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Dental Disease Prevalence among Methamphetamine and Poly-drug Users in an Urban Setting: A Pilot Study

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Abstract

Background/Objectives—Rampant tooth decay has been reported among methamphetamine users. We investigated the prevalence of dental disease and associated risk behaviors in methamphetamine users compared to heroin users.

Methods—This pilot project is a cross-sectional study of an on-going cohort of young adult injection-drug users (IDUs) in San Francisco. An oral health questionnaire was administered by a research-assistant, and two dentists performed clinical examinations to record the Decayed-Missing-Filled-Surfaces (DMFS) index, presence of residual roots, the Simplified Oral Hygiene Index, and salivary hypofunction.

Results—The prevalence of dental disease among 58 young adult IDUs was strikingly high compared to the U.S. general population, however, there was no difference in the level of dental disease between the methamphetamine and heroin users in this study. The mean DMFS and number of decayed surfaces exceeded 28 in both groups.

Conclusions—While no difference in dental disease between methamphetamine and heroin users was detected, we found a high prevalence of caries and caries-associated behaviors in this sample of young adult IDUs.

Clinical Implications—Given the high level of dental disease observed in this population of young adult IDUs, one next step may be to explore the feasibility and effectiveness of providing low-intensity preventative measures (e.g., distribution of chlorhexidine rinses, xylitol gum, application of fluoride varnishes) through outreach workers.

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Keywords

Caries; drug abuse; oral health

Introduction

Non-medicinal or illicit methamphetamine use in the United States is a serious public health concern due to the high prevalence of use, the addictive nature of the drug, and the putative effects on long-term users. According to the 2007 National Survey on Drug Use and Health (NSDUH), approximately 5% of the U.S. population, or 13 million Americans, over the age of 12 years have reported ever using methamphetamine.[1] The 2009 NSDUH reports a higher number of past month methamphetamine users, and a significantly higher number of new methamphetamine users, over the previous year.[2] Another national survey from 2008 suggests an increase in the reported methamphetamine use in the high school-aged population.[3,4] The percentages of U.S. admissions to substance abuse treatment services for primary methamphetamine/amphetamine use more than doubled from 3.3 percent in 1996 to 7.5 percent in 2007. In California, methamphetamine-related admissions increased by 363% from 1992 to 2005.[5]

Studies have uncovered an association between illicit drug use and poor oral hygiene, high sugar intake, alcohol and tobacco use.[6-9] Dependence on drugs is also associated with severe social, financial, and health consequences.[10] One of the many reported adverse health effects noted with long-term methamphetamine use is severe dental caries, widely referred to as “meth mouth” in the scientific literature and in the press.[11] First reported by Shaner in 1992, “meth mouth” is described as rampant dental caries in a pattern specifically on buccal and lingual surfaces, and with widespread destruction of coronal tooth structure often presenting as residual root tips.[12] While this description of atypical caries pattern in adults is speculated to be specific to methamphetamine use, this pattern is also associated with hyposalivation secondary to radiation treatment and first reported with prolonged heroin use and in other poly-drug users.[7, 13-15] In addition to this atypical caries pattern, bruxism, attrition, and trismus have also been reported among drug users, including methamphetamine users.[16]

The etiology of dental caries secondary to prolonged drug-use and associated health behaviors has been attributed to salivary hypofunction, poor oral hygiene, and high frequency consumption of refined carbohydrates.[15] Methamphetamine use is thought to stimulate inhibitory alpha-2 receptors via the central nervous system, thus inhibiting unstimulated saliva flow.[17] However, while multiple clinical case reports and public awareness messages of “meth mouth” have been published, few epidemiologic studies have explored the relationship between methamphetamine use and clinical manifestation of secondary, atypical dental caries or tooth loss patterns in a population. Observational studies have found higher caries rates in drug users versus non-drug users, and higher tooth loss rates in methamphetamine users versus non-drug users.[7,18] Shetty and colleagues reported a statistically significant association of missing teeth with injected methamphetamine use as compared to smoking as the route of drug administration.[18] It is still not clear, however, whether high caries rate is a consequence of any injection drug use, or whether it is specific to methamphetamine use as the term “meth mouth” suggests. A recent systematic review on methamphetamine use and dental disease emphasized the need for more definitive epidemiologic studies.[19] Therefore, we conducted an exploratory pilot study to evaluate dental disease prevalence and patterns, and dental caries risk factors, among injection drug users (IDUs), comparing methamphetamine and heroin users. The caries risk factors explored included dietary practices, signs and symptoms of salivary hypofunction, and

measures of oral hygiene. This pilot study was also meant to assess the feasibility of recruiting a population of IDUs, and to determine how readily these users can be categorized by types of drugs used.

Methods

Study Population

Participants were recruited for this cross-sectional pilot oral health study using a consecutive sampling strategy (n = 58), from a larger ongoing cohort study (N = 1,445) of young adult IDUs in a clinic in the Tenderloin district in San Francisco, California. This larger parent cohort is called the U Find Out study, part 1 (UFO-1). Inclusion criteria for UFO-1 included the following: age (from 18 to 29 years old at enrollment), report of an illicit injection drug in the previous month, English speaking, and recruited by street outreach methods.[20] The participants in the parent study were interviewed and received pre-test counseling prior to being tested for Hepatitis C Virus (HCV), Hepatitis B Virus (HBV) and Human Immunodeficiency Virus (HIV) antibodies, post-test counseling and referrals if they tested positive for any of these viruses.[21] If participants tested negative for HCV, HBV, and HIV, they were followed every 3 months as part of a sub-study called UFO-3a. UFO-3a is one of several cohort studies under the parent UFO-1 study being conducted by the University of California San Francisco exploring the incidence of infection by several viruses (HBV, HCV, HIV) and temporal drug use among young adult IDUs from September 1997 to present. Participants for our oral health study were recruited from UFO-3a follow-up visits in the spring of 2007. Thus, eligibility criteria were the same as those of the UFO-1 screening study, and participants had tested negative for HCV, HIV, and HBV antibodies (as required by UFO-3a). Participants in the oral health study may have been older than 30 years because they enrolled in UFO-1 several years earlier. This oral health study was approved by the Institutional Review Boards of the University of California, San Francisco.

Variables and Measures

Data collection for this pilot study involved 1) a standardized questionnaire, administered by a trained dental student (PJ), who collected information on general oral health, dietary habits, perception of dry mouth, and oral hygiene practices; and 2) a comprehensive oral/dental examination performed by one of two dentists (KH and CS). The oral health examiners and the questionnaire administrator were blinded to the type of drug use, and sociodemographic information of each participant. The clinical examination included a caries assessment using the decayed-missing-filled-surfaces (DMFS) index.[22] The Simplified Oral Hygiene Index (S-OHI) developed by Greene and Vermillion was employed to evaluate the presence of dental plaque and overall oral hygiene. The S-OHI includes both a Debris Index and a Calculus Index measured on 6 pre-selected tooth surfaces.[23] The Debris Index and Calculus Index are classified as follows:

Debris Index:

0 If no debris is present

1 If soft debris is covering not more than one third of the tooth surface, or if extrinsic stains without other debris regardless of surface area covered is present

2 If soft debris is covering more than one third, but not more than two thirds, of the exposed tooth surface

3 If soft debris is covering more than two thirds of the exposed tooth surface

Calculus Index:

0 If no calculus is present

1 If supragingival calculus is covering not more than one third of the exposed tooth surface

2 If supragingival calculus is covering more than one third but not more than two thirds of the exposed tooth surface or if individual flecks of subgingival calculus around the cervical portion of the tooth are present

3 If supragingival calculus is covering more than two third of the exposed tooth surface or a continuous heavy band of subgingival calculus around the cervical portion of the tooth is pres

The S-OHI is the sum of the Debris Index and Calculus Index divided by 6, and ranges from 0 to 6. The S-OHI can be further categorized as:

- Good: If the score ranges from 0 to 1.2
- Fair: If the score ranges from 1.3 to 3
- Poor: If the score ranges from 3.1 to 6

One dentist (CS) trained the other dentist (KH) in the use of the various oral health indices, and a calibration exercise was performed for the caries and oral hygiene indices on two participants. Inter-examiner agreement was ≥ 80% for the caries component of the DMFS and for the S-OHI. Furthermore, inter-examiner variability for the overall study was minimal because the majority of oral examinations (43 or 74%) were performed by one dentist (KH).

Non-oral health data were obtained from the parent study protocols (both UFO-1 for baseline characteristics, and UFO-3a for follow-up data). All UFO data were collected by trained, calibrated UFO study personnel using standardized survey instruments. The follow-data collected as part of UFO-3a were usually collected on the same day or within a week of the oral health data.

Statistical Analysis

The chi-square test was used to compare a range of socio-demographic characteristics between the participants in the present study and the broader UFO-3a cohort from which they were recruited to assess whether our sub-sample was representative of the broader cohort.

Sample characteristics were summarized using proportions. Participants were categorized by the injection drug they had used predominantly or injected the most times in the past month. The group termed “Meth” users consisted of users of predominantly methamphetamine, and “Heroin” of users of predominantly heroin. The UFO studies track cessation and relapse among their participants who are all IDUs.[24] The UFO survey instruments used to capture drug use patterns were designed by the UFO studies group, and have been in use for over 12 years. Nearly one out of every 3 cohort participants for both UFO1 and UFO3a studies report methamphetamines/speed as a drug used most days. Unlike drug use surveys cited in other referenced dental literature, this survey does not assess “addiction severity” as its main outcome, but exposure to drugs, including dose, frequency, and duration. Longitudinal data from UFO studies reveal a very high correlation between drug used most days at baseline and drug used most days at subsequent visits, with a correlation coefficient $r = 0.70$, ($p < 0.001$).[24] Therefore, drug of choice in the past month is a good indicator of drug of choice over time in this study.

Contingency table analyses and the Fisher's Exact tests were used to compare specific drug use characteristics, dietary practices, dry mouth symptoms, measures of oral hygiene, reported use of dental care in the past year, categorized DMFS index, number of decayed surfaces and residual roots between “Meth” and “Heroin” users. We computed median and range of the DMFS index, number of decayed surfaces, residual roots, and S-OHI, and compared “Meth” and “Heroin” users with respect to these variables using a Mann-Whitney rank-sum test.

Results

From April 17, 2007 to June 5, 2007, 58 participants were recruited at the Tenderloin Clinic in San Francisco. The majority reported using heroin as their most commonly injected drug (71% “Heroin” users), and 17 (29%) reported predominant methamphetamine use in the prior month (“Meth” users). The majority of participants among both “Meth” and “Heroin” users were male (76 and 66%), Caucasian (53 and 88%), and had graduated from high school (59 and 44%; Table 1). The participants ranged in age from 18 to 36 years, with 76% and 78% being younger than 30 years among “Meth” and “Heroin” users, respectively. More than one third in either group reported not being housed the previous night. There was no significant difference in socio-demographic characteristics between “Meth” and “Heroin” users, except with respect to race, with a higher proportion of Caucasians amongst the “Heroin” users. A comparison of socio-demographic variables between the present sub-sample and the larger cohort revealed no statistically significant difference with respect to gender ($p = 0.8$), race ($p = 0.7$), and education ($p = 0.4$), suggesting our sub-sample was representative of the larger cohort.

A large proportion of participants among both “Meth” and “Heroin” users reported using a wide variety of both injection and non-injection other drug types in the past month (Table 2). The main difference between the two groups with respect to drug use was a much higher proportion of speedball (heroin and cocaine mixed together) use (63%) and benzodiazepine (BZD) pill use (61%) among “Heroin” users compared to 29% and 13%, respectively, among ”Meth” users ($p = 0.02$ and $p = 0.001$). All “Heroin” users and 94% of “Meth” users were current tobacco smokers, with 63% of “Heroin” and 44% of “Meth” users smoking at least one pack of cigarettes per day. Half of the participants reported injection drug use for at least eight years and reported on average 2 to 3 injections per day.

About half of “Meth” users reported drinking two or more glasses of fruit juice per day and one third (29%) reported drinking five or more non-diet soft drinks per day, compared to 24% and 5%, respectively, among “Heroin” users (Table 3; $p = 0.06$ and 0.07, respectively). More than 40% in both groups reported having only one full meal (such as breakfast, lunch, or dinner) per day. “Heroin” users reported snacking more frequently, 40% snacking 6 or more times per day compared to 24% of “Meth” users (a snack is defined as a small amount of food consumed outside of regular meals). One third of “Meth” users reported having “cotton mouth” often or all the time and 35% said they needed to sip water to swallow their food (Table 3). However, there was no statistically significant difference with respect to xerostomia or clinician-observed signs of oral cavity dryness between the two groups.

About half of the participants in either group reported never or only occasionally brushing their teeth (Table 3). Nearly one third (28%) of “Heroin” users had poor oral hygiene with a S-OHI > 3 compared to none in the other group, and the association between S-OHI and type of drug predominantly used was statistically significant ($p = 0.04$). However, the median S-OHI scores were 2.08 among “Meth” and 2.33 among “Heroin” users, and a non parametric test (rank-sum) did not reveal a statistically significant difference in the S-OHI between the two groups ($p = 0.4$). Thus, while there was a significantly higher proportion of “Heroin” users categorized as having poor oral hygiene, the median S-OHI score did not differ between the 2 groups.

About half of the participants in either group had 9 or more caries, and 18% of “Meth” users had 7 or more residual roots compared to only 2% among “Heroin” users (Table 4). The median DMFS in both groups was > 20, and the mean DMFS was 28.6 among “Meth”, and 29.9 among “Heroin” users. The median number of decayed surfaces was 7 among “Meth” and 9 among “Heroin” users, while the mean number of decayed surfaces was 28.8 and 29.8,

respectively, reflecting a very skewed distribution of the number of decayed surfaces. However, there was no statistically significant difference between the two groups with respect to DMFS, number of decayed teeth, or number of residual roots. A high proportion of participants among both “Meth” and “Heroin” users reported visiting a dentist in the past year (82% and 76%, respectively).

Discussion

In this sample of 58 young adult poly-drug users recruited from a larger cohort in San Francisco we found no differences with respect to dental disease between “Meth” and “Heroin” users. However, the prevalence of dental disease of the poly-drug IDUs was strikingly high compared to the U.S. general population where the mean DMFS and number of decayed surfaces are estimated to be 13.4 and 1.7, respectively, among adults 20 to 34 years of age according to the National Health and Nutrition Examination Survey 1999–2004.[25] The mean DMFS and the mean number of decayed surfaces exceeded 28 among both “Meth” and “Heroin” users. There was also a high proportion of participants with 7 or more residual roots (18%) among “Meth” compared to “Heroin” users (2%; $p = 0.06$). However, the difference was not statistically significant, perhaps due to the lack of power to detect a difference in this small exploratory study. Almost all of the study participants were active smokers (57/58, 98%) with more than half (58%) reporting they smoked at least one pack a day. This is another strikingly high result compared to the 1999-2004 NHANES study, which estimates smoking tobacco use in 23% of the U.S. population.

Both “Meth” and “Heroin” users reported using other types of both injection and non-injection drugs at some point in the past month. This highlights the difficulty of exploring outcomes such as dental disease in relation to one type of injection drug like methamphetamine. As described in the Methods, longitudinal data from UFO studies reveal a very high correlation between drug used most days at baseline and drug used most days at subsequent visits.[24] Therefore, drug of choice in the past month is a good indicator of drug of choice over time in this study. Lambert and colleagues found more than twice the rate of methamphetamine use in rural young adults compared to their urban counterparts using national data.[26] Therefore, perhaps one way of limiting confounders such as poly-drug use when exploring the effect of methamphetamine use on oral health may be to recruit a study population from a rural setting.

Overall, the main differences detected between “Meth” and “Heroin” users was with respect to the use of BZD pills. The higher prevalence of BZD use among “Heroin” users may be attributed to a number of factors stemming around drug substitution and/or co-consumption. There is reported extra-medicinal use of BZD by IDUs, both heroin and methamphetamine users.[27] There is also reported concomitant use of BZDs by opioid addicts since both drugs are depressants and dopamine stimulants.[28] A behavioral economics analysis report suggests that supply-side economics may also be a factor. Chalmers and colleagues reported that heroin-dependent drug users with a hypothetical fixed drug budget would substitute pharmaceutical opioids, BZDs and methamphetamine when the hypothetical price of heroin increased; however, there was weak hypothetical substitution of other drugs amongst methamphetamine-dependent drug users when the price of methamphetamine increased.[29]

The dietary practices assessed in this sample revealed high consumption of non-diet soft drinks and fruit juice, and frequent snack intakes throughout the day in both groups. IDUs had both clinical signs and symptoms of oral dryness, and reported infrequent tooth brushing, regardless of which injection drugs they used predominantly. These are all well known risk behaviors for dental caries, and are likely explanatory factors for the high prevalence of dental disease found in this population. This is consistent with other studies

that have reported high prevalence of dental disease and unmet dental needs (both patient-reported and clinically assessed) among long-time IDUs.[30, 31] Reece also found higher rates of dental caries among heroin, methadone, amphetamine, and cannabis users compared to non-users.[7]

None of the 58 participants chose to follow-up for dental care at the Native American Health Center in San Francisco after the examination and disclosure of their oral health status despite high caries rates and the presence of fractured teeth and residual roots, even though they were given a voucher to receive an exam, dental cleaning and urgent care if needed. This suggests that active drug users perceived dental need may not equate with their actual oral health status. It also eludes to the challenges faced by public health professionals and community leaders in developing strategies to effectively prevent and manage dental disease in this population through effective preventative strategies. Also, clinicians should consider all types of drug use when they suspect “meth mouth”, and probe previous and present substance use with their patients in a culturally competent manner.

Conclusion

In conclusion, this study was successful in recruiting active and long-term methamphetamine, and heroin users for the purpose of investigating oral disease. It is the first to employ established oral health clinical indices to measure dental disease prevalence and co-variates in such a cohort utilizing trained and calibrated dental professionals. Furthermore, it provides valuable information regarding the pattern and variety of drug use among young adult users with injection exposure in an urban setting. Lessons learned from this exploratory study suggest a large sample size, a more elaborate sampling strategy, and comprehensive query of types of drugs used may be needed to detect an association between any specific drug used and dental disease. This may require consideration of rural settings where methamphetamine use may be more prevalent or exclusively used. Meanwhile, given the high level of dental disease observed in this population of young poly-drug users, one next step may be to explore the feasibility and effectiveness of low-intensity preventative measures for this population (e.g., distribution of chlorhexidine rinses, xylitol gum, application of fluoride varnishes). Furthermore, oral health education and low-intensity intervention at service-provision sites and outreach workers may help engage disenfranchised drug-users to accept selected strategies to prevent dental disease.

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Table 1

Socio-Demographic characteristics among 58 young poly-drug users participating in the UFO study in San Francisco by predominant type of injection drug used ("Meth" and "Heroin" users)

Characteristics	"Meth" users (N = 17) n (%)*	"Heroin" users (N = 41) n (%)*	*P-value*†
Race			
Caucasian	9 (53)	35 (88)	
Native American	2 (12)	1 (3)	
Latino	2 (12)	0 (0)	
African American	1 (6)	0 (0)	
Asian	0 (0)	1 (3)	
Other/mixed	3 (18)	3 (8)	0.01
Age (years)			
18-24	6 (35)	16 (39)	
25-29	7 (41)	16 (39)	
30 and older	4 (24)	9 (22)	1.0
Gender			
Male	13 (76)	27 (66)	
Female	3 (18)	13 (32)	
Trans-gender	1 (6)	1 (2)	0.4
Education			
No high school (< 9 years of schooling)	1 (6)	8 (20)	
Some high school	6 (35)	15 (37)	
High school graduate	8 (47)	13 (32)	
Some college education	2 (12)	5 (12)	0.6
Main type of Accommodation in last 3 months‡			
Housing	10 (63)	20 (49)	
Street	6 (37)	19 (46)	
Detention	0 (0)	2 (5)	0.7
Main source of income in last 3 months¶			
Job(s)	2 (14)	3 (7)	
Government aided income	0 (0)	3 (7)	
Family/friends/Partner	0 (0)	2 (5)	
Illegal source	2 (14)	10 (24)	
Multiple Income sources	10 (71)	22 (54)	
No income	0 (0)	1 (2)	0.8

*Column count for each characteristic may not add up to total column count due to missing values; column percent may not add up to 100 due to rounding.

†P-value for a 2-sided Fisher's exact test.

‡"Housing" includes Own apartment, Home of parents/relatives/Home of Friends/Halfway House/Foster Home/Group Home, Hotel/Motel/ Boarding House & Shelter; "Street" includes squat, park & street/under freeway/doorway/vehicle;

¶"Government aided" sources include SSI/Disability/VA, GA/Welfare/Food stamps/AFDC/Unemployment benefits. "Illegal" sources include panhandling, Selling drugs, Selling Sex and Stealing.

Table 2

Drug use characteristics and cigarette smoking among 58 young poly-drug users participating in the UFO study in San Francisco by predominant type of injection drug used ("Meth" and "Heroin" users)

Drug-Use Characteristics	"Meth" users (N = 17)	"Heroin" users (N = 41)	
Types of other drugs used	**n (%)***	**n (%)***	***P*-value†**
Other injected drugs used in the last 30 days			
Cocaine	2 (12)	9 (22)	0.5
Crack	5 (31)	16 (41)	0.6
Speedballs (Heroin & Cocaine)	5 (29)	26 (63)	0.02
Goofballs (Heroin & Speed)	6 (35)	5 (12)	0.06
Other	1 (7)	3 (10)	1.00
Non-injected drugs used in the last 30 days‡			
Marijuana	10 (77)	19 (61)	0.5
Hallucinogens	5 (29)	8 (20)	0.5
Ketamine/Viagra/"Poppers"	2 (15)	1 (4)	0.2
Opioid pills	8 (50)	25 (61)	0.6
Benzodiapine pills	2 (13)	25 (61)	0.001
Non-injection crack	8 (53)	31 (79)	0.09
Non-injection powder cocaine	2 (13)	5 (13)	1.00
Alcohol	13 (76)	28 (68)	0.8
Tobacco smoking			
Current use	16 (94)	41 (100)	0.3
Number of cigarettes per day			
< 20	9 (56)	15 (37)	
20-30	6 (38)	23 (56)	
> 30	1 (6)	3 (7)	0.3
Drug-use history	Median [range]	Median [range]	*P*-value¶
Median # of years of injecting	9.4 [0.4-16]	8 [0.1-17]	0.7
# injections/day in last 30 days	2 [0-4]	2.5 [0-15]	0.4
# of days drugs injected in last 30 days	7.5 [0-30]	20 [0-30]	0.2

*Column percents do not add up to 100 because categories are not mutually exclusive

†P-value for a 2-sided Fisher's exact test.

‡Hallucinogens refers to a broad class of pharmacologic agents, including but not limited to LSD and mescaline. "Poppers" refer to the use of alkyl nitrates, most commonly through insufflation.

¶P-value for a Kruskal-Wallis test.

Table 3

Dietary practices, xerostomia, and oral hygiene among 58 young poly drug users by predominant type of injection drug used ("Meth" and "Heroin" users)

Characteristics	"Meth" users (N = 17)*	"Heroin" users (N = 41)*	
	n (%)	n (%)	*P*-value†
Dietary Practices			
Frequency of Juice Consumption (glasses/day)			
0	7 (41)	14 (34)	0.06
1	2 (12)	17 (42)	
2 or more	8 (47)	10 (24)	
Frequency of Non-Diet Soft Drink Consumption (glasses/day)			
0	4 (24)	11 (27)	0.07
1	3 (18)	16 (39)	
2-4	5 (29)	12 (29)	
5 or more	5 (29)	2 (5)	
Frequency of Meal‡Consumption (# meals/day)			
0	1 (6)	2 (5)	0.7
1	6 (35)	18 (45)	
2	6 (35)	15 (38)	
3 or more	4 (24)	5 (13)	
Frequency of Snack‡Consumption (snacks/day)			
1-2	6 (35)	6 (15)	0.25
3-5	7 (41)	18 (45)	
6 or more	4 (24)	16 (40)	
Clinician-Observed Signs of Oral Cavity Dryness			
Absence of pooled saliva	1 (6)	7 (17)	0.4
Dry/sticky oral mucosa	5 (29)	16 (39)	0.5
Oral mucosa erythema/tongue papillary atrophy	3 (18)	15 (37)	0.2
Symptoms of dry mouth (xerostomia– Fox Index)			
Need to sip on water/liquid to swallow food	6 (35)	22 (54)	0.3
Complaints of dryness while eating a meal	3 (18)	6(15)	1.0
Difficulty in swallowing dry foods (e.g., crackers)	4 (24)	11(27)	1.0
Perception of Amount of Saliva in the mouth			
Too much	1 (6)	5 (12)	0.9
Too little	2 (12)	3 (7)	
Didn't Notice	11 (65)	27 (66)	
Not sure	3 (18)	6 (15)	
Frequency of "cotton mouth"			
Never	2 (13)	5 (12)	0.2
Sometimes	7 (44)	27 (66)	
Often	4 (25)	7 (17)	

Characteristics	"Meth" users (N = 17)*	"Heroin" users (N = 41)*	
	n (%)	n (%)	*P*-value†
All the time	1 (6)	2 (5)	
Not sure	2 (13)	0 (0)	
Oral Hygiene			
Frequency of Brushing			
Never/Occasionally	9 (53)	19 (46)	0.1
Once/day	3 (18)	17 (41)	
Twice/day or more	5 (29)	5 (12)	
Simplified Oral Hygiene Index (S-OHI)¶			
Good (0.0 - 1.2)	2 (12)	4 (10)	0.04
Fair (1.3 - 3.0)	15 (88)	25 (63)	
Poor (3.1 - 6.0)	0 (0)	11 (28)	

*Column count for each characteristic may not add up to total column count due to missing values; column percent may not add up to 100 due to rounding

†P-value for a 2-sided Fisher's exact test.

‡A meal refers to breakfast, lunch, or dinner; a snack is defined as a small amount of food consumed outside of regular meals

¶A non parametric test (rank-sum) did not reveal a statistically significant difference in the S-OHI between the two groups ($p = 0.4$).

Table 4

Prevalence of DMFS (decayed-missing-filled surfaces), dental and root caries among 58 young poly drug users by predominant type of injection drug used ("Meth" and "Heroin" users)

DMFS and dental caries outcomes	"Meth" users (N = 17)*	"Heroin" users (N = 41)*	
Categorized Outcomes	**n (%)***	**n (%)***	***P*-value†**
DMFS			
0-8	4 (24)	9 (22)	0.1
9-16	2 (12)	8 (20)	
17-31	6 (35)	4 (10)	
≥ 32	5 (29)	20 (49)	
Decayed teeth			
0	2 (12)	5 (12)	0.9
1-4	5 (29)	11 (27)	
5-8	2 (12)	4 (10)	
≥ 9	8 (47)	21 (51)	
Residual roots			
0	9 (53)	25 (61)	0.06
1-2	4 (24)	5 (12)	
3-6	1 (6)	10 (24)	
≥ 7	3 (18)	1 (2)	
Continuous Outcomes	**Median (Range)**	**Median (Range)**	***P*-value‡**
DMFS	21 (1-136)	22 (0-140)	0.8
Decayed teeth	7 (0-115)	9 (0-92)	0.8
Residual roots	0 (0-11)	0 (0-12)	0.5

*Column count for each characteristic may not add up to total column count due to missing values; column percent may not add up to 100 due to rounding.

†P-value for a 2-sided Fisher's exact test

‡P-value for a rank-sum test.