Cover Story

Periodontitis in US Adults

National Health and Nutrition Examination Survey 2009-2014

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Supplemental material is available online.

ABSTRACT

Background. This report presents weighted average estimates of the prevalence of periodontitis in the adult US population during the 6 years 2009-2014 and highlights key findings of a national periodontitis surveillance project.

Methods. Estimates were derived for dentate adults 30 years or older from the civilian noninstitutionalized population whose periodontitis status was assessed by means of a full-mouth periodontal examination at 6 sites per tooth on all non–third molar teeth. Results are reported according to a standard format by applying the Centers for Disease Control and Prevention/American Academy of Periodontology periodontitis case definitions for surveillance, as well as various thresholds of clinical attachment loss and periodontal probing depth.

Results. An estimated 42% of dentate US adults 30 years or older had periodontitis, with 7.8% having severe periodontitis. Overall, 3.3% of all periodontally probed sites (9.1% of all teeth) had periodontal probing depth of 4 millimeters or greater, and 19.0% of sites (37.1% of teeth) had clinical attachment loss of 3 mm or greater. Severe periodontitis was most prevalent among adults 65 years or older, Mexican Americans, non-Hispanic blacks, and smokers.

Conclusions. This nationally representative study shows that periodontitis is a highly prevalent oral disease among US adults.

Practical Implications. Dental practitioners should be aware of the high prevalence of periodontitis in US adults and may provide preventive care and counselling for periodontitis. General dentists who encounter patients with periodontitis may refer these patients to see a periodontist for specialty care.

Key Words. Adults; epidemiology; NHANES; periodontal diseases; periodontitis; population surveillance; United States.

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In 2003, the Centers for Disease Control and Prevention (CDC) set out on a surveillance project to determine the prevalence of periodontitis in the US adult population and formed a workgroup in collaboration with the American Academy of Periodontology (AAP), with participation of other experts in periodontitis surveillance and epidemiology.[1,2] Because of the lack of globally accepted definitions, this CDC/AAP Workgroup created periodontitis case definitions specifically for periodontitis surveillance known as the "CDC/AAP periodontitis case definitions for surveillance."[3,4] These case definitions are based on a full-mouth periodontal examination (FMPE) and are part of the global standards for reporting chronic periodontitis prevalence and severity.[5]

Beginning in 2009 and ending in 2014, the National Health and Nutrition Examination Survey (NHANES) implemented an FMPE protocol to collect probing measurements from 6 sites per tooth around all teeth, except third molars, as described by Eke and colleagues.[6,7] Because of the site-specific, asymmetric distribution of periodontal tissue breakdown in a dentition, the FMPE protocol optimizes the capture of clinical measurements for surveillance of periodontitis, which results in greater accuracy in detecting and categorizing cases of periodontitis compared

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with estimates derived from the partial-mouth periodontal examination protocols used in previous NHANES, such as those conducted in 1988-1994 and 1999-2004.[8-10] Moreover, measurements recorded according to the FMPE protocol optimize the use of the CDC/AAP standard case definitions for surveillance of periodontitis and minimize misclassification of periodontitis.[11-16]

In 2 previous report, we presented interim findings on the prevalence of periodontitis and its adjunct population characteristics from 2 NHANES 2-year survey cycles—namely, 2009-2010[6] and 2011-2012.[7] These initial reports revealed a much higher burden of periodontitis in US adults than previously reported.[6] In this report, we provide the final estimates for all the 6 years in which the NHANES data collection protocol included clinical periodontal examinations, namely the 3 2-year NHANES cycles 2009-2010, 2011-2012, and 2013-2014, hereafter referred to as *NHANES 2009-2014*.[17]

METHODS

We analyzed data from NHANES 2009-2014.[17] NHANES is a stratified multistage probability sample of the civilian noninstitutionalized population in the 50 US states and the District of Columbia. The CDC's National Center for Health Statistics Ethics Review Board (an institutional review board equivalent) approved the oral health data collection protocols, and all survey participants provided written informed consent.[18,19]

Trained examiners, who during the 2009-2010 cycles were registered dental hygienists and who from 2011-2014 were general dentists, performed all periodontal examinations in a mobile examination center. The survey's reference examiner (B.A.D.) trained and calibrated all dental examiners. He performed both the initial training and presurvey calibration and subsequently visited each examiner in the field annually and replicated 25 to 30 periodontal examinations each time. Dye and colleagues[20] described in detail the oral health component, including its quality assurance for the 2009-2010 examinations, providing interexaminer statistics expressed as percentage agreement, κ statistics, and intraclass correlation coefficients. For the CDC/AAP moderate and severe periodontitis case definitions combined, the κ scores were 0.70 and 0.71 for the 2 examiners whose agreement rates with the reference examiner were 87.5% and 85.7%, respectively. The intraclass correlation coefficients for mean clinical attachment loss (CAL) were 0.80 or higher for both examiners. Hence, the level of data quality for this period is acceptable.[20] Final quality assurance reports for the later surveillance cycles will be reported in the future.

Examiners performed 2 measurements at each periodontal site, namely, gingival recession (REC) measured as the distance between the free gingival margin and the cementoenamel junction (CEJ) and periodontal probing depth (PPD) measured as the distance from the free gingival margin to the bottom of the sulcus (in periodontal health) or periodontal pocket (in periodontal disease). The examiners scored REC as a negative value when the free gingival margin was positioned apically to the CEJ and as a positive value when positioned coronally. Measurements were taken at 6 sites around each tooth other than third molars, namely, mesio-, mid-, and distobuccal and mesio-, mid-, and distolingual. The examiners positioned a periodontal probe with 2-, 4-, 6-, 8-, 10- and 12-millimeter gradations (PCP2, Hu-Friedy) parallel to the long axis of the tooth at each site, and they rounded measurements to the lower whole millimeter.[6,7,18] Recorders entered data directly into the NHANES Integrated Survey and Information System program that instantly calculated CAL as the difference between PPD and REC (PPD minus REC). Eligibility for the NHANES 2009-2014 periodontal examination was restricted to adults 30 years or older who had 1 or more natural teeth and no health conditions requiring antibiotic prophylaxis before periodontal probing. A total of 14,061 adults 30 years or older participated in the examinations in the mobile examination centers. Among them, 2,318 were excluded from the periodontal health assessment due to medical conditions or did not complete their oral examination for other reasons, while 11,753 people underwent complete oral examinations, including 1,070 who were edentulous.

Except for adding the variable of race/ethnicity, results are reported according to the standard reporting format suggested by a joint European Union/US workgroup[5] that follows the guidelines of the STrengthening the Reporting of Observational Studies in Epidemiology (STROBE) Initiative[21] recommended by the Enhancing the QUAlity and Transparency Of health Research (EQUATOR)

ABBREVIATION KEY

AAP: American Academy of Periodontology.
BMI: Body mass index.
CAL: Clinical attachment loss.
CDC: Centers for Disease Control and Prevention.
CEJ: Cementoenamel junction.
FMPE: Full-mouth periodontal examination.
FPL: Federal poverty level.
NHANES: National Health and Nutrition Examination Survey.
NS: Not significant.
PPD: Periodontal probing depth.
REC: Gingival recession.