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The Periodontal Status of Current Methamphetamine Users

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Abstract

Background—Methamphetamine use is associated with extensive dental caries. The purpose of this study was to determine the prevalence and severity of periodontal disease in a convenience sample of methamphetamine-users.

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Methods—In this cross-sectional survey, methamphetamine-using individuals were recruited using a combination of snowball sampling and street outreach techniques. Three dentists, trained and calibrated to the oral assessments used in the National Health and Nutrition Survey, measured and recorded the Attachment Loss, Probing Depth and Gingival Recession. Concomitant interviews elicited psychological, substance use, medications, and dietary habits associated with methamphetamine use.

Results—Periodontal assessments were completed on 546 adults. Over 69% were cigarette smokers and over 55% were medium-to-high methamphetamine-users. Classifying prevalence by the Centers for Disease Control and Prevention-American Academy of Periodontology definitions, cigarette smokers and medium/high methamphetamine-users had a high prevalence of periodontal disease. The defining features of the participants was being older than 30 years (average 42.2 years) and the presence of severe and moderate periodontitis.

Conclusion—This is the first study to systematically examine periodontal disease in a large population of current methamphetamine-users. Methamphetamine-users in our Los Angeles urban setting had an extremely high prevalence and severity of destructive periodontal disease. The frequency of methamphetamine use had a minimal impact on the severity of periodontal disease.

Keywords

Epidemiology; Dental Public Health; Methamphetamine; Periodontitis

INTRODUCTION

The elevated rates and unusual patterns of dental disease observed in methamphetamine (MA) users have gained notoriety in recent years. Earlier reports, including one of our studies, focused on the unusual or extensive patterns of dental caries observed in MA-users.[1–10] However, less is known on the impact of MA use on the periodontal status of MA-users. A large body of dental literature documenting the high prevalence of dental caries in addicts[11–17] suggests that the oral conditions existing in MA-users are the same deleterious conditions that are conducive to destructive periodontal disease.

Some studies focusing on oral health of injectable drug users found elevated indicators of poor periodontal health such as elevated levels of plaque, gingivitis or attachment loss.[18–20] Overall, information in the dental literature documenting the high prevalence of periodontal disease among drug users suggests that MA use could be associated with increased periodontal disease.

In 2012 the National Survey on Drug Use and Health (NSDUH) estimated that 0.4%, or 1.2 million people, reported using MA during the past year.[21] The alarming part is that use starts as early as 8th grade and by 12th grade 1.2% have used it over their young lifetime. Between the ages of 18 to 25, 3.3% are lifetime users, increasing to 6.4% over 26 years of age.[22] When these small percentages are translated into millions, the dental profession will be overwhelmed with adults needing extensive restorations and rehabilitation of the dentition and supporting periodontium.

The purpose of this study was to determine the prevalence and severity of periodontal disease in a convenience sample of MA-users. We also wanted to explore the disease patterns or distribution in MA subgroups with regards to sociodemographics, MA use patterns, HIV status, smoking habits and other behavioral variables. We hypothesize that the high risk caries factors that exist in MA-users are the high risk oral conditions that contribute to destructive periodontal disease.

METHODS

This cross-sectional survey was conducted in Los Angeles County, a populous urban area beset with high rates of MA-use.[23,24] Between February 9, 2011 and August 26, 2013, 571 MA-users recruited from local communities underwent comprehensive oral examinations and psychosocial assessments. The examinations and assessments were conducted at dental clinics associated with two large community health centers: a) the AIDS Project Los Angeles center that primarily serves a sociodemographically diverse group of individuals with HIV/AIDS, and b) the Mission Community Hospital in the San Fernando Valley that caters to a large, underserved migrant population. The study sites were chosen to provide access to a diverse cohort of Angelenos with a broad range of MA use behaviors.[25]

Participants were recruited using a combination of snowball sampling and street outreach (e.g., posting flyers within the community, distributing advertising matchboxes in bars and restaurants), Craigslist postings, newspaper advertisements, referrals from local drug treatment centers, and word of mouth.[26] Inclusion criteria were being 18 years of age or older, speaking either English or Spanish, having used MA in the past 30 days, able to undergo a detailed dental exam and psychosocial assessments, and willing to provide a urine sample. Of the 1,793 potential participants who contacted the research team, 1,120 passed the initial phone screening for MA use, 576 met the eligibility criteria for MA use in the past 30 days and enrolled in the study, and 571 completed all the eligibility criteria. Nineteen of the 571 were completely edentulous and six more were excluded because they were edentulous in randomly selected quadrants for their half-mouth examination, resulting in a sample size of 546 dentate participants with periodontal assessments. Priority was given to medium and high use MA-users in order to reach the required sample size while controlling for confounding variables (age, sex, drug use) through matching or other statistical adjustments. The informed consent process and the assessments were accomplished according to procedures reviewed and approved by the UCLA Institutional Review Board (#10-000976). A Federal Certificate of Confidentiality ensured unconditional confidentiality to the interviews, thus minimizing participant concerns regarding the disclosure of sensitive drug-use behaviors. All participants consented in writing prior to their psychosocial interview and dental examination. Each participant received $60 as recompense for taking part in the study.[25]

Prior to the periodontal assessment, a soft tissue examination was conducted and any lesions or abnormalities were noted. To maximize comparability with national datasets, periodontal assessments adhered to the National Health and Nutrition Examinations Survey (NHANES) examination protocols, described in greater detail elsewhere.[27] Gingival recession (GR) was measured in millimeters from the free gingival margin (FGM) to the cemento-enamel

junction (CEJ). Probing depth (PD) was measured from the FGM to the base of the gingival sulcus.

Attachment loss (AL) was calculated from the difference in PD and GR or from the CEJ to the base of the sulcus. Any measurements between the gradations on the periodontal probe (PCP2 probe) were rounded down to avoid over estimation. Bleeding on probing (BOP) was also recorded. Gingival recession and probing depth measures were made at four sites per tooth (third molars excluded), specifically the disto-facial (DF), mid-facial (B), mesio-facial (MF), and the disto-lingual (DL) sites in randomly selected half mouth examinations. An algorithm calculated loss of attachment from the information on gingival recession and probing depth. All of the examinations were conducted in a dental operatory with adequate light and air using appropriate protective barriers.

All periodontal assessments were conducted by three trained and calibrated dentists. The training and calibration sessions were conducted by the national reference examiner for the NHANES (BD). A resident dental epidemiologist (VWS; first author) provided ongoing quality assurance, monitoring the dentists on a monthly basis, evaluating their assessments by performing duplicate assessments in approximately 9% of the participants (n = 49) and remediating any drift from the criteria throughout the duration of the examination period. The Kappa values for inter-examiner variability were 0.88 for attachment loss, 0.80 for pocket depth, and 0.89 for gingival recession. Interclass correlation coefficients were 0.88 for AL, 0.80 for PD and 0.89 for GR. Additional details describing the overall oral health examination as it relates to quality assurance is available elsewhere.[28]

Periodontal disease status was assessed using the case definitions recommended for periodontitis surveillance by the CDC Periodontitis Workgroup, appointed by the Centers for Disease Control and Prevention and the American Academy of Periodontology (CDC-AAP).[29,30] The CDC-AAP case definitions require information from two interproximal sites (DF, MF, ML [mesio-lingual], and/or DL) and are not dependent upon the presence of an adjacent tooth. *Severe Periodontitis* was defined as the presence of two or more interproximal sites with AL ≥6 mm (not on the same tooth) and one or more interproximal sites(s) with ≥5 mm PD. *Moderate periodontitis* was defined as two or more interproximal sites with ≥4 mm clinical AL (not on the same tooth) or two or more interproximal sites with PD ≥5 mm (not on the same tooth). *Mild periodontitis* was defined as two or more interproximal sites with AL ≥3 mm and ≥2 interproximal sites with PD ≥4 mm (not on the same tooth) or one site with PD ≥5 mm. Although a participant may have periodontal conditions that cover two or more of the CDC-AAP classifications, each participant is classified exclusively and based on the most advanced disease status.

Participants also completed a set of interviewer-facilitated questionnaires covering various psychological, substance-use, medications, and dietary attributes linked to the development of dental and periodontal disease. Participants were stratified based on their self-reported history and patterns of MA use (frequency, and duration of use). At the time of screening participants who indicated that they had used methamphetamine for less than 10 days of the past 30 days were classified as being “light” MA use. Participants who used MA 10 to 15 days over the past 30 days were classified as “moderate” users. “Heavy” use was defined as

16 or more days over the past 30 days. Moderate and heavy users were grouped together for data analysis purposes as “moderate+” users.

Software analysis (SAS, Version 9.3; SAS Institute Inc., Cary, NC, USA) was used for data analysis and data management. Descriptive statistics focused on the prevalence and severity of AL, PD and GR and classification of periodontal disease by demographic and behavioral variables (independent variables). Pearson correlation coefficients were calculated for each of the independent variables against the dependent variables. Multiple linear regressions were used for examining AL, PD, GR by independent variables. All independent variables were used in multiple regression analysis (method of ordinary least squares). Collinear variables from the correlational analysis were excluded from the regression analysis. Additionally, quantile-quantile plots and residual analysis to check for normality (PD, AL, GR) and regression line were performed.

RESULTS

Periodontal assessments were presented on 546 dentate participants. Table 1 summarizes the sociodemographic profile and substance-use habits of the study participants. The study group consisted of a majority of African–American men, 30 years of age or older, who graduated from high school, with another third reporting education beyond high school, and over two-thirds being current cigarette smokers. More than half were medium/high MA-users. The severity of periodontal disease and the prevalence of periodontal disease by selected threshold values is presented in Table 2. The pattern of disease was similar to the distribution of disease in a national sample. This was also true when the values were shown by specific cutoff points. Differences between African-Americans and Hispanics were statistically significant ($p < 0.05$). Current cigarette smokers had clinically significant higher AL scores than those who had never smoked. However, there were no significant differences among methamphetamine-users whether medium/high or light. The severity of PD scores showed a similar pattern to the AL scores.

The prevalence of periodontitis is presented by the definitions of the CDC-AAP by selected variables in Table 3. Overall, the prevalence of *mild periodontitis* was 6.0% (SE 1.0%), *moderate periodontitis* was 54.8% (SE 2.1%) and *severe periodontitis* was 22.9% (SE 1.8%). All three levels of periodontitis followed the same patterns of prevalence by sex, education, smoking history and methamphetamine use except for race/ethnicity. Methamphetamine-users over 30 years of age had a higher prevalence of moderate and severe periodontitis than participants less than 30 years of age. Among light MA-users, 8.3% (SE 1.8%) had mild periodontitis, 51.7% (SE 3.2%) had moderate periodontitis and 19.8% (SE 2.6%) had severe periodontitis. Approximately, 4.3% (SE 1.2%) of medium/high MA-users had mild periodontitis, 57.7% (SE 2.8%) had moderate periodontitis and 25.3% (SE 2.5%) had severe periodontitis.

In order to minimize collinearity, Pearson correlation coefficients were done on the three measures of periodontal destruction (AL, PD, GR) and variables that have been shown previously to be of clinical significance (see Table 4). In addition, correlations were done between mean attachment loss and mean PD, mean GR, number of PD sites greater than 4

mm, and number of PD sites greater than 4 mm with bleeding on probing (BOP). Highly significant ($p<0.001$) correlations were found between attachment loss and the following demographic variables: ≥ 30 years of age, current cigarette smoking and being Hispanic. The correlational analysis also identified soda consumption within the last 30 days and being African-American as significant at the $p<0.05$ levels. Tooth brushing 1–3 times per day, oral lesions and high methamphetamine use were not significant for attachment loss.

Table 4 displays a variable specific analysis, using simple linear regression. Severe periodontitis made a stronger contribution to the parameter estimate than moderate periodontitis. Although age was significant, the group ≥30 years had a stronger influence on the parameter estimate. Among ethnicity, when Whites were used as the reference group, Hispanics had a negative coefficient (−0.30) that was significant ($p<0.05$). When Hispanics were used as the reference group, Whites ($p<0.05$) and African-Americans ($p<0.001$) were significant. Only two of the behavioral variables, soda consumption ($p<0.05$) and current cigarette smokers ($p<0.001$), were significant.

Table 5 presents the regression coefficients from multiple regression analysis. Four of the demographic variables remained significant. Severe periodontitis and moderate periodontitis were both highly significant ($p<0.001$), with severe periodontitis making the stronger contribution to the regression coefficient over moderate periodontal disease and strongest over all of the other variables. Being over 30 years of age remained highly significant ($p<0.001$). Among the racial/ethnic groups, however, Hispanics emerged as significant ($p<0.05$). The presence of lesions was significant ($p<0.05$). Out of the 546 MA-users, 71 (13%) had oral lesions. The most common was leukoplakia. Soda consumption and current cigarette smokers did not remain significant. Collectively all five significant variables accounted for 47% of the attachment loss severity (adjusted R^2 =0.4742). Both mean probing depth and mean gingival recession followed a similar pattern to attachment loss except they did not approach the level of significance of mean attachment loss.

Two other clinically relevant measures that represent the *extent* of disease are the number of probing depth sites >4mm and the number of probing depth sites >4mm with bleeding on probing (BOP). A natural log transformation was done on both of these measurements in order to meet the conditions for linear regression. For the number of PD sites >4mm, only four variables were significant. Severe periodontal disease, moderate periodontal disease and being Hispanic were all highly significant ($p<0.001$). Being African-Americans and the Other racial/ethnic group were significant at the $p<0.05$ level. Also, being HIV-positive was significant at $p<0.05$. High MA use was also significant ($p<0.05$). Severe and moderate periodontal disease contributed heavily to the regression coefficient. The adjusted R^2 for the number of PD sites >4 mm was 0.4833.

The number of probing depth sites >4mm with bleeding on probing (BOP) also had five variables that contributed to the regression coefficient significantly. Severe periodontitis, moderate periodontitis and being Hispanic were highly significant ($p<0.001$). Being HIV-positive ($p<0.05$) and belonging to the Other racial/ethnic group ($p<0.05$) were also significant.

DISCUSSION

The most salient findings of our cross sectional survey of methamphetamine-users over 30 years of age was an extremely high severity and prevalence of severe and moderate periodontitis. In a comparably aged group in the 1999–2004 NHANES, 5% of the population had moderate to severe periodontitis.[27] Our study had a prevalence that ranged from 56% to 23% for moderate to severe periodontitits. The average severity of attachment loss for the same age group in NHANES was 0.73 mm of AL.[27] Our study had an average severity of 2.8 mm of AL for adults over 30 years of age. Cigarette smokers had a higher proportion of medium to high MA-users, however cigarette smokers were not significant in the linear regression. Among racial/ethnic groups, African-Americans had the highest prevalence when classified as mild, moderate and severe periodontitis.

Also, based on correlational analysis, soda consumption, oral lesions and cigarette smokers were strongly associated with severe periodontitis in MA-users suggesting that they contributed to the mild, moderate and severe classifications of periodontitis. Cigarette smoking is a major risk factor in periodontal disease[31] and in this study it clearly contributes to the periodontal disease in high MA-users. High frequency of MA use had a minimal effect on severe periodontal disease. Clague et al. added the dimension of duration to frequency in this same population, and made a similar observation.[32] This is more likely based on age and behavioral risk factors like cigarette smoking, soda consumption and tooth brushing frequency that contribute to periodontal status than MA use itself. The same rationale would apply to non-MA-users with periodontal problems, except that MA-users have sustained these detrimental behaviors for longer durations.

Shetty et al. made the case for the high level of dental caries experience in the same urban sample reported in this paper.[25] The high level of destructive periodontal disease observed in this study fulfills the assumption of our hypothesis, i.e., the high risk caries factors that exist in MA-users are the high risk oral conditions that contribute to destructive periodontal disease. The Shetty et al. study presented the high prevalence of destructive periodontal disease, but this is the first paper in the dental literature to present the severity of periodontal disease in metamphetamine-users in this large of a sample. Rommel et al. also found high levels of dental caries and periodontal disease in crystal meth-users.[11] In the U.S. population, African-Americans have consistently had a high severity and prevalence of periodontal disease.[27,33] Murphy et al., was the first to show a significant association between MA use and sugared soda consumption.[34]

One of the limitations of the study is the use of a convenience sample that limits the generalizability of the results. It also encourages self-selection, even though there was an overwhelming word of mouth current among the participants. Having a large sample size tends to decrease this limitation. Also, examining only four sites per tooth in randomly selected half mouth examinations seriously underestimates the standard of six sites per tooth for the entire dentition. Partial mouth protocols can underestimate the prevalence of periodontitis by as much as 50%.[35] The implication of these underestimates suggest that the high prevalence and severity of periodontal disease observed in our MA population are very likely to be higher than our clinical findings. Even though many of the independent

behavioral variables were not significant, they still need to be included in future studies to bring about a better understanding of their roles in the disease process, especially the provision of dental services.

The clinical relevance of this study is that a methamphetamine-user can be in a high-risk category for periodontal disease and, therefore, it's essential to manage these patients expeditiously. This should be reflected in treatment protocols developed and published for the management of periodontal disease. It should also be incorporated into the education protocols for dental students encountering periodontal cases in their teaching clinics. This is especially the case in clinics for under-served populatons where this health problem is more likely to be prevalent.

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References

1. Murakawa N. Toothless: the methamphetamine "epidemic," "meth mouth," and the racial construction of drug scares. Du Bois Review. 2011; 8:219–28.
2. Shetty V, Mooney LJ, Zigler CM, et al. The relationship between methamphetamine use and increased dental disease. J Am Dent Assoc. 2010; 141(3):307–18. [PubMed: 20194387]
3. Shaner JW, Kimmes N, Saini T, Edwards P. "Meth mouth": rampant caries in methamphetamine abusers. AIDS Patient Care STDs. 2006; 20(3):146–50. [PubMed: 16548711]
4. Diago S. When your patient is an addict. AGD Impact. 2003; 33:12–16.
5. Nixon PJ, Youngson CC, Beese A. Tooth surface loss: does recreational drug use contribute? Clin Oral Investig. 2002; 6(2):128–30.
6. Milosevic A, Agrawal N, Redfearn P, Mair L. The occurrence of toothwear in users of Ecstasy (3,4-methylenedioxymethamphetamine). Community Dent Oral Epidemiol. 1999; 27(4):283–287. [PubMed: 10403088]
7. Howe AM. Methamphetamine and childhood and adolescent caries. Aust Dent J. 1995; 40(5):340.
8. Duxbury AJ. Ecstasy--dental implications. Br Dent J. 1993; 175(1):38. [PubMed: 8101450]
9. Lee CY, Heffez LB, Mohammadi H. Crystal methamphetamine abuse: a concern to oral and maxillofacial surgeons. J Oral Maxillofac Surg. 1992; 50(10):1052–54. [PubMed: 1527658]
10. Di Cugno F, Perec CJ, Tocci AA. Salivary secretion and dental caries experience in drug addicts. Arch Oral Biol. 1981; 26(5):363–67. [PubMed: 6947736]
11. Rommel N, Rohleder NH, Wagenpfeil S, et al. The impact of the new scene drug "crystal meth" on oral health: a case-control study. Clin Oral Investig. 2016; 20(3):469–475.
12. Turkyilmaz I. Oral manifestations of "meth mouth": a case report. J Contemp Dent Pract. 2010; 11(1):E073–80.
13. Padilla R, Ritter AV. Meth mouth: methamphetamine and oral health. J Esthet Restor Dent. 2008; 20(2):148–49. [PubMed: 18380848]

14. Goodchild JH, Donaldson M, Mangini DJ. Methamphetamine abuse and the impact on dental health. Dent Today. 2007; 26(5):124, 126, 128–131. quiz 131.
15. Mallatt ME. Meth mouth: a national scourge. J Indiana Dent Assoc. 2005; 84(3):28–29. [PubMed: 16359093]
16. Rhodus NL, Little JW. Methamphetamine abuse and “meth mouth.”. Northwest Dent. 2005; 84(5): 29, 31, 33–37.
17. Shaner JW. Caries associated with methamphetamine abuse. J Michigan Dent Assoc. 2002; 84(9): 42–47.
18. Molendijk B, ter Horsts G, Kasbergen M, Truin GJ, Mulder J. Dental health in Dutch drug addicts. Community Dent Oral Epidemiol. 1996; 24(2):117–19. [PubMed: 8654031]
19. Angelillo IF, Grasso GM, Sagliocco G, Villari P, D’Errico MM. Dental health in a group of drug addicts in Italy. Community Dent Oral Epidemiol. 1991; 19(1):36–37. [PubMed: 2019088]
20. Scheutz F. Dental health in a group of drug addicts attending an addiction-clinic. Community Dent Oral Epidemiol. 1984; 12(1):23–28. [PubMed: 6583038]
21. National Institute on Drug Abuse. [Accessed February 27, 2017] What is the scope of methamphetamine abuse in the United States?. 2013. https://www.drugabuse.gov/publications/research-reports/methamphetamine/what-scoope-methamphetamine-abuse-in-united-states
22. National Institute on Drug Abuse. [Accessed February 27, 2017] Methamphetamine. 2012. https://www.drugabuse.gov/drugs-abuse/methamphetamine
23. Brecht, M-L. National Institute on Drug Abuse. [Accessed July 27, 2016] Drug abuse patterns and trends in Los Angeles County – Update. Jan. 2014 Available at: http://www.drugabuse.gov/about-nida/organization/workgroups-interest-groups-consortia/community-epidemiology-work-group-cewg/highlights-summaries-january-2014-reports/los-angeles-county-california
24. Office of Health Assessment & Epidemiology, Los Angeles County Department of Public Health. [Accessed July 27, 2016] Methamphetamine Use in Los Angeles County Adults. L.A. Health. Oct. 2006 Available at: http://lapublichealth.org/wwwfiles/ph/hae/ha/Meth05.pdf
25. Shetty V, Harrell L, Murphy DA, et al. Dental disease patterns in methamphetamine users: Findings in a large urban sample. J Am Dent Assoc. 2015; 146(12):875–85. [PubMed: 26610832]
26. Atkinson R, Flint J. Accessing hidden and hard-to-reach populations: snowball research strategies. Soc Res Update. 2001; 44:307–17.
27. Dye BA, Tan S, Smith V, et al. Trends in oral health status: United States, 1988–1994 and 1999–2004. National Center for Health Statistics. Vital Health Stat. 2007; 11(248)
28. Dye BA, Harrell L, Murphy DA, Belin T, Shetty V. Performance of a quality assurance program for assessing dental health in methamphetamine users. BMC Oral Health. 2015; 15:76.doi: 10.1186/s12903-015-0057z [PubMed: 26143495]
29. Page RC, Eke PI. Case definition for use in population-based surveillance of periodontitis. J Periodontol. 2007; 78(7 Suppl):1387–99. [PubMed: 17608611]
30. Eke PI, Page RC, Wei L, Thornton-Evans G, Genco RJ. Update of the case definitions for population-based surveillance of periodontitis. J Periodontol. 2012; 83(12):1449–54. [PubMed: 22420873]
31. Albandar JM, Streckfus CF, Adesanya MR, Winn DM. Cigar, pipe, and cigarette smoking as risk factors for periodontal disease and tooth loss. J Periodontol. 2000; 71(12):1874–81. [PubMed: 11156044]
32. Clague J, Belin TR, Shetty V. Mechanisms underlying methampthetamine-related dental disease. J Am Dent Assoc. 2017; 148(6):377–86. [PubMed: 28457476]
33. Eke PI, Dye BA, Wei L, Thornton-Evans GO, Genco RJ. Prevalence of periodontitis in adults in the United States: 2009 and 2010. J Dent Res. 2012; 91(10):914–20. [PubMed: 22935673]
34. Murphy DA, Harrell L, Fintzy R, Vitero S, Gutierrez A, Shetty V. Soda consumption among methamphetamine users in the USA: impact on oral health. Oral Health Prev Dent. 2016; 14(3): 227–34. [PubMed: 26870851]
35. Eke PI, Thornton-Evans GO, Wei L, Borgnakke WS, Dye BA. Accuracy of NHANES periodontal examination protocols. J Dent Res. 2010; 89(11):1208–13. [PubMed: 20858782]

Practical Implications

A methamphetamine-user can be at high-risk for periodontal disease. Knowing that behavioral factors, such as smoking and consuming sugary beverages, are more important than methamphetamine use will assist the clinician in managing the treatment of the methamphetamine-user.

Table 1

Description of 571 Methamphetamine Users

	n	%
Age[a]		
<30 years	48	8.4%
≥ 30 years	523	91.6%
Sex		
Male	460	80.6%
Female	111	19.4%
Race/ethnicity		
Hispanic	178	31.2%
African-Americans	241	42.2%
White	109	19.1%
Other	43	7.5%
Education		
Less than High School	170	29.8%
High School Graduate	201	35.2%
More than High School	200	35.2%
Smoking History		
Current smoker	392	68.9%
Former smoker	54	9.6%
Never smoked	124	21.5%
Methamphetamine Use		
Light	253	44.4%
Medium / High	318	55.6%

[a]Average age was 44.2 (SE 0.4) ranging from 19 to 79 years of age.

Table 2

Indices of Periodontal Disease Severity: Attachment Loss, Probing Depth and Gingival Recession, and the Prevalence (SE) of Periodontal Disease by Selected Attachment Loss and Probing Depth Cutoff Points, for Demographic, Smoking and Methamphetamine Use.

		Attachment Loss (AL)					
Variables		**millimeter**		**AL ≥ 4 mm.**		**AL ≥ 6 mm.**	
	n	**mean**	**SE**	**%**	**SE**	**%**	**SE**
Age							
<30 years	48	1.61	0.08	60.4%	7.1%	12.5%	4.8%
≥ 30 years	498	2.77	0.05	90.2%	1.3%	52.0%	1.3%
Sex							
Male	441	2.62	0.051	88.7%	1.5%	49.0%	2.4%
Female	105	2.70	0.140	82.9%	3.7%	46.7%	4.9%
Race/ethnicity							
Hispanic	174	2.37	0.072	86.2%	2.6%	39.7%	3.7%
African-Americans	233	2.81	0.077	91.0%	1.9%	57.1%	3.2%
White	102	2.70	0.120	84.3%	3.6%	43.1%	4.9%
Other	37	2.77	0.220	81.1%	6.5%	51.4%	8.3%
Education							
< High School	159	2.71	0.093	90.6%	2.3%	55.3%	4.0%
High School	194	2.67	0.082	87.1%	2.4%	45.9%	3.6%
> High School	193	2.54	0.081	85.5%	2.5%	45.6%	3.6%
Smoking History							
Current smoker	372	2.79	0.060	88.7%	1.6%	54.0%	2.6%
Former smoker	52	2.29	0.120	88.5%	4.5%	38.5%	6.8%
Never smoked	121	2.32	0.100	83.5%	3.4%	35.5%	4.4%
Methamphetamine Use							
Light	242	2.58	0.073	82.6%	2.4%	40.1%	3.2%
Medium / High	304	2.71	0.066	91.4%	1.6%	55.3%	2.9%
Total	546	2.66	0.049	87.5%	1.4%	48.5%	2.1%

	Probing Depth (PD)		
	millimeter	**PD ≥ 5 mm.**	**PD ≥ 7 mm.**

Variables	Attachment Loss (AL)						
		millimeter		AL ≥ 4 mm.		AL ≥ 6 mm.	
	n	**mean**	**SE**	**%**	**SE**	**%**	**SE**
	n	mean	SE	%	SE	%	SE
Age							
<30 years	48	2.09	0.07	20.8%	5.9%	2.1%	2.1%
≥ 30 years	498	2.41	0.03	43.6%	2.2%	6.6%	1.1%
Sex							
Male	441	2.38	0.026	42.4%	2.4%	5.9%	1.1%
Female	105	2.40	0.068	38.1%	4.8%	7.6%	2.6%
Race/ethnicity							
Hispanic	174	2.37	0.042	43.7%	3.8%	4.6%	1.6%
African-Americans	233	2.47	0.038	46.4%	3.8%	7.7%	1.8%
White	102	2.23	0.061	30.4%	4.6%	5.9%	2.3%
Other	37	2.40	0.091	37.8%	8.1%	5.4%	3.8%
Education							
< High School	159	2.43	0.047	42.8%	3.9%	6.9%	2.0%
High School	194	2.42	0.042	43.8%	3.6%	6.2%	1.7%
> High School	193	2.31	0.040	38.3%	3.5%	5.7%	1.7%
Smoking History							
Current smoker	372	2.44	0.031	43.5%	2.6%	7.3%	1.3%
Former smoker	52	2.23	0.071	36.5%	6.7%	1.9%	1.9%
Never smoked	121	2.27	0.050	37.2%	4.4%	5.0%	2.0%
Methamphetamine Use							
Light	242	2.33	0.037	39.7%	3.2%	7.9%	1.7%
Medium / High	304	2.43	0.033	43.1%	2.8%	4.9%	1.2%
Total	546	2.38	0.025	41.6%	2.1%	6.2%	1.0%

	Gingival Recession *		
	millimeter		
	n	mean	SE
Age			

Variables		Attachment Loss (AL) millimeter		AL ≥ 4 mm.		AL ≥ 6 mm.	
	n	mean	SE	%	SE	%	SE
<30 years	48	+0.53	0.07				
≥ 30 years	498	−0.33	0.04				
Sex							
Male	441	−0.24	0.040				
Female	105	−0.30	0.110				
Race/ethnicity							
Hispanic	174	−0.002	0.053				
African-Americans	233	−0.34	0.061				
White	102	−0.44	0.093				
Other	37	−0.36	0.180				
Education							
< High School	159	−0.28	0.074				
High School	194	−0.25	0.063				
> High School	193	−0.24	0.063				
Smoking History							
Current smoker	372	−0.35	0.048				
Former smoker	52	−0.06	0.082				
Never smoked	121	−0.05	0.077				
Methamphetamine Use							
Light	242	−0.26	0.055				
Medium / High	304	−0.25	0.053				
Total	546	−0.25	0.038				

*Although gingival recession calculations result in negative values, they are reported as absolute or positive values by NHANES even though they represent measurements apical to the CEJ to the gingival margin.

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Table 3

Prevalence of Periodontal Disease by CDC-AAP Definitions

Variables		Mild [a] Periodontitis		Moderate [a] Periodontitis		Severe [a] Periodontitis	
	n	%	SE	%	SE	%	SE
Age							
<30 years	48	58.3%	7.2%	31.3%	7.2%	2.1%	2.1%
≥ 30 years	498	83.1%	1.7%	55.6%	2.2%	23.1%	1.9%
Sex							
Male	441	81.6%	1.8%	54.0%	2.4%	21.1%	1.9%
Female	105	78.1%	4.1%	51.4%	4.9%	21.9%	4.1%
Race/ethnicity							
Hispanic	174	79.3%	3.1%	51.1%	3.8%	18.4%	2.9%
African-Americans	233	84.5%	2.4%	53.6%	3.3%	26.6%	2.9%
White	102	73.5%	4.4%	52.9%	4.9%	15.7%	3.6%
Other	37	86.5%	5.7%	64.9%	7.9%	16.2%	6.1%
Education							
Less than High Sch.	159	85.5%	2.7%	54.7%	4.0%	22.6%	3.3%
High School	194	78.4%	3.0%	54.1%	3.6%	23.2%	3.0%
More than High Sch.	193	79.8%	2.9%	51.8%	3.6%	18.1%	2.8%
Smoking History							
Current smoker	372	84.1%	1.9%	55.1%	2.6%	24.2%	2.2%
Former smoker	52	84.6%	5.1%	61.5%	6.8%	13.5%	4.8%
Never smoked	121	69.4%	4.2%	45.5%	4.5%	14.9%	3.2%
Methamphetamine Use							
Light	242	8.3%	2.7%	51.7%	3.2%	19.8%	2.5%
Medium / High	304	4.3%	2.1%	57.2%	2.8%	25.3%	2.4%
Total	546	6.0%	1.7%	54.8%	2.1%	22.9%	1.8%

[a]CDC-AAP case definitions [28,29]

Table 4

Regression Coefficients for Attachment Loss by Important Demographic and Behavioral Variables. [a]

Variable	Regression Coefficients	SE	p-value
Severe periodontitis	2.26	0.107	<.0001
Moderate periodontitis	0.98	0.088	<.0001
Ethnicity			
White as Reference			
Hispanic	−0.30	0.141	0.032
African-Americans	0.14	0.134	0.313
Other	0.09	0.217	0.678
Hispanic as Reference			
White	0.30	0.141	0.032
African-Americans	0.44	0.113	0.0001
Other	0.39	0.205	0.055
Age	0.05	0.005	<.0001
Age ≥ 30 years	1.18	0.166	<.0001
High School	−0.04	0.123	0.756
> High School	−0.17	0.122	0.173
Sex	−0.08	0.124	0.531
HIV	−0.08	0.112	0.504
Brush 1–3/day	−0.07	0.149	0.658
Soda consumption [b]	−0.02	0.008	0.046
Current Smoker	0.45	0.118	0.0002
Former Smoker	−0.05	0.187	0.770
Lesions	0.14	0.117	0.220
Meth High User	0.10	0.099	0.322

[a] Simple linear regression

[b] Soda with sugar consumption within the last 30 days.

Table 5

Regression Coefficients from Multiple Regression Analysis[a], Standard Errors, P-Values and Adjusted R^2 for Mean Attachment Loss

Variable	Regression Coefficient	Standard Error	95% Confidence Interval	P-value
Intercept	1.54	0.23	(1.09, 1.99)	<.0001
HIV	−0.07	0.09	(−0.23, 0.09)	0.430
Severe Periodontitis	2.11	0.11	(1.89, 2.33)	<.0001
Moderate Periodontitis	0.87	0.09	(0.69, 1.05)	<.0001
Mild or No Periodontitis	Reference			
Brush 1–3/day	−0.12	0.11	(−0.33, 0.09)	0.270
Soda consumption [b]	−0.01	0.01	(−0.02, 0.01)	0.373
High School	−0.05	0.09	(−0.22, 0.13)	0.625
More than High School	−0.08	0.09	(−0.26, 0.1)	0.400
Less than High School	Reference			
Hispanic	−0.27	0.11	(−0.48, −0.05)	0.014
African-Americans	−0.10	0.10	(−0.29, 0.09)	0.312
Other	0.03	0.16	(−0.29, 0.34)	0.877
Caucasian/White	Reference			
Current Smoker	0.12	0.09	(−0.06, 0.3)	0.185
Former Smoker	−0.16	0.14	(−0.43, 0.12)	0.260
Never Smoker	Reference			
Oral Lesions	0.19	0.09	(0.02, 0.36)	0.025
Sex	−0.04	0.09	(−0.22, 0.14)	0.669
Female	Reference			
≥ 30 years of age	0.50	0.13	(0.24, 0.76)	0.0002
MethH (High Meth use)	−0.07	0.07	(−0.21, 0.07)	0.331

Adjusted R^2 = 0.4742

[a] Ordinary least squares

[b] Soda with sugar consumption within the last 30 days.