

Sexual activity as risk factor for hepatitis C virus (HCV) transmission among the female sex workers in Nagaland

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Background & objectives: Female sex workers (FSWs) of north-east India form a unique group as they are exposed to an enormous injecting drug user (IDU) clientele. This association makes them more vulnerable to blood borne viral infections. Over and above some of them also indulge in drug injecting practices along with their partners. The present study was carried out on FSWs to assess the prevalence of hepatitis C virus (HCV) infection and possibility of sexual transmission of HCV and associated risk factors among them.

Methods: A sample of 426 FSWs was recruited cross-sectionally using respondent driven sampling methods. Univariate and multivariate logistic regression analysis was carried out to determine the factors associated with HCV infection.

Results: The seroprevalence of HCV among 426 FSWs was 9.6 per cent, antibody to HIV was present in 13.4 per cent, 4.9 per cent were co-infected with HIV and HCV. Seroprevalence of HCV among participants without history of injecting drugs use, tattooing or blood transfusion was 7.5 per cent. An increased risk of HCV seropositivity was associated with history of injecting drug use (OR 10.41, CI 4.30-25.22), use of oral drugs (OR 4.7, CI 2.4-9.08), having sexual partners who were injecting drug users (OR 2.9, CI 1.5-5.6), having live-in relationship (OR 7.1, CI 1.59-31.52), HIV seropositivity (OR 10.18, CI 5.05-20.54) and HSV-2 seropositivity (OR 2.86, CI 1.45-5.43) in univariate analysis. In the multivariate analysis, history of injecting drug use, HIV and HSV-2 seropositivity were found to be significantly associated with HCV seropositivity.

Interpretation & conclusion: Although acquisition of HCV by sexual route may not be as efficient as parenteral route, yet sexual transmissibility of HCV among FSWs poses high risk to the community.

Key words FSW - HCV - HIV - sexual transmission

Infection by hepatitis C virus (HCV) is now recognized as a major worldwide public health problem owing to its high prevalence¹ and to the high risk of

chronicity resulting in liver cirrhosis and hepatocellular carcinoma. Percutaneous exposures such as blood transfusion and injecting drug use are well established

risk factor for HCV infection². However, transmission of HCV by sexual contact still remains less established. There are epidemiological evidences indicating HCV can also be transmitted sexually³ but less efficiently than other sexually transmitted viruses like HIV, HBV and herpes simplex virus-2 (HSV-2). There is also a study reporting low or null transmissibility of HCV in heterosexual relation even when index case was HIV coinfectd⁴.

The prevalence of HCV infection is known to differ according to different geographical areas and among the general population and specific risk groups such as sex workers². Although prevalence and incidence studies of HCV have been carried out among different high risk behaviour groups such as men having sex with men (MSM), blood donors *etc.*, reports of prevalence and risk factor of HCV among female commercial sex workers are very few^{5,6}. Persons in long term monogamous partnerships are at lower risk of HCV acquisition (0 to 0.6% per year) than person with multiple partner or those at risk for sexually transmitted infections (STIs) (0.4 to 1.8% per year)¹. FSWs are sexually promiscuous and more likely to have multiple sexual partners and are, therefore, vulnerable to various STI and HIV. The present study was carried out among FSWs to assess the prevalence of HCV infection and possibility of sexual transmission of HCV and associated risk factors among them.

Material & Methods

This study was carried out among 426 female sex workers in the Dimapur district of Nagaland in 2006. Respondent driven sampling (RDS) technique was applied to recruit the FSWs for the study. RDS centres were set up for conducting behavioural interviews and biological sample collection among the study subjects. Details of methodology adopted in the study are described elsewhere^{7,8}. Female sex worker was defined as a female 18 yr or older, who had sex with men in exchange of cash at least once in the past one month. Pre-designed and pre-tested questionnaires were used to capture data on their demographic profile, sexual practices and risky injecting behaviours. The study followed a 'linked anonymous' strategy to maintain confidentiality of behavioural and biological data provided by every individual respondent. Written informed consent was taken from all participants. The project was approved by the Health Ministry Screening Committee of the Government of India and institutional ethical review committees of Regional

Medical Research Centre for Northeast India (ICMR), Family Health International (FHI) and National AIDS Research Institute (NARI). Blood samples were collected for laboratory diagnosis. Serum was separated by centrifugation and stored at -70°C to be tested later. Serum samples were tested for HCV antibody by a commercially available HCV4.0 ELISA (Murex anti-HCV version 4.0, Abbot Diagnostics, USA). Participants were considered positive when the serum samples were repeatedly positive by recombinant immunoblot assay (Chiron RIBA 3.0 SIA, USA). Antibodies to HIV were tested by Microlisa-HIV (J Mitra & Co., India) and confirmed by Genedia HIV1/2 ELISA3.0 (Green Cross Life Science Corp, South Korea). Serological diagnosis for HSV-2 was done using HerpeSelect 2 ELISA IgG (Focus Diagnostics, USA).

Univariate and multivariate logistic regression analysis was performed to calculate odds ratio (OR) and their 95% confidence interval to determine the factors associated with HCV seropositivity. All analyses were performed using the SPSS version 17.0 (South Asia Pvt. Ltd., Bangalore, India).

Results

A total of 426 eligible female sex workers were recruited in the study. The mean age of the participants was 25.6 ± 6.65 yr. Of these, 193 (45%) FSWs were literate. The main occupation of 63.6 per cent (n=271) FSWs was sex work, 19.2 per cent (n=82) were also involved in some petty business while 6.3 per cent (n=29) were employed as maid servant. About one-third (n=121, 28.4%) were never married, 39.9 per cent (n=170) were currently married and the remaining were either divorced/separated/widowed. Nearly a third (n=132, 31.1%) were into sex work for more than 6 years and 16.7 per cent (n=71) got into sex work less than a year ago. The median length of sex work was 4 years and median number of clients per day was two. Almost all the respondents had both occasional and regular clients and about 21 per cent (n=89) had experienced receptive anal sex with their clients.

Only 24 (5.6%) FSWs had history of injecting drugs use for non medical reason in the past and 399 FSWs did not have any history of injecting drug use. However, no history of blood transfusion, tattooing, *etc.* could be elicited. Overall, 41 (9.6%) participants were found to be seropositive for HCV. Seroprevalence of HCV among 24 IDU-FSWs was 45.8 per cent (n=11), whereas among 399 non-IDU FSWs seroprevalence

was 7.5 per cent (n=30). There was no history of injecting drugs among 73.2 per cent (30/41) of HCV seropositive FSWs. Overall HIV seroprevalence was 13.4 per cent (57/426) and 21 (4.9%) FSWs were co-infected with HCV and HIV.

In the univariate logistic regression analysis (Table I), having history of injecting drug use (OR 10.41, CI 4.30-25.22), having history of oral drug use (OR 4.68, CI 2.41-9.08), having sexual partners who shared injecting drugs (OR 2.90, CI 1.5-5.61), having live-in relationship (OR 7.1, CI 1.59-31.52), being HIV seropositive (OR 10.18, CI 5.05-20.54), being seropositive for HSV-2 (OR 2.86, CI 1.48-5.54) were significantly associated with increased risk of being seropositive for HCV. However, other variables such as age at initiation of commercial sex work, length of sex work, presence of one or more STIs, anal sex with clients, condom breakage in last sex and condom use with regular clients were not statistically associated with HCV seropositivity. Presence of one or more STIs, duration of commercial sex work more than one year, condom breakage in last sex were associated with elevated risk of being seropositive for HCV, but not in a statistically significant manner.

In the multivariate logistic regression analysis (Table II), having past history of injecting drug use (OR 6.34, CI 1.63-24.63) and HIV seropositivity (OR 9.39, CI 3.95-22.33) was found to be significantly ($P<0.01$) associated with HCV seropositivity in the study. Other variables were not found to be statistically significant in the multivariate analysis.

Discussion

There are evidences of sexual transmission of HCV, but the enormity of an individual's risk of HCV acquisition by sexual contact is difficult to determine. Commercial sex workers have greater vulnerability and higher potential to STIs and blood borne infections like HCV. The average seroprevalence of HCV antibody among FSW was reported to be 6 per cent in United States², while others have reported a seroprevalence of 6.6 per cent in Congo⁹, 3.2 and 6.2 per cent in Japan^{6,10}. Studies conducted in India have reported a HCV seroprevalence of 0.57 to 21.1 per cent among the attendees of STD clinics¹¹⁻¹³. However, data on prevalence among FSWs at large in India are lacking. Studies from the north east India conducted in an isolated community in Arunachal Pradesh showed 8 per cent prevalence of an anti-HCV antibody in the group¹⁴ while 1.17 per cent HCV seroprevalence was reported

among blood donors in Assam¹⁵. Some States in the northeastern part of India have the highest prevalence of IDU population. Many FSWs also indulge in injecting drug use. Prevalence of HCV among IDUs in the region ranges from 29.9 to 98 per cent¹⁶. As a consequence, prevalence of HCV among FSWs is also expected to vary greatly.

Results of the present study showed an overall seroprevalence of 9.6 per cent for HCV among FSWs in Nagaland. Seroprevalence was higher (45.8%) among sex workers who were also IDU, whereas among non-IDU FSWs seroprevalence was only 7.5 per cent. History of blood transfusion, tattooing, *etc.* was not present indicating existence of sexual transmission of HCV in this region.

It may be mentioned here that Nagaland is one of the six high HIV prevalent States of India and the burden is attributed to male IDUs¹⁷. Therefore, the sex workers who are a conduit for transferring STI to the community are definitely exposed to the IDU clientele who are known to have high prevalence of HCV infection. The intermingling between these two groups with the backdrop of HIV could be responsible for the high rate of sexual transmission of HCV in this setting in the absence of other risk factors.

Our study also showed strong association of HCV infection with other STI markers such as HIV and HSV-2 as in other studies¹⁸. The frequency of HCV transmission to sexual partners is five times higher when HIV is also transmitted, suggesting that HIV may be a co-factor for the sexual transmission of HCV¹⁹. Association of HCV with intake of oral drugs also indicate that substance abusers like alcoholics²⁰ are at a higher risk of acquiring STIs due to unsafe sexual practices under the influence of drugs. Although not statistically significant yet risk of HCV seropositivity was higher among those who had one or more STIs. These findings corroborate with earlier findings although in different settings^{18,19,21}. We found low usage of condom in FSWs with both occasional and regular clients thus suggesting sexual transmission of HCV through infected male partner²². There are studies which provide strong evidence for the sexual transmission of HCV²²⁻²⁴. Blood containing HCV can penetrate the genital epithelium more efficiently in areas with microlaceration¹⁸. Such minute exposure may be sufficient for infection because it is thought that percutaneous exposure to even small quantities of infected blood can result in infection²⁵.

Table I. Univariate logistic regression analysis showing factors association with HCV seropositivity

Variables	n (%) (N=426)	Odds ratio	95% CI
<i>Ever married</i>			
No	121 (28.4)	Reference	0.77-3.83
Yes	305 (71.6)	1.71	
<i>Living with partner (only unmarried)</i>			
No	103 (24.2)	Reference	1.59-31.52
Yes	18 (4.2)	7.07*	
<i>Consumption of alcohol</i>			
No	119 (27.9) ^a	Reference	0.59-2.61
Yes	304 (71.4)	1.24	
<i>Intake of oral drugs</i>			
No	318 (74.6) ^a	Reference	2.41-9.08
Yes	105 (24.6)	4.68**	
<i>Ever injected drugs</i>			
No	399 (93.7) ^a	Reference	4.30-25.22
Yes	24 (5.6)	10.41**	
<i>Had sex partners who shared injecting drugs</i>			
No	281 (66) ^a	Reference	1.50-5.61
Yes	133 (31.2)	2.90**	
<i>Duration of sex work (yr)</i>			
<1	71 (16.7) ^a	Reference	0.44-2.93
1-5	222 (52.1)	1.13	0.47-3.51
≥6	132 (31)	1.29	
<i>Age at first selling sex (yr)</i>			
<20	264 (62) ^a	Reference	0.55-2.04
≥20	161 (37.8)	1.1	
<i>Had anal sex</i>			
No	337 (79.1)	Reference	0.33-1.78
Yes	89 (20.9)	0.76	
<i>Condom used with occasional clients</i>			
Yes	177 (41.5)	Reference	0.25-0.92
No	243 (57)	0.48*	
<i>Condom used with regular clients</i>			
Yes	139 (32.6)	Reference	0.33-1.25
No	280 (65.7)	0.64	
<i>Condom breakage in past month</i>			
No	257 (75.4%)	Reference	0.55-26
Yes	84 (24.6%)	1.20	
<i>HSV-2 serostatus</i>			
Negative	265 (62.2)	Reference	1.45-5.43
Positive	161 (37.8)	2.86**	
<i>HIV serostatus</i>			
Negative	368 (86.6)	Reference	5.05-20.54
Positive	57 (13.4)	10.18**	
<i>Presence of one or more STI</i>			
Negative	250 (58.7) ^a	Reference	0.60-2.18
Positive	174 (40.8)	1.14	

^aNumbers varied due to non-response or missing data
P *<0.05, **<0.01

Table II. Multivariate logistic regression analysis showing factors association with HCV

Variables	Odds ratio	95% CI
<i>Ever married</i>		
No	Reference	
Yes	1.69	0.56-5.08
<i>Consumption of alcohol</i>		
No	Reference	
Yes	0.83	0.33-2.12
<i>Intake of oral drugs</i>		
No	Reference	
Yes	2.38	0.92-6.14
<i>Ever injected drugs</i>		
No	Reference	
Yes	6.34*	1.63-24.63
<i>Had sex partners hared injecting drugs</i>		
No	Reference	
Yes	1.18	0.49-2.87
<i>Duration of sex work (yr)</i>		
<1	Reference	0.24-2.70
1-5	0.81	0.16-2.24
≥6	0.59	
<i>Age at first selling sex (yr)</i>		
<20	Reference	
≥20	0.64	0.26-1.54
<i>Had anal sex</i>		
No	Reference	
Yes	0.61	0.22-1.70
<i>Condom used with occasional clients</i>		
Yes or no occasional clients	Reference	
No	1.64	0.62-4.30
<i>Condom used with regular clients</i>		
Yes or no regular clients	Reference	
No	0.64	0.23-1.74
<i>HSV-2</i>		
Negative	Reference	
Positive	1.35	0.59-3.07
<i>HIV</i>		
Negative	Reference	
Positive	9.39*	3.95-22.33
<i>Presence of one or more STI</i>		
Negative	Reference	
Positive	0.55	0.23-1.29

*P<0.01

One of the limitations of the study was its cross-sectional design due to which it was difficult to establish causal relationship. To conclude, although acquisition of HCV by sexual route may not be as efficient as parenteral route, yet our study indicates the presence of sexual transmissibility of HCV among FSWs with high risk behaviour, primarily associated with unprotected sexual practices. Consequently, it underscores the need to screen for HCV among such bridge population besides blood donors and IDUs.

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