38%)

NA, not applicable.
*Bantha, biological males with a male gender identity.
†Khotki, biological males who dress publicly as men but have feminised traits.
††Khusra, transgender biological males who dress mostly as women.

Table-2: Risk behaviours and risk reduction measures reported by sex workers in Rawalpindi and Abbottabad.

Characteristics of participants	Female sex workers	Male sex workers		
		Bantha	Khotki	Khusra
Number of participants	540	278	368	269
Rawalpindi	431	195	364	253
Abbottabad	109	83	4	16
Sexual debut				
Mean (SD) age at first sex (years)	16.6 (3.6)	14.1 (2.9)	13.4 (2.2)	13.3 (2.4)
<12	10 (1.9%)	41 (15%)	69 (19%)	51 (19%)
15-Dec	198 (37.6%)	165 (60%)	239 (65%)	181 (67%)
16/17	139 (26.4%)	49 (18%)	52 (14%)	31 (11%)
18+	180 (34.2%)	21 (8%)	8 (2%)	8 (3%)
First sex was forced	27 (5%)	36 (13%)	36 (10%)	50 (18%)
Mean (SD) age difference with first sex partner (years)	6.9 (5)	9.2 (8.5)	9.3 (8)	11.9 (10)
Sexual risk				
Mean (SD) number of years in sex work	13.9 (6.7)	6.7 (4.4)	8.5 (5.3)	12.5 (6.3)
Mean (SD) number of clients in past week	5.5 (3.6)	3.2 (2.3)	4.8 (2.9)	7.0 (6.4)
Mean (SD) number of new clients in past week	1.7 (1.4)	1.8 (2)	2.0 (3)	4.0 (3)
	0=46 (8%)	0=56 (20%)	0=46 (13%)	0=34 (13%)
	1=251 (47%)	1=78 (28%)	1=40 (11%)	1=36 (13%)
	2+=241 (45%)	2+=142 (51%)	2+=282 (77%)	2+=201 (74%)
Mean (SD) number of non-paying partners in past year (excluding gyria)	Not asked	1.6 (3.5)	0.8 (1.6)	0.6 (1.2)
Risk reduction				
Used condom in last vaginal sex with client	205/536 (38%)	NA	NA	NA
In last month always used condom during vaginal sex with client	63/526 (12%)	NA	NA	NA
Used condom in last anal sex with client	99/162 (61%)	65/278 (23%)	114/368 (31%)	68/272 (25%)
In last month always used condom during anal sex with client	NA	29/278 (10%)	28/368 (8%)	11/272 (4%)
Used condom in last oral sex with client	59/109 (54%)	4/64 (6%)	25/168 (15%)	16/103 (16%)
Used condom in last sex with husband/gyria	240/517 (46%)	0/6	34/125 (27%)	7/108 (7%)
In last month always used condom during sex with husband/gyria	78/515 (15%)	0/5	10/124 (8%)	7/108 (7%)
Condom with non-paying partner	45/92 (49%)	24/128 (19%)	21/139 (15%)	9/70 (13%)
Drug use				
Injected drugs in past year	18/534 (3%)	9/265 (3%)	3/364 (1%)	0 (0%)
Had IDU sex partner(s) (past year)	194/540 (36%)	50/259 (19%)	85/363 (23%)	67/265 (25%)
Had husband/gyria who is IDU (past year)	140/504 (28%)	0/273 (0%)	2/366 (0.5%)	5/261 (2%)
	140/540 (26%)			
Uses other types of (non-injectable) drugs	Not asked	60/265 (23%)	142/364 (39%)	119/267 (45%)
Drank alcohol in past month	190/525 (36%)	115/265 (43%)	171/364 (47%)	147/267 (55%)

IDU, injecting drug user; NA, not applicable.

slightly more than half of khusra (54%), 14% of khotki and ,10% of all other groups. Evidence of past syphilis infection was uncommon except among khusra. Current infections were predominantly found among the khusra community, with almost half in Rawalpindi with active syphilis and 22.5% (57/253) in the same city with rectal gonorrhoea or Chlamydia (Table 3).

Multivariate analysis:

Tables-4 and 5 summarise findings from the multivariate analysis: those variables associated with current infection (higher titre syphilis, gonorrhoea, Chlamydia or Trichomonas) or infection with HSV-2 or HIV. Full details

are available in the tables in the online supplement.

Table-4 presents multivariate analysis for FSWs. The odds of having a current infection were higher in FSWs who were not married (OR 4.16, p=0.002) and those who experienced first sex as forced (OR 2.05, p=0.04). Women had higher odds of HSV-2 infection if they reported ever drinking alcohol (OR 2.41, p=0.01), but had lower odds if they reported more clients in the last 7 days (OR 0.37 and OR 0.25, respectively; p=0.04). With only two past syphilis infections, it was not possible to run a risk analysis.

Table-5 presents the results of multivariate analysis for bantha, khotkis and khusra. Current infections with

Table-3: Prevalence of sexually transmitted infections (STIs) and HIV among people with high-risk behaviours in Rawalpindi and Abbottabad (expressed as percentages with confidence intervals).

	Male sex workers (MSW)						Female sex workers (FSW)	
	Rawalpindi			Abbottabad				
	Bantha	Khotki	Khusra	Bantha	Khotki	Khusra	Rawalpindi	Abbottabad
Number tested	195	364	253	83	4	16	426	107
HIV	0.5 (0.005 to 1.5)	0	2.4 (0.4 to 4.3)	0	0	0	0	0
HSV	7.4 (3.6 to 11.1)	14 (10.4 to 17.6)	54 (47.7 to 60.2)	2.5 (0.4 to 9.5)	25 (1.3 to 78)	31.3 (12.1 to 58.5)	8.0 (5.4 to 10.6)	4.7 (6.1 to 8.7)
Syphilis (all RPR+/ TPHA+)	4.7 (1.7 to 7.7)	9.6 (6.6 to 12.7)	48.8 (42.6 to 55.0)	4.9 (0.12 to 9.8)	0	37.5 (10.9 to 64.1)	1.2	2.8
RPR (1:2	1.5	3.6	8.7	2.4	0	18.8	10.5	1.8
RPR =1:4	2.6	1.9	7.5	0	0	12.5	0	0.9
RPR =1:8	0.5	1.9	9.9	0	0	6.3	0.2	0
RPR =1:16	0	1.4	13.4	0	0	0	0	0
RPR >1:32	0	0.8	9	2.4	0	0	0.5	0
RPR2/TPHA+ (presumed past infection)	4.7	6	21.4	5	0	37.5	0.5	0
Rectal gonorrhoea	12.6 (7.8 to 17.4)	4.7 (2.5 to 6.8)	20.2 (15.2 to 25.2)	11.1 (5.5 to 20.5)	0	6.3 (0.33 to 32.3)	Not tested	Not tested
Rectal Chlamydia	4.7 (1.7 to 7.7)	3.6 (1.6 to 5.5)	9.9 (6.2 to 13.6)	4.9 (1.6 to 12.8)	0	6.3 (0.33 to 32.3)	Not tested	Not tested
Urine gonorrhoea (MTSW) or cervical gonorrhoea (FSW)	0	0	0	0	0	0	2.0 (0.6 to 3.4)	1.9 (0.007 to 4.5)
Urine Chlamydia (MTSW) or cervical Chlamydia (FSW)	0	0	0	1.2 (0.06 to 7.5)	0	0	1.7 (0.4 to 3.1)	0.9 (0.009 to 0.3)
Trichomonas	Not tested	Not tested	Not tested	Not tested	Not tested	Not tested	4.3 (2.3 to 6.3)	5.7 (1.2 to 10.3)

HSV, herpes simplex virus; MTSW, male and transgender sex worker; RPR, rapid plasma reagin; TPHA, Treponema pallidum haemagglutination test.

Table-4: Variables associated with sexually transmitted infections (STIs) in female sex workers: results of multivariate analysis.

	+/total	OR (95% CI)	Adjusted OR (95% CI)	p Value*
Current infection (GC, CT, high-titre syphilis, TV)				
Currently married				
Yes	29/490	1	1	
No	9/39	3.86 (1.74 to 8.77)	4.16 (1.81 to 9.54)	0.002
First sex was forced				
No	14/279	1	1	
Yes	24/259	1.93 (0.98 to 3.82)	2.05 (1.03 to 4.11)	0.04
HSV-2 infection				
Number of new clients in last week				
0	7/46	1	1	0.04
1	19/251	0.46 (0.18 to 1.16)	0.37 (0.14 to 0.97)	
2+	14/241	0.34 (0.13 to 0.91)	0.25 (0.09 to 0.68)	
Ever drank alcohol				
No	14/274	1	1	
Yes	26/262	2.05 (1.04 to 4.01)	2.41 (1.21 to 4.85)	0.01

CI, confidence interval; CT, Chlamydia trachomatis; GC, gonorrhoea; HSV-2, herpes simplex virus-2; OR, odds ratio; TV, Trichomonas vaginalis.
*p Value derived from likelihood ratio test.

Table-5: Variables associated with current infections and HSV-2/HIV in banthas, khotki and khusra: results of multivariate analysis.

		+/total	OR (95% CI)	Adjusted OR (95% CI)	p Value*
Banthas (Current infection) (Demographic indicators)					
Living arrangement	Daira	0/1			
	Family	39/249	1	1	0.07
	Other	7/21	2.51 (0.96 to 6.56)	2.51 (0.96 to 6.56)	
HSV-2/HIV infection (Demographic indicators)					
Increasing age			1.24 (1.14 to 1.35)	1.24 (1.14 to 1.34)	<0.001
Khotki (Current infection) (Recent sexual behaviour)					
Condom use during last anal sex	No	35/254	1	1	0.02
	Yes	7/114	0.41 (0.18 to 0.95)	0.38 (0.16 to 0.91)	
Years engaged in sex work	<5	7/86	1	1	0.05
	5–9	15/165	1.13 (0.44 to 2.88)	1.67 (0.63 to 4.44)	
	10+	20/117	2.33 (0.94 to 5.78)	3.35 (1.29 to 8.72)	
HSV-2 infection (Demographic indicators)					
Increasing age			1.25 (1.18 to 1.32)	1.27 (1.19 to 1.36)	<0.0001
Family lives in same city	Yes	40/250	1	1	0.03
	No	12/118	0.59 (0.30 to 1.18)	0.39 (0.16 to 0.96)	
Recent sexual behaviour					
Number of new clients in the last week	0	18/46	1	1	<0.0001
	1–2	21/132	0.29 (0.14 to 0.63)	0.45 (0.17 to 1.15)	
	3+	13/190	0.11 (0.05 to 0.26)	0.15 (0.06 to 0.42)	
Number of non-paying partners in last year	0	11/128	1	1	0.02
	1	22/134	2.09 (0.97 to 4.51)	3.50 (1.24 to 9.89)	
	2+	19/106	2.32 (1.05 to 5.13)	3.42 (1.19 to 9.85)	
Khusra (Current infection) (Demographic indicators)					
City of residence	Rawalpindi	111/254	1	1	<0.001
	Abbottabad	2/17	0.17 (0.04 to 0.77)	0.08 (0.01 to 0.42)	
Other income (not sex work-related)	No	83/216	1	1	0.03
	Yes	27/49	1.97 (1.05 to 3.68)	1.97 (1.05 to 3.68)	
Recent sexual behaviour					
Condom use during last anal sex	No	98/203	1	1	<0.001
	Yes	15/68	0.30 (0.16 to 0.57)	0.33 (0.17 to 0.65)	
Past sexual behaviour					
Age at first sex with a man	<12	14/51	1	1	0.03
	12–15	77/180	1.98 (1.00 to 3.91)	2.16 (1.00 to 4.65)	
	16–17	17/31	3.21 (1.26 to 8.19)	3.60 (1.24 to 10.43)	
	18+	5/8	4.40 (0.93 to 20.92)	10.82 (1.11 to 105.44)	
First sex with man was forced	No	84/219	1	1	0.003
	Yes	29/50	2.22 (1.19 to 4.14)	2.96 (1.44 to 6.09)	
HSV-2 infection (Demographic indicators)					
Increasing age			1.16 (1.11 to 1.21)	1.17 (1.11 to 1.23)	<0.0001
Recent sexual behaviour					
Condom use during last anal sex	No	119/203	1	1	0.04
	Yes	24/68	0.39 (0.22 to 0.68)	0.48 (0.25 to 0.93)	
First sex with man was forced	No	110/219	1	1	0.03
	Yes	32/50	1.76 (0.93 to 3.33)	2.21 (1.03 to 4.76)	
Health care and knowledge					
Ever heard of HIV or AIDS	No	99/163	1	1	0.03
	Yes	44/108	0.44 (0.27 to 0.73)	0.54 (0.30 to 0.96)	

CI, confidence interval; HSV-2, herpes simplex virus 2; OR, odds ratio.

*p Value derived from likelihood ratio test.

gonorrhoea, Chlamydia or high-titre syphilis were more likely to be found among bantha sex workers living away from their families (OR 2.51, p=0.07) and khotki sex workers who had spent more than 10 years in sex work (OR 3.35, p=0.05). Khusra sex workers had higher odds of current infections if they had another source of income (OR 1.97, p=0.03) or reported that their first sex was forced (OR 2.96, p=0.003). Older age at first sex with a man was associated with increased odds of current infection (p=0.03), although only a minority of khusra experienced sexual debut after the age of 15 (leading to large confidence intervals). Both khotki and khusra who reported use of condoms at last anal sex had lower odds of current infections (OR 0.38, p=0.02 and OR 0.33, p=0.001, respectively).

Among the bantha, HSV-2 and/or HIV were found more frequently in older men (OR 1.24, p,0.001). Similarly, older khotkis also had higher odds of HSV-2 (no HIV in this group) (OR 1.27, p,0.001), as did those khotkis who had one or more non-paying partners in the last year (OR 3.50, p=0.02). Older khusra (OR 1.17, p,0.001) and those khusra who reported that their first sex was forced had higher odds of HSV-2/HIV infections (OR 2.21, p=0.03). Several variables were found to be associated with lower odds of HSV-2/HIV infection; lower odds were found in khotki who did not live in the same city as their family (OR 0.39, p=0.03) or who had an increasing number of clients in the last week (OR 0.15, p,0.001). Khusra who had ever heard of HIV (OR 0.54, p=0.03) had lower odds of being infected with HSV-2/HIV, as did those khusra who reported using condoms at last anal sex with a client (OR 0.48, p=0.04).

Past infection with syphilis (results not shown) was found more frequently in older age groups: bantha (OR 1.11, p=0.01); khotkis (OR 1.18, p=0.003); and khusra (OR 1.15, p=0.05), while married khotki also had higher odds of syphilis (OR 2.88, p=0.03).

Discussion

We have completed a large survey of sex workers in Rawalpindi and Abbottabad in Pakistan, with high rates of participation in both cities. Conducting surveys in two sites allows for comparisons between a large and a smaller city. As with all other studies, the interpretation of these results and their generalisability to other non-comparable cities and settings should be exercised with caution. Nonetheless, results arising from this work highlight a number of issues which are of direct relevance for STI/HIV control in the two cities where the work was conducted, and in similar settings in Pakistan.

The low prevalence HIV results have brought into focus

the extremely heterogeneous nature of the epidemic in Pakistan and are consistent with the wide variation in the prevalence of HIV reported from national bio-behavioural surveillance[6] and crosssectional surveys.[4] The particular vulnerability of the khusra (transgender) to HIV and other STIs is reflected in their high STI prevalence; almost half (49%), for example, were RPR+/TPHA+ (any titre) and more than half (54%) had serological evidence of HSV-2 infection. Levels of rectal infection were especially high among khusra and bantha. It should be noted that problems with specificity have been found using Amplicor on rectal specimens,[17] but this is usually more problematic in low-prevalence populations.[18] The high levels of STIs in transgender populations are consistent with findings from other surveys in Asia.[19]

FSW, in contrast, had a low prevalence of STIs (and no HIV), at levels similar to population-based surveys among women in the general population (ie, not high-risk) elsewhere in Asia.[20,21] There may be several reasons for the low prevalence of both current and past infections in FSW. They have a relatively low number of new clients (compared with MTSW in the same cities), with many FSW seeming to service a few "regular" clients. However, women reported significant levels of potential exposure, high levels of vulnerability (as evidenced by the high levels of physical and sexual assault to which they are subjected) and scant evidence that they currently possess the knowledge or means to protect themselves against infection.

Although condom use reported by FSW was higher than among MTSW, women reported the lowest levels of condom use with their clients (ie, husbands and regular non-paying partners were more likely to have used a condom at last vaginal sex than were clients). This may seem a surprising finding, but is possibly explained by the use of condoms with husband and regular partners as contraception, as reported by 49% of women. This finding deserves confirmation and explanation from further research, as does the finding that those women reporting more clients in the past week had a lower rate of HSV-2 infection. Addressing and changing risks to the health of these women will require an approach that incorporates, inter alia, behaviour change among male partners (and especially clients) within the wider context of structural change-an area which requires further exploration in Pakistan and elsewhere.[22] Other programmes have shown that changes are more successful and sustained when interventions include structural changes.[23]

Findings from the survey serve to illustrate the importance of understanding the context and background of sex workers' lives including social networks. Khotki who lived away from their families were seemingly protected from infection with HSV-2. The protective social network for the khusra and khotki is likely to lie outside the natal home and within the dairas or other social networks. In contrast, bantha who live away from their family were more likely to have acute infections.

Violence was a common experience in the lives of sex workers-both current and over the lifetime. Key perpetrators of violence included partners (husbands, regular non-paying partners), clients, neighbours and the police. There is increasing evidence of the role that violence (by intimate partners, clients and state forces) plays in shaping the risk environment for those who sell sex in many parts of the world.[24-26] Khusra report high levels of abuse in the recent past (more than one-quarter were raped by the police in the last year), possibly indicative of a lifelong pattern of abuse (1 in 5 had their first sex below the age of 12 years, almost 9 out of 10 were sexually active by 14 years of age; first sex was forced in almost 1 in 5).

First sex was reported as being forced (in childhood in the vast majority of cases) in 5-18% of respondents. Multivariate analysis highlighted the importance that forced first sex had on the long-term risk of STIs. It was associated with a higher odds of acute infection in khusra and FSW and of HSV-2/HIV infection in khusra. The longer term sexual health implications of childhood sexual abuse have previously been noted in populations of young women[27] and men who have sex with men[28] in the USA, but this is the first time that such associations have been noted among sex working populations in Pakistan. This finding serves to illustrate not only the longterm impact that abuse in childhood may have, but also the lifetime nature of risk and vulnerability.

Nonetheless, among khotki and khusra there is evidence that risk reduction strategies can be effective at preventing infection. Lower rates of current and past infection were found among khusra who reported using condoms at last anal sex with clients and among those khusra who had correct knowledge about HIV risk reduction.

In our survey, risk reduction behaviours among some of the MTSW give some cause for optimism-and impetus for action. There are notably successful interventions with sex workers in the south Asian region; programmes have managed not only to address immediate risk environments but have also focused on the context and structural determinants of risk.[29] In part, the success of these interventions has relied on utilising existing social and professional networks to increase knowledge, promote empowerment and enable those at risk (eg, women selling sex) to insist on safer sex.[30] While these interventions have proved difficult to replicate in other settings,[31] they may nonetheless provide some guidance for the direction of effective strategies for reducing risk among sex workers in Pakistan.

Limitations of study:

As with any survey, there are limitations to the survey itself and the interpretation of the findings. The data are drawn from a cross-sectional survey and behavioural findings are based on self-reports, so any inferences about causality between risk factors and current or past infection are limited. Furthermore, since the sample was recruited from community settings, there is no established sampling frame from which a measure of representativeness can be obtained. During the course of the survey, incomplete collection of the RDS data prevented the sample proportions from being adjusted for network sizes and recruitment biases and thus did not allow us to obtain population estimates of FSW and MTSW characteristics. Comparisons with findings from other surveys in Pakistan, however, show that the people who participated in the surveys in Rawalpindi and Abbottabad had broadly similar characteristics and reported behaviours to those sex workers taking part in behavioural surveillance, with some exceptions (including numbers of partners and use of condoms),[32]

Take-home messages

► Low levels of knowledge, poor access to interventions and high levels of risk behaviours have been found among all sex workers.
► Transgender sex workers are particularly vulnerable to infection, and this vulnerability starts at a very young age.
► Social networks are strong in the sex working communities, especially among MTSW, and could be leveraged for changing community norms around safer sex.
► Equitable access to effective interventions and commodities (condoms, lubricants, comprehensive sexual health care, etc) is urgently needed; this should be a priority for the national programme.
► Framing interventions by respecting human rights and protecting against stigma and discrimination is vital.

and STI/HIV prevalence levels are similar to those found in other sex worker surveys in Pakistan.[33] Knowledge of HIV and its transmission was low in our survey compared with findings in many other cities, and this may account for some of the observed differences.

Conclusions

An HIV and further STI epidemic in Pakistan is not inevitable. Interventions that are known to be effective (behavioural, biomedical, possibly structural) are available to reduce HIV/STI risks and improve sexual health.[34-37] A hierarchy of interventions exists, and the ultimate selection of the most appropriate interventions is often dependent on the prevailing political and social climate for reducing risk.[38] Addressing underlying vulnerabilities and the lack of an enabling environment faced by all people in the study face is of paramount importance for the success and sustainability of any proposed intervention. As a matter of urgency, these interventions should include provision of high quality comprehensive sexual health care which is accessible and available to all sex workers. Framing interventions by upholding the recognition and protection of their human rights is vital.

Competing Interests:

None.

Ethics Approval:

The study was undertaken with ethical approval from both Nai Zindagi Institutional Review Board (in Pakistan) and the London School of Hygiene and Tropical Medicine (in the UK).

Contributors:

SH, principal investigator, contributed to the design of the survey and survey instruments, coordinated survey implementation, interpreted data and was lead author on the paper. MC contributed to the design of the survey instrument, analysed and interpreted the data for MTSW and contributed to several drafts. NL contributed to the design of the survey instrument, was responsible for project implementation in Pakistan and contributed to the writing of the paper. LP cleaned and coded all the datasets, led the analysis for FSWs, wrote the methods and contributed to the writing of the paper. NR contributed to the design of the survey instrument, assisted with project implementation in Pakistan and contributed to the writing of the paper.

AA contributed to the development of the laboratory methods and the writing of the paper. Hur-R was responsible for project implementation in Rawalpindi. NS was responsible for project implementation in Abbottabad and contributed to the writing of the paper. JC was responsible for data analysis and review of the manuscript. RM was responsible for laboratory inputs. SH contributed to the design of the survey and implementation of the project in Rawalpindi and Abbottabad. AB contributed to the design of the survey, facilitated survey implementation in Pakistan and contributed to several drafts of the paper.

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