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Original article

The Effect of Tobacco and Marijuana Use on Dental Health Status in Nevada Adolescents: A Trend Analysis

Marcia Ditmyer, Ph.D. *, Christina Demopoulos, D.D.S., Mildred McClain, Ph.D., Georgia Dounis, D.D.S., and Connie Mobley, R.D., Ph.D.

University of Nevada, Las Vegas, School of Dental Medicine, Las Vegas, Nevada

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A B S T R A C T

Purpose: Tobacco use is the leading cause of preventable death worldwide. If current trends persist, tobacco will kill more than 8 million people worldwide by 2030 and 1 billion by the end of the century. The purpose of this study was to determine trends in tobacco/marijuana use in Nevada adolescents and their effect on dental health status. Relative comparative data were compared with nationally reported data.

Methods: Retrospective data in this cohort study was from an ongoing statewide, school-based, dental health screening initiative that was conducted across 8 years (2002–2010) in public/private middle/high schools in Nevada. A total of 66,941 dental health screenings of adolescents between ages 13–18 were conducted. Self-reported data were collected on tobacco/marijuana use. Descriptive statistics and trends were reported. Means (SE) were computed for caries prevalence and severity. Effect size was reported on dental caries and use of tobacco/marijuana.

Results: Overall, percentage prevalence of tobacco use was approximately the same as the national average; however, there were significantly higher rates of marijuana use (12.0% vs. 3.3%). Prevalence and severity of dental caries was significantly higher in those who used tobacco/marijuana than those who did not across all variables and across all 8 years controlling for gender, race/ethnicity, where they lived, and exposure to secondhand smoke.

Conclusions: Tobacco use negatively affected dental health status with marijuana having the largest negative effect. The findings from this study identified the need for tobacco/marijuana prevention services targeting adolescents residing in the geographic areas most at risk.

IMPLICATIONS AND CONTRIBUTION

Preliminary associations have been found between tobacco use and dental caries. This study expands across several years and to include marijuana. The ability to assess the magnitude effect from tobacco and/or marijuana to help determine those at highest risk for targeted preventive measures.

Tobacco use remains one of the leading preventable causes of death in the U.S. [1]. Tobacco is estimated to be responsible for more than 5 million deaths each year [2]. By 2004, premature deaths attributed to tobacco use increased to 443,000, accounting for ~5.1 million years of potential life lost [3]. Marijuana use has also been linked with adverse physical health effects and a greater concentration of carcinogens than what is in tobacco [4]. If current trends persist, tobacco and marijuana use will kill more than 8 million people worldwide by 2030 and 1 billion or more by the end of this century [2].

Studies in the early 2000s reported downward trends of tobacco and marijuana use; however, by 2006 these trends began to increase. By the mid 1990s, cigarette smoking among middle and high school students peaked; however, prevalence of 30-day use declined by 56% in eighth graders, 47% in 10th graders, and 32% in 12th graders by 2004 [5]. Rates have been increasing, with 19.5% of high school students reported to be current smokers [6]. In 2010, almost 1.4 million people younger than age 18 reported they smoked cigarettes for the first time within the past

* Address correspondence to: Marcia Ditmyer, Ph.D., UNLV School of Dental Medicine, 1001 Shadow Lane, MS 7425, Las Vegas, NV 89106.
E-mail addresses: mditmyer1@hotmail.com, marcia.ditmyer@unlv.edu (M. Ditmyer).

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12 months [7]. More than one third of all adolescents who ever tried cigarettes became daily smokers before leaving high school, with nearly 90% of adults reporting they began at or before the age of 18 [8–10]. Similarly, smokeless tobacco use by adolescents decreased after peaking in the 1990s, but by 2009 increased to 36% [11]. Furthermore, the daily rates of marijuana use increased significantly in 2010 and 2011 with daily use rates of marijuana at 1.3%, 3.6%, and 6.6% in grades 8, 10, and 12, respectively.

Background on dental caries

Studies have identified associations between numerous factors and dental caries thus supporting the agreement that dental caries is a multifactorial disease modulated by genetics, behavior, and environment [12,13]. There have been very few studies that controlled for potential confounding factors, such as tobacco/marijuana use associated with caries. It has been suggested that the potential impact should be addressed to determine the actual magnitude difference in dental caries between those who use tobacco and/or marijuana and those who do not [12–17].

The purpose of this study was threefold. The first was to determine trends in the use of tobacco/marijuana use in Nevada adolescents screened during a statewide, school-based, dental health screening initiative (2002–2010). A secondary purpose was to investigate the magnitude of differences in the dental caries prevalence (untreated caries [D-Score]) and the severity (decayed, missing, and filled teeth [DMFT] indices) between those who used tobacco and/or marijuana and those who did not across all 8 years of the initiative. The third purpose was to compare relative reported national data on adolescents' use of tobacco and/or marijuana with current prevalence rates among Nevada adolescents.

Methods

Selection and description of participants

An ongoing statewide, school-based, dental health screening initiative was conducted between 2002 and 2010 in public/private middle and high schools in Nevada. This initiative was funded by Master Settlement Agreement appropriations allocated to the Trust Fund for Public Health and the Fund for a Healthy Nevada [18]. A total of 66,941 dental health screenings of adolescents ages 13–18 were conducted. These data were used for this retrospective cohort study. The University of Nevada Las Vegas (UNLV) Institutional Review Board approved this initiative to assure participant confidentiality and protection.

Oral health screenings

Examinations were conducted in two dedicated mobile dental clinics across Nevada. Licensed dentists and dental hygienists, along with dental hygiene students under the supervision of the licensed dental professionals, conducted the screenings. Oral health indices (untreated tooth decay/DMFT) were collected on each participant. The number of examiners was dependent on the annual funding allocated to the program. On average, there were four full-time examiners on each mobile unit with one dedicated to northern Nevada and one to southern Nevada. Part-time examiners were also used; however, all examiners were trained/calibrated prior to staffing each year by the program director in accordance with the established protocol approved by the funding agency and the UNLV Institutional Review Board. All training was documented and reported to the funding agency to ensure validity and reliability of the data.

Prevalence and severity indices

Examiners followed the Radike criteria used in the National Health and Nutrition Examination Surveys [NHANES]), with modifications [19]. Similar to established Radike criteria, artificial light and non-magnifying mirrors were used to perform visual assessments. Restrictions placed on the initiative by the funding agency and the UNLV Institutional Review Board disallowed the use of compressed air and explorers. However, researchers have found little difference in caries prevalence results in adolescent cohorts when comparing studies that used visual methods without probing and drying with those of studies using visual/tactile methods with explorer [20].

Prevalence was defined as mean D-Score and severity was defined as mean DMFT indices [19]. Untreated tooth decay and DMFT index provided an estimate of caries activity up to the day of the examination. Because the third molars typically do not erupt until approximately age 17 (average between ages 15–25), the DMFT index for children/adolescents included 28 (permanent) teeth, excluding 1, 16, 17, and 32 (third molars) in the computation [21]. The *Crackdown on Cancer* dental health screening initiative procedural manual detailed all training/calibration, diagnostics, data collection, and coding criteria.

Establishing reliability of examiners

Intraclass correlation coefficient is used as a reliability index of the ratings for one or multiple observers, focusing on how accurately the observations matched [22,23]. Single measure intraclass correlation coefficient was used as an index of a single examiner across the subjects screened ($r = .91$). Average measure intraclass correlation coefficient was used as an index of multiple examiners ($r = .98$). This assessment was computed after each training session; coefficients represented an average across all 8 screening years.

Face-to-face interviews and tobacco education

Trained/calibrated interviewers collected self-reported information regarding tobacco behaviors through face-to-face interviews in the privacy of the mobile dental clinics. Information recorded included status of current tobacco use, type and number of cigarettes/marijuana used per week and over the past 30 days, and whether respondents used more than one type of tobacco/marijuana in combination.

Statistical analysis

Frequencies and percentages were reported for the following select demographic variables found in the literature to significantly contribute to caries. These were statistically controlled for in analyzing the data and included: (1) gender; (2) race/ethnicity; (3) community water fluoridation status; (4) locale; and (5) exposure to environmental tobacco smoke [13]. Percent change (PC) was computed to determine significant differences between frequencies across the years (forecasting trends) for tobacco use (cigarettes, cigars, smokeless tobacco combined) and