

Oral health status of a group of illicit drug users in Delhi, India

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Objectives: To assess the oral health and related practices of a group of illicit drug users in Delhi, India; to compare with that of non-drug users; and to assess the impact of illicit drug use on oral health. **Design:** Cross-sectional study. Comparison was made with non-drug users to investigate any differences in oral health between illicit drug users and general population. **Setting and participants:** Illicit drug users attending a drug dependence treatment clinic in Delhi (n=126). Equal number of non-drug users attending other outpatient departments in the same setting. **Outcome measures:** Oral health practices assessed using structured questionnaire; dental caries, periodontal status and oral mucosa assessed using World Health Organization 2004 criteria; oral hygiene assessed using OHI-S. **Results:** Mean DMFT and OHI-S scores amongst the drug users were 3.48 and 3.80, respectively. Bleeding, shallow pockets and deep pockets were found as the highest CPI finding in 42%, 44% and 12% of drug users respectively. Premalignant states of leukoplakia and OSMF were diagnosed in 13% and 4% of drug users respectively. Significant differences were found between drug users and non-drug users with respect to oral hygiene practices; DMFT, OHI-S, CPI scores; and leukoplakia. In multivariate analysis, illicit drug use was significantly associated with CPI highest score (OR=2.21, 95% CI 1.08-4.52). **Conclusion:** The illicit drug users had significantly poorer oral hygiene practices, oral hygiene and periodontal health; higher caries experience; and higher prevalence of leukoplakia as compared to non-drug users. The findings of the study suggest that illicit drug use is independently associated with poor periodontal health.

Key words: drug users, dental caries, epidemiology, leukoplakia, oral health, periodontal diseases

Introduction

The word “drug” is defined as “any substance that modifies mind and/or body functioning”. In the field of drug abuse the term “psychoactive drug (substance)” is more specific which refers to a drug that affects the central nervous system and alters consciousness and/or perceptions (Hanson *et al.*, 2005). Psychoactive drugs are classified as licit e.g. alcohol, tobacco, or illicit e.g. cannabis, amphetamine type stimulants, cocaine and opiates (Hanson *et al.*, 2005; United Nations Office on Drugs and Crime, 2008).

Modern society is plagued with the problem of illicit drug use along with the well-recognised problem of use of licit drugs with 4.9% of the world’s 15–64 year olds having used illicit drugs in the preceding 12 months (United Nations Office on Drugs and Crime, 2008). About 4.7% of the Indian population was found to have used illicit drugs at some time with cannabis and opiates being commonly used. The use of cocaine and amphetamines is not common among illicit drug users in India (Ray, 2004). A community-based survey found that the prevalence of cannabis and opioids use was 0.3 and 0.4% respectively among Delhi males with the highest rates found in resettlement clusters (Mohan *et al.*, 2001).

Illicit drug use has both medical and social implications. Negative consequences of drugs include health damage; psychological problems; domestic violence; unemployment; and economic, social and legal problems. Parenteral drug users are at a higher risk of contracting infections such as HIV and Hepatitis B and C (Hanson *et al.*, 2005; Ray, 2004).

Studies have also reported poor oral health among drug users (Du *et al.*, 2001; Molendijk *et al.*, 1996; Reece, 2007; Rooban *et al.*, 2008; Scheutz, 1984). Factors which contribute to oral disease in these subjects include dry mouth and preference for sweet food induced by opiates, cannabinoids and stimulants (Reece, 2007; Robinson *et al.*, 2005). Poor oral hygiene due to neglect of overall personal hygiene may also be a contributing factor. Further, impairment of cell division and immunosuppression induced by addictive drugs have been suggested as possible reasons for compounding the oral health problems (Reece, 2007). Cannabis smoke may act as a carcinogen and has been associated with oral premalignant lesions (Cho *et al.*, 2005; Versteeg *et al.*, 2008). Cocaine use may cause ischemic necrosis of the palate, nasal septum and gingiva due to its vasoconstrictive effect (Brand, 2008). Cocaine and methamphetamine use has been associated with bruxism and tooth wear (Brand, 2008; Hamamoto and Rhodus, 2009). Concomitant use of other psychoactive substances such as tobacco and alcohol may further deteriorate the oral health status of these subjects (Rooban *et al.*, 2008).

There is paucity of published data related to oral health status of illicit drug users in Delhi, India. A study by Rooban and colleagues (2008) throws light on the oral health status of drug abusers in Chennai, South India and indicates a large gap in oral health status between drug abusers and general population. The research questions which arise are: 1, What is the state of oral health and related practices amongst illicit drug users in Delhi? 2,

Are oral health and related practices poorer among illicit drug users as compared to those of the non-drug users? 3, Is illicit drug use independently associated with poor oral health?

Therefore, the present study was carried out to assess the oral health and related practices of a group of illicit drug users in Delhi, India; to compare this with that of non-drug users; and to assess the impact of illicit drug use on oral health.

Material and methods

The National Drug Dependence Treatment Centre, India provides community-based care in an urban resettlement colony of Trilokpuri, Delhi. A cross-sectional study was designed with the study population comprising of illicit drug users attending the community clinic for treatment of drug dependence. Persons who 'had used/were using' any of the illicit drugs and 'were presently undergoing/had presented for' treatment for drug dependence at the clinic were included in the study. The diagnosis of drug dependence was made clinically based on the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) criteria at the time of initiation of treatment. Drug users who were seeking treatment for dependence on legal drugs alone such as tobacco and alcohol were excluded from the study. A comparison was made with non-drug users (who had never used any illicit drug) to investigate any differences in oral health between illicit drug users and general population.

Sample size of 126 was determined using the formula $N=Z^2[P(1-P)]/E^2$ where: Z, level of confidence =1.96 for 95% confidence; P, estimated prevalence of disease =91% based on the prevalence of dental diseases in drug users reported in a previous study (Rooban *et al.*, 2008); and E, permissible error = 5%.

Ethical approval for the study was obtained from the Institutional Ethics Committee, AIIMS and participants gave written informed consent.

The community clinic was visited twice a week and the first five consecutive patients (excluding repetitions) were interviewed each day. A total of 136 patients were interviewed between September and December, 2008. All the patients consented to take part in the study. However, ten patients who were dependent on alcohol alone were not included in the study. Thus, the study sample comprised of the required number of 126 drug users. Equal numbers of non-drug users were recruited from out-patients attending ophthalmic and internal medicine clinics in the same hospital. They were selected using consecutive sampling while maintaining a similar age and sex distribution to that of the sample of drug users. They were interviewed and examined over the following 4 months.

A structured questionnaire gathered subjects' data on socio-demographic characteristics, illicit drug use, use of other psychoactive substances and oral health practices. Socioeconomic status was determined using Kuppuswamy's scale (Mishra and Singh, 2003). The income scale was updated to 2008 prices using a national consumer price index (Kumar *et al.*, 2007). The questionnaire was pretested on a small sample prior to the main study to assess the suitability and comprehensibility of the questions.

The evaluation of oral health status included assessment of dental caries, periodontal status and oral mucosa using 2004 World Health Organization (WHO) criteria (Parkash *et al.*, 2004; WHO, 1997) though calculus was not scored. This involved assessment of dental caries using Dentition status and Treatment Needs Index: coronal caries only (WHO, 1997), periodontal status using modified CPI (WHO, 1997) and oral mucosa using WHO, 1997 criteria. Additionally, oral hygiene was assessed using Simplified Oral Hygiene Index (OHI-S) (Greene and Vermillion, 1964). Examination was carried out by a single examiner trained in public health dentistry. Subjects were examined using mouth mirror, CPI probe and explorer with the subject in a dental chair. Oral health counselling was provided for all subjects after the examination and referrals were made to dental clinic of the same hospital.

Statistical analysis used the Statistical Package for Social Sciences (SPSS), v.14.0 and STATA 9.0 (College Station, Texas, USA). Data were presented as number (%), mean (standard deviation) and median (range). Categorical variables were compared between drug users and non-drug users using χ^2 test and Fisher's Exact test. Parametric and non-parametric numerical data were compared using independent samples t-test and Mann-Whitney U test, respectively. To assess the impact of drug use after controlling for the confounding factors, regression analysis was done for oral hygiene (linear regression), dental caries (logistic regression), periodontal status (ordinal logistic regression) and leukoplakia (logistic regression). A p-value <0.05 was considered statistically significant.

Results

The socio-demographic details of the study subjects are given in Table 1. Their mean age was 36 (sd 11, range 18-66) years. All were male except one female. Most (89%) belonged to lower or upper lower socioeconomic classes and this was a significant difference from the non-drug users ($p<0.0001$).

The details of drug use of the illicit drug users are given in Table 2. The most commonly used category of illicit drug was the opioids (98%), particularly inhaled "smack" (slang for street heroin) (91%) which is smoked with tobacco in rolled cigarettes or by heating the drug from underneath on aluminium foil ('chasing the dragon'). Cannabis was taken in the form of ganja/charas by 29% of the drug users. About a quarter were taking both opioids and cannabis. Use of other psychoactive substances was also found to be high amongst drug users. The patients attending the clinic were largely on substitution treatment with buprenorphine or oral sustained release morphine (based on the principles of harm reduction) along with psychosocial intervention.

The oral health status and related practices of drug users and non-users are presented in Table 3. There were significant differences between these groups with respect to mode, material and frequency of cleaning teeth. More than two-thirds of drug users were affected by dental caries, with a mean DMFT score of 3.48 (sd 5.20). The group's mean OHI-S score was 3.80 (sd 1.06). Bleeding, shallow pockets and deep pockets were found as

Table 1. Socio-demographic characteristics of illicit drug users and non-drug users

		<i>Drug users</i> <i>n (%) n=126</i>	<i>Non-drug users</i> <i>n (%) n=126</i>	<i>p value</i>
Age group (years)	10-20	7 (6)	7 (6)	1.000
	21-30	39 (31)	39 (31)	
	31-40	43 (34)	43 (34)	
	41-50	22 (17)	22 (17)	
	51-60	11 (9)	11 (9)	
	61-70	4 (3)	4 (3)	
Gender	Male	125 (99)	125 (99)	1.000
	Female	1 (1)	1 (1)	
Education	Profession or Honours	1 (1)	4 (3)	<0.0001
	Graduate or post graduate	3 (2)	14 (11)	
	Intermediate/ post high school diploma	4 (3)	26 (21)	
	High school certificate	14 (11)	39 (31)	
	Middle school certificate	38 (30)	26 (21)	
	Primary school certificate	38 (30)	12 (9)	
	Illiterate	28 (22)	5 (4)	
Occupation	Profession	1 (1)	5 (4)	<0.0001
	Semi-profession	0 (0)	6 (5)	
	Clerical, shop owner, farmer	12 (9)	36 (29)	
	Skilled worker	0 (0)	9 (7)	
	Semi-skilled worker	54 (43)	50 (40)	
	Unskilled worker	36 (29)	16 (13)	
	Unemployed	23 (18)	4 (3)	
Income per month (1 US\$= INR 49) (Modified for 2008)	>21,200 INR	0 (0)	4 (3)	<0.0001
	10,600-21,200 INR	2 (2)	14 (11)	
	8000-10,600 INR	4 (3)	9 (7)	
	5300-8000 INR	16 (13)	25 (20)	
	3200-5300 INR	39 (31)	39 (31)	
	1060-3200 INR	40 (32)	29 (23)	
	<1060 INR	25 (20)	6 (5)	
Socioeconomic class ^a	Upper	1 (1)	3 (2)	<0.0001
	Upper middle	1 (1)	22 (18)	
	Lower middle	12 (9)	38 (30)	
	Upper lower	85 (67)	61 (48)	
	Lower	27 (21)	2 (2)	
Marital status	Married with spouse living	61 (48)	97 (77)	<0.0001
	Never married	48 (38)	28 (22)	
	Married but widowed/separated	17 (14)	1 (1)	

^a As per the Kuppuswamy's socioeconomic status scale: education, income and occupation each scored; scores summed; total scores categorised into 5 classes.

Table 2. Details of drug use of illicit drug users

<i>Illicit drug</i>	<i>Prevalence</i> <i>n (%)</i> <i>n=126</i>	<i>Current user</i> <i>n (%)</i> <i>n=126</i>	<i>Duration of use</i> <i>Mean (sd)</i> <i>years</i>	<i>Frequency</i> <i>Mean (sd)</i>	<i>Stopped since</i> <i>Mean (sd)</i> <i>months</i>	
Opioids	Smack	115 (91)	21 (17)	12.1 (7.9)	4 (2) times/day	18.2 (19.6)
	Opium	13 (10)	5 (4)	19.5 (9.3)	2 (1) times/day	51.6 (67.5)
	Injectable opioid	12 (10)	4 (3)	6.4 (5.8)	3 (1) injections/day	16.6 (26.9)
Cannabis (Ganja/Charas)	37 (29)	25 (20)	14.9 (9.1)	6 (7) cigarettes/day	15.7 (56.5)	
Other psychoactive substances						
Betel quid	9 (7)	4 (3)	10.1 (3.5)	8 (8) per day	72.9 (102.6)	
Tobacco chewing	37 (29)	33 (26)	10.6 (7.2)	1 (1) packets/day	0.3 (1.1)	
Gutkha	27 (21)	13 (10)	6.9 (6.0)	9 (9) packets/day	9.0 (17.2)	
Tobacco smoking	120 (95)	110 (88)	18.0 (11.1)	18 (14) bidi/cig.s/day	3.9 (22.1)	
Alcohol	36 (29)	30 (24)	13.0 (9.5)	3 (3) bottles/week	9.5 (30.6)	

Table 3. Oral health practices and status of drug users and non-drug users

<i>Oral health practice/condition</i>	<i>Drug users (n=126)</i>		<i>Non-drug users (n=126)</i>		<i>p-value</i>
Mode of cleaning teeth, n (%)					
Toothbrush	78	(62)	109	(86)	<0.0001
Finger	30	(24)	10	(8)	
Neemstick	7	(6)	6	(5)	
Nil	11	(9)	1	(1)	
Material used for cleaning teeth, n (%)					
Toothpaste	76	(60)	98	(78)	0.004
Toothpowder	23	(18)	20	(16)	
Others ^a	10	(8)	2	(2)	
Nil	17	(13)	6	(5)	
Frequency of cleaning teeth, n (%)					
Nil or less than once a day	66	(52)	13	(10)	<0.0001
Once a day	55	(44)	91	(72)	
Two or more times a day	5	(4)	22	(17)	
Dentition status					
DMFT>0, n (%)	87	(69)	74	(59)	0.088
Decayed teeth, Mean (SD)	2.49	(3.39)	1.37	(2.00)	
Median (Range)	1.0	(0-19)	1.0	(0 - 9)	0.004
Missing teeth (due to caries) (M) Mean (SD), Median (Range)	0.98	(3.33)	0.52	(1.62)	
Filled teeth (F), Mean (SD)	0.0	(0 - 32)	0.0	(0 - 14)	0.419
Median (Range)	0.01	(0.09)	0.13	(0.51)	
DMFT, Mean(SD)	0.0	(0 - 1)	0.0	(0 - 4)	0.003
Median (Range)	3.48	(5.20)	1.96	(2.99)	
No. of missing teeth (for any reason), Mean (SD)	1.0	(0 - 32)	1.0	(0 - 21)	0.023
Median (Range)	3.13	(5.59)	1.23	(3.36)	
Median (Range)	0.50	(0 - 32)	0.0	(0 - 24)	<0.0001
Oral hygiene, Mean (SD)					
Debris Index, (DI-S)	2.19	(0.51)	2.07	(0.51)	0.054
Calculus index, (CI-S)	1.61	(0.78)	1.29	(0.88)	0.003
OHI-S	3.80	(1.06)	3.36	(1.19)	0.002
Periodontal status:					
CPI highest score, n (%)					
0 (Healthy periodontium)	2	(2)	2	(2)	<0.0001
1 (Bleeding only)	52	(42)	82	(65)	
2 (Shallow pocket) (4-5 mm)	55	(44)	25	(20)	
3 (Deep pocket) (\geq 6mm)	15	(12)	17	(13)	
CPI LOA highest score, n (%)					
0 (LOA 0-3 mm)	42	(34)	60	(48)	0.020
1 (LOA 4-5 mm)	22	(18)	29	(23)	
2 (LOA 6-8 mm)	36	(29)	19	(15)	
3 (LOA 9-12 mm)	16	(13)	15	(12)	
4 (LOA \geq 12 mm)	8	(6)	3	(2)	
Oral mucosa, n (%)					
Normal mucosa	83	(66)	96	(76)	0.123
Leukoplakia	16	(13)	3	(2)	0.002
Lichen planus	1	(1)	3	(2)	0.372
Abscess	3	(2)	4	(3)	1.000
Tobacco pouch keratosis	15	(12)	11	(9)	0.407
OSMF	5	(4)	3	(2)	0.722
Nicotine stomatitis	1	(1)	2	(2)	1.000

^a Coal powder, tobacco powder, salt, oil, neem leaves, soil

Table 4. Association of illicit drug use with various oral conditions

<i>Oral condition</i>	<i>Unadjusted OR (95% CI)</i>	<i>p-value</i>	<i>Adjusted OR (95% CI)</i>	<i>p-value</i>
Dental caries ^a	1.57 (0.93- 2.63)	0.088	2.03 (0.98 – 4.23)	0.056
CPI highest score ^a	2.13 (1.30-3.50)	0.003	2.21 (1.08 – 4.52)	0.029
Leukoplakia ^b	5.96 (1.69-21.02)	0.002	3.25 (0.92- 11.45)	0.067
	Unadjusted RC (95% CI)		Adjusted RC (95% CI)	
Oral hygiene (OHI-S score) ^a	0.44 (0.16 - 0.72)	0.002	-0.07(-0.44 - 0.30)	0.709

OR= Odds ratio, RC= Regression coefficient, CI= Confidence interval

^a Adjusted odds ratio/regression coefficient calculated by adjusting for: age, socioeconomic status, oral hygiene practice, tobacco smoking, tobacco chewing, alcohol

^b Adjusted odds ratio calculated by adjusting for: age, tobacco use, alcohol. 1 imputed to an empty cell in 'tobacco use' to calculate the adjusted odds ratio

the highest CPI finding in 42%, 44% and 12% of drug users respectively. Oral mucosal examination revealed potentially malignant states such as leukoplakia and oral submucous fibrosis amongst 13% and 4% of drug users. Drug users had significantly worse scores than non-drug users with respect to DMFT, OHI-S, highest CPI score, highest score for loss of attachment and leukoplakia.

Table 4 gives the unadjusted and adjusted odds ratios for the association of illicit drug use with various oral conditions. Illicit drug use was found to be significantly associated with highest score of CPI with an adjusted odds ratio of 2.21. Illicit drug use was not found to be associated with OHI-S score and leukoplakia after controlling for confounding factors.

Discussion

Drug users are exposed to various health risks including poor oral health. There is paucity of data related to their oral health in Delhi, India. Access to this population for research purposes is difficult due to the social stigma associated with illicit drug use. However, drug users attending a drug dependence treatment clinic form an accessible group. A community clinic of the National Drug Dependence Treatment Centre, India provided an opportunity to assess the oral health and related practices of this vital disadvantaged group.

Sample size was determined using prevalence of dental diseases in drug users reported in a previous study and consecutive sampling was used. This method of sampling, though a non-probability sampling technique, allows every available subject to be included (Lunsford and Lunsford, 1995). However, taking the first few patients attending the drug dependence treatment clinic as the study sample could be a potential source of selection bias. Non-drug users, with similar age and sex distribution as that of drug users, were assessed to draw a valid inference. An attempt was made to recruit non-drug users of similar socioeconomic status by taking subjects attending the same hospital for other reasons. However, socioeconomic status of the drug users was found to be poorer than that of the control. Frequent absenteeism, unemployment and economic difficulties are well recognised consequences of drug dependence (Hanson *et al.*, 2005; Ray, 2004) and these could explain the observed difference.

The major illicit drugs used were opioids and cannabis rather than cocaine or amphetamine-type stimulants. Ray (2004) found alcohol, cannabis, heroin and opium were the common drugs of abuse for target communities in various parts of India.

Oral hygiene practices of the drug users were alarming with more than half of the subjects cleaning their teeth less than once a day as compared to 90% of non-users cleaning their teeth at least once a day. Poor oral hygiene practices may be attributed to the lack of concern for overall personal hygiene, resulting from dependents' preoccupation with drug procurement, consumption and withdrawal (DSM-IV criteria: Jaffe, 2000). The qualitative study by Robinson and colleagues, (2005) found that recovering drug users had over-riding concern to avoid withdrawal symptoms and everything was subservient to this priority.

A mean OHI-S score of 3.80 suggests poor oral hygiene amongst drug users. Also, this was significantly higher amongst illicit drug users than the non-drug users. This agrees with the findings of previous studies (Molendijk *et al.*, 1996; Scheutz, 1984). The finding that illicit drug use was not associated with oral hygiene after adjusting for confounding factors suggests that the poor oral hygiene status amongst drug users results indirectly from other factors such as their poor oral hygiene practices and low socioeconomic status.

The periodontal status of the drug users was found to be poorer than the non-drug users. Regression analysis revealed that drug users were over twice as likely to have a higher score of CPI as the non-drug users. Previous studies (Du *et al.*, 2001; Scheutz, 1984) have also reported poor periodontal health among drug users. This may be attributed to their poor oral hygiene and concomitant heavy use of tobacco. Further, addictive drugs, particularly opiates have been found to impair cell division, thereby tilting the balance towards breakdown of tissue and failure to achieve repair and regeneration (Reece, 2007).

Analysis of the individual components of mean DMFT value showed that the mean number of decayed teeth constituted the major part of the index, indicating a high treatment need among drug users. Significantly lower numbers of filled teeth was recorded amongst drug users, suggesting that these subjects rarely received

comprehensive dental care. This indicates that in addition to poor oral health and corresponding needs, they have difficulty in accessing dental services. Also, symptoms of caries may be masked by pharmacological effects of drugs and in case of severe pain these subjects may self-medicate (Robinson *et al.*, 2005).

The findings of this study reflect the oral health status of disadvantaged group of illicit drug users in a single centre. India is a nation with diverse socio-cultural and regional variations. Therefore, further multi-centric studies in the country are recommended to get a more comprehensive picture. The possibility of social desirability bias while answering the questions on drug use and oral health practices cannot be ruled out due to interview-based administration of the questionnaire. However, measures were taken to reduce the bias by conducting interview in privacy in the hospital premises and assuring confidentiality of data. The possibility of observer bias cannot be eliminated as the investigator conducting the interview and oral examination was not blinded to the identity of the subjects. Like other epidemiologic field studies, this study did not include radiographs as part of the clinical dental examination because of common ethical and logistical constraints. This approach may underestimate the prevalence and severity of dental caries and periodontal disease.

In conclusion, the results of the study indicate that, compared to non-drug users, the illicit drug users had inferior oral hygiene practices, poorer oral hygiene and worse periodontal health; higher caries experience; and higher prevalence of leukoplakia. The findings suggest that illicit drug use is independently associated with poor periodontal health. It can be inferred that it is not only the direct effect of the illicit drug, but also the indirect influence of factors such as associated low socioeconomic status and lifestyle pattern that contributes to poor oral health in this disadvantaged group.

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