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applied the condom at last use (AOR 1.90, $p < 0.001$); if they were inconsistent condom users (AOR 2.77, $p < 0.001$); and if they had never seen a condom demonstration (AOR 2.37, $p < 0.001$).

Conclusions: The reported incidence of condom breakage was high in this study, and this is a major concern for HIV/STI prevention programs, for which condom use is a key prevention tool. Younger and more marginalized female sex workers were most vulnerable to condom breakage. Special effort is therefore required to seek out such women and to provide information and skills on correct condom use. More research is also needed on what specific situational parameters might be important in predisposing women to condom breakage.

Introduction

Condom use is a key strategy for preventing sexually transmitted infections, including HIV [1,2]. However, condoms are only effective in preventing infection if they do not break or slip off during intercourse, and if they are correctly applied before initial penetration [3-7]. Published data show that condoms break approximately 1-13% of the time, depending on the population [8]. Data from Africa and India generally show much higher rates of breakage. In a study of female sex

workers (FSWs) in Benin in 2005, Mukenge-Tshibaka et al. [9] reported that 33% had experienced a breakage in the previous 2 days. Data from female sex workers in four southern states of India are available from face-to-face interviews (FTFI) in cross-sectional studies termed integrated biological and behavioural assessments (IBBAs). The percentage of FSWs reporting condom breakage at least once in the last month ranged from 5% in Thane, Maharashtra (MH) to 34% in Mumbai (IndPradesh

districts of Karnataka south India, the personal characteristics of those who reported a condom breakage in the previous month with those who did not. We examined aspects such as socio-demographic background, usual place of solicitation and place of sex, other aspects

Table 1 Univariate analysis of factors associated with **breakage**

Factor	Response categories	% broke in last month	Odds ratio	95% confidence intervals	p value
District	Shimoga	6.09	Ref	1.28-3.90	0.005
	Belgaum	12.65	2.23	0.81-2.99	0.188
	Bellary	9.15	1.55	1.78-5.36	<0.001
	Bangalore	16.70	3.09		
Number of clients in typical week	1-4	9.59	Ref	0.55-1.49	0.684
	5-9	8.73	0.90	0.75-1.80	0.497
	10-19	10.99	1.16	1.13-2.97	0.014
	20+	16.30	1.83		
Demographic factors					
Age	40+	9.12	Ref	0.71-1.79	0.608
	35-39	10.17	1.12	0.96-2.31	0.075
	30-34	13.00	1.49	0.91-2.35	0.116
	20-24	12.78	1.46	2.44-7.89	0.000
	<20	30.56	4.39		
Marital status	Devadasi (traditional FSW)	4.84	Ref	1.36-7.03	0.007
	Divorced/separated/ widowed	13.58	3.09	1.07-6.73	0.035
	Never married	12.03	2.69	1.04-5.21	0.041
	Married	10.57	2.32		
Sex work and personal risk factors					
Duration of sex work in this district	>5 years	10.20	Ref	0.78-1.61	0.538
	1-4 years	11.29	1.12	1.09-3.53	0.024
	< 1 year	18.23	1.96		
Ever practiced sex in a different place	No	10.16	Ref	1.54-3.55	<0.001
	Yes	20.93	2.34		
Ever had anal sex	No	10.17	Ref	1.39-3.42	0.001
	Yes	19.80	2.18		
Been forced to have sex in the last year	No	10.53	Ref	1.37-3.32	0.001
	Yes	20.08	2.13		
Ever been arrested	No	10.15	Ref	1.54-3.81	<0.001
	Yes	21.50	2.42		
Main place of entertaining clients	Public places	6.42	Ref	0.51-2.77	0.686
	Home	7.54	1.19	1.02-5.32	0.046
	Rented room/lodge	13.80	2.32	1.67-10.08	0.002
	Brothels	21.95	4.10		
Drink alcohol	Never	8.27	Ref	1.71-5.09	<0.001
	Occasionally	21.00	2.95	1.63-3.17	<0.001
	Regularly	17.03	2.28		
Condom use					
Always used condoms in the last 30 days	Yes	9.08	Ref	2.24-4.36	0.001
	No	23.77	3.12		
Where last condom was obtained	Peer educator/health facility	10.36	Ref	1.08-2.57	0.020
	Client	16.17	1.66	1.42-3.69	0.001
	Other	20.93	2.29		
Last time condom was put on by?	Client	7.65	Ref	1.70-3.26	<0.001
	Respondent	16.30	2.35		
Programme exposure					
Registered with sex worker CBO	Yes	10.17	Ref	1.66-3.59	<0.001
	No	21.65	2.44		
Ever given condom by a peer educator	Yes	10.28	Ref	1.62-3.50	<0.001
	No	21.43	2.38		
Ever seen a condom demonstration	Yes	10.14	Ref	1.94-4.00	<0.001
	No	23.91	2.79		

Table 2 Logistic regression analysis of factors associated with condom breakage

Factor	Response categories	Adjusted odds ratio	95% confidence intervals	p value
District	Shimoga	Ref	0.80-2.71	0.213
	Belgaum	1.47	0.65-2.24	0.55
	Bellary	1.20	1.30-3.91	1 0.004
	Bangalore	2.26		
Number of clients in typical week	1-4	Ref	0.50-1.41	0.50
	5-9	0.84	0.70-1.97	4 0.54
	10-19	1.18	0.77-2.43	1 0.273
	20+	1.37		
Demographic factors				
Age	20 and above	Ref	1.89-6.23	<0.001
	<20	3.43		
Marital status	Never married/married/devadasi Divorced/separated/widowed	Ref 1.52	1.10-2.10	0.012
Sex work and personal risk factors				
Ever had anal sex	No	Ref	1.23-3.36	0.006
	Yes	2.03		
Main place of entertaining clients	Public places	Ref	1.35-2.68	0.196
	Home	1.9	1.12-8.01	0.029
	Rented room/lodge	2.99	1.69-13.48	0.003
	Brothels	4.78		
Drink alcohol	Never	Ref	1.16-2.28	0.005
	Ever	1.63		
Condom use				
Always used condoms in the last 30 days	Yes	Ref	1.87-4.11	<0.001
	No	2.77		
Last time condom was put on by?	Client Respondent	Ref 1.90	1.35-2.68	<0.001
Programme exposure				
Ever seen a condom demonstration	Yes No	Ref 2.37	1.65-3.40	<0.001

breakage than unmarried or currently married women (AOR 1.52, 95% CI 1.10-2.10, $p=0.012$); users of alcohol had a higher risk if reporting breakage (AOR 1.61, 95% CI 1.16-2.28 $p=0.005$); those who primarily entertained clients in lodges/rented rooms (AOR 2.99, 95% CI 1.12-8.01, $p=0.029$) or brothels (AOR 4.78, 95% CI 1.69-13.48, $p=0.003$) were more likely to report breakage rather than those who primarily entertained their clients in public places. Those women who reported that they had ever had anal sex were twice more likely than others to report breakage (AOR 2.03, 95% CI 1.23-3.36, $p=0.006$). Those sex workers who reported that they had been the one to put the condom during the last time one was used were more likely to report breakage (AOR 1.90, 95% CI 1.35-2.68, $p<0.001$) and if the sex workers reported inconsistent (less than 100%) condom use in the last month, they were almost three times more likely to report breakage than consistent condom users (AOR 2.77, 95% CI 1.87-4.11, $p<0.001$). Those who had never seen a condom demonstration were more than twice more likely to report breakage in the last month than those who had seen a demonstration

(AOR 2.37, 95% CI 1.65-3.40, $p<0.001$). Other variables associated with sex practices and with other aspects of programme exposure were not associated with breakage in the multivariate regression model.

Conclusions

There have been many studies that have examined factors associated with condom breakage, though they often only evaluate aspects of the sex act where a break occurred, rather than looking at over-arching population variables. Furthermore, most studies have been done in developed countries and in non-commercial sex settings, and with a limited number of subjects. A limitation of this study is that the IBBA data do not give us specific details of the sex act in which the condom breaks, and we can only examine personal factors. A further limitation of this study is that we asked only about whether condom breakage had occurred in the past month, not the number of times that breakage occurred as a proportion of all sex acts (i.e. the frequency of condom breakage). More research is needed on the frequency of breakage to better assess the potential impact of

condom breakage on the HIV epidemic among FSWs in the context of high condom use levels. However, this study is a useful complement to the literature because it examines, in a large sample of female sex workers with many partners, the background characteristics and general sexual practices that might predispose them to condom breakage, so that programme planners can know *who* to target with informational material.

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