

# Understanding the Relationship between Oral Health and Chronic Disease among Rhode Island Adults 45 years and Older

MONIKA DROGOSZ, MPH; STEPHANIE MUNTHE, DDS; SAMUEL ZWETCHKENBAUM, DDS, MPH

## INTRODUCTION

Maintaining good oral health is a critical component of overall health and quality of life. Oral conditions are frequently considered separate from other chronic conditions, but they are inter-related. Studies have suggested that there is a relationship between chronic disease and oral health,<sup>1</sup> including shared risk factors between good oral health and chronic conditions. Age increases the risk of chronic disease and may pose challenges for older adults in maintaining their oral health and preventing disease.<sup>2</sup> Tooth loss can pose a significant impact on an individual's ability to function, including chewing foods and maintaining a satisfactory diet.<sup>3</sup>

There is also a significant psychosocial impact of tooth loss, with adults who have lost teeth more likely to experience social isolation<sup>4</sup> and impaired dental esthetics, increasing the difficulty in getting hired for work.<sup>5</sup> While there are national data on the connection between oral health and chronic conditions, there is less known about this in Rhode Island. This report examines the relationship between oral health and chronic disease among RI adults aged 45 years and greater with the goal of helping primary care clinicians identify patients at greater risk of tooth loss who may benefit from preventive dental care.

## METHODS

Data are from the 2021 Rhode Island Behavioral Risk Factor Surveillance System (RI BRFSS). The BRFSS is a telephone survey of non-institutionalized Rhode Islanders aged 18 years or older which is administered by the Rhode Island Department of Health (RIDOH). The BRFSS survey collects data related to health, health-risk behaviors, preventive measures, and healthcare access among adults in Rhode Island. Survey data are weighted to obtain statewide population estimates. Self-reported status of chronic conditions was coded from questions which asked, "Has a doctor, nurse, or other health professional ever told you that you had any of the following?": diabetes, pre-diabetes, hypertension, skin cancer or other types of cancer, angina or coronary heart disease (CHD), asthma or arthritis, gout, rheumatoid arthritis, lupus, or fibromyalgia. Chronic disease status was based on this language and there is no method to verify diagnosis. Current smoker refers to adults who report they are an everyday or some day smoker. Recent dental visit was defined as a visit within the last year. Tooth loss severity refers to the number of teeth removed due to tooth decay or gum disease and was divided into three categories: no tooth loss, moderate tooth

loss (one to five teeth removed), and severe tooth loss (six or more teeth removed). Chi-square tests were used to test for significance ( $p < .05$ ) between groups. SAS survey procedures were used for the analysis to account for the sampling design.

## RESULTS

5,639 individuals completed the BRFSS in 2021, representing a weighted population of 889,340 adults. 3,962 were 45 years or older. Prevalence of chronic conditions and oral health, by age and gender, are shown in **Table 1**. Arthritis, CHD, cancer, diabetes/prediabetes, and hypertension were more prevalent among adults aged 45 and older, compared to adults under the age of 45. Adults 45+ had a higher prevalence of a recent dental visit and were more likely to have any teeth extracted. Adults 45+ who were ever told they had diabetes/pre-diabetes, CHD or hypertension were less likely to report having had a recent dental visit (**Figure 1**). The percentage of adults 45+ with severe tooth loss was higher among those who reported being told they had asthma, arthritis, CHD, cancer, diabetes/prediabetes, or hypertension (**Figure 2**). A significant difference between tooth loss severity and recent dental visit was observed among adults 45+ with a chronic condition or on blood pressure medication (**Table 2**). Additionally, adults 45+ who are current smokers were less likely to have a recent dental visit than non-smokers (55% vs 72%,  $p < .0001$ ) and were more likely to have severe tooth loss compared to non-smokers (36% vs 24%,  $p = .001$ ). Adults 45+ who reported being on blood pressure medication were more likely to have had a recent dental visit compared to those not on blood pressure medication (70% vs 62%). Severe tooth loss was more common among adults 45+ on blood pressure medication than those not on blood pressure medication (13% vs 9%).

## DISCUSSION

Although oral diseases are mostly preventable, they continue to persist with high prevalence and with significant physical, mental, and social implications for those impacted.<sup>6</sup> Good oral health is critical for overall health and well-being and is a contributing factor to an individual's overall quality of life.<sup>7</sup> The bidirectional relationship between oral health and chronic conditions is important to understand as are the shared risk factors among both.

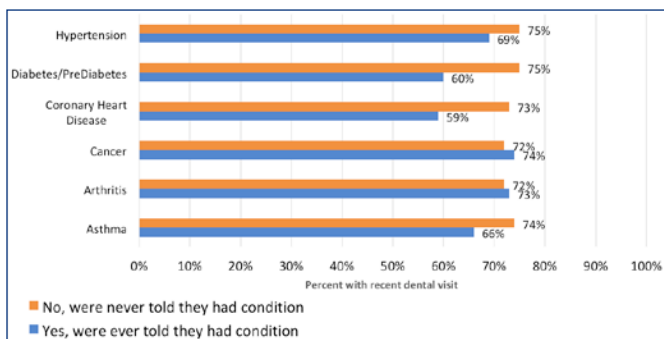
Adults with hypertension, coronary heart disease and diabetes/prediabetes were less likely to have visited a dentist

**Table 1.** Chronic Disease and Oral Health prevalence, by Sex and Age Group

|                  | N    | Hypertension %<br>(95% CI)* | Asthma %<br>(95% CI) | Arthritis %<br>(95% CI) | Coronary Heart Disease %<br>(95% CI) | Diabetes %<br>(95% CI) | Cancer %<br>(95% CI) | Recent Dental Visit %<br>(95% CI) | Any teeth extracted %<br>(95% CI) |
|------------------|------|-----------------------------|----------------------|-------------------------|--------------------------------------|------------------------|----------------------|-----------------------------------|-----------------------------------|
| <b>Sex</b>       |      |                             |                      |                         |                                      |                        |                      |                                   |                                   |
| Male             | 2504 | 35.4%<br>(33.0–37.8)        | 15.7<br>(13.6–17.8)  | 25.0<br>(22.8–27.3)     | 4.2<br>(3.4–5.1)                     | 10.9<br>(9.3–12.5)     | 5.8<br>(4.8–6.9)     | 68.4<br>(65.9–70.9)               | 40.7<br>(38.1–43.3)               |
| Female           | 3105 | 30.6<br>(28.5–32.7)         | 18.9<br>(17.1–20.8)  | 31.6<br>(29.5–33.7)     | 3.2<br>(2.5–4)                       | 10<br>(8.7–11.3)       | 8.6<br>(7.3–9.9)     | 70.8<br>(68.6–73)                 | 37.9<br>(35.6–40.2)               |
| <b>Age Group</b> |      |                             |                      |                         |                                      |                        |                      |                                   |                                   |
| 18–34            | 900  | 11.7<br>(9.0–14.3)          | 20.5<br>(17.1–24.0)  | 5.6<br>(3.3–7.9)        | X                                    | 2.8<br>(1.2–4.3)       | 1.5<br>(.2–2.9)      | 65.0<br>(61–68.9)                 | 17.4<br>(14.2–20.6)               |
| 35–44            | 747  | 20.7<br>(16.8–24.6)         | 17.5<br>(14.1–21.0)  | 17.8<br>(14.4–21.3)     | X                                    | 4.6<br>(2.5–6.7)       | 2.3<br>(1.1–3.6)     | 66.2<br>(62–70.5)                 | 31.4<br>(27.3–35.5)               |
| 45–64            | 2157 | 39.1<br>(36.4–41.7)         | 16.9<br>(14.9–18.8)  | 34.7<br>(32.1–37.3)     | 2.9<br>(2.1–3.8)                     | 12.9<br>(11.1–14.8)    | 7.0<br>(5.7–8.4)     | 71.4<br>(69–73.9)                 | 46.5<br>(43.8–49.2)               |
| 65+              | 1805 | 60.6<br>(57.7–63.5)         | 14.3<br>(12.2–16.4)  | 56.8<br>(53.9–59.8)     | 10.2<br>(8.4–12.1)                   | 20.5<br>(18–23)        | 18.4<br>(16.1–20.9)  | 73.8<br>(71–76.6)                 | 64.1<br>(61.1–67)                 |

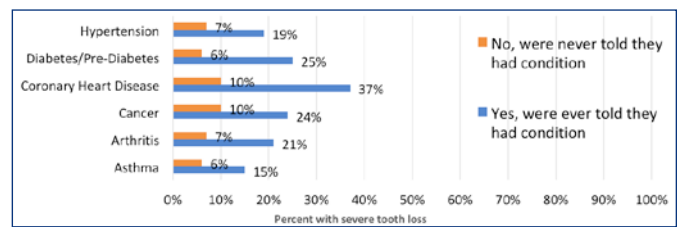
\*Note: 95% Confidence Interval

**Figure 1.** Percent of RI Adults aged 45+ with recent dental visit, by chronic condition



\*Note: Language used above is based on how the survey question is phrased in BRFSS, there is no method to verify diagnosis.

**Figure 2.** Percent of RI Adults 45+ with severe tooth loss, by chronic condition



\*Note: Language used above is based on how the survey question is phrased in BRFSS, there is no method to verify diagnosis.

**Table 2.** Tooth Loss Severity among Adults 45+ with Chronic Conditions, with and without a Recent Dental Visit

| Current Condition                | Recent Dental Visit |          |        |                     |          |        | P Value |
|----------------------------------|---------------------|----------|--------|---------------------|----------|--------|---------|
|                                  | Yes                 |          |        | No                  |          |        |         |
|                                  | Tooth Loss Severity |          |        | Tooth Loss Severity |          |        |         |
|                                  | None                | Moderate | Severe | None                | Moderate | Severe |         |
| Asthma                           | 46%                 | 34%      | 20%    | 26%                 | 34%      | 39%    | .0007   |
| Arthritis                        | 44%                 | 38%      | 18%    | 24%                 | 33%      | 43%    | <.0001  |
| Cancer                           | 42%                 | 39%      | 19%    | 24%                 | 26%      | 49%    | <.0001  |
| Coronary Heart Disease           | 28%                 | 41%      | 31%    | 13%                 | 34%      | 52%    | .02     |
| Diabetes/Pre-Diabetes            | 38%                 | 41%      | 21%    | 19%                 | 38%      | 44%    | <.0001  |
| Hypertension                     | 46%                 | 39%      | 15%    | 27%                 | 34%      | 38%    | <.0001  |
| Taking Blood Pressure Medication | 44%                 | 40%      | 16%    | 42%                 | 41%      | 39%    | <.0001  |

within the last year. Lower dental service utilization among adults with chronic conditions is likely attributed to varying dental insurance coverage, income, and various other factors.<sup>8</sup> Medical professionals for the at-risk adult population can consider integrating oral health risk assessments into chronic disease management plans or identify opportunities for better care coordination for adults with chronic diseases. Adults who reported currently taking blood pressure medication and a recent dental visit were less likely to experience severe tooth loss compared to those on the medication with no recent dental visit. Given the potential increased risk of oral complications such as hyposalivation that can occur with polypharmacy,<sup>9</sup> maintaining regular dentist visits can aid in providing recommended preventive measures and check-ups.

Oral and chronic diseases share common risk factors such as tobacco use.<sup>10</sup> Current smokers with chronic conditions are more likely to have severe tooth loss compared to non-smokers. Educating patients that their oral health is connected to the rest of the body and certain behaviors can contribute to both oral and chronic conditions is critical. Addressing shared risk factors can prevent the impact of both and emphasize the significance of an integrated approach to healthcare which accounts for both oral and overall health. Screening for chronic diseases within the dental setting and early intervention or referral can impact chronic disease outcomes, especially those at high risk or with shared risk factors who may otherwise be missed through the medical setting. Continued collaboration between medical and dental health professionals is critical, as clinicians have an opportunity to educate their patients and make referrals.

Studies have suggested that older adults with chronic conditions have an increased risk of tooth loss.<sup>11</sup> Our findings suggest a similar conclusion; however, having a recent dental visit may lessen tooth loss severity in this population. Maintaining regular dental visits is not only important for tooth loss but also for overall quality of life. Adults with chronic conditions are more likely to experience severe tooth loss, which can negatively impact their self-esteem, quality of diet and life.<sup>12</sup> Primary care professionals referring patients with chronic conditions for routine preventive dental care can reduce risk of tooth loss and promote overall quality of life for these patients. Additionally, incorporating an equity focus is essential for recognizing that health outcomes, including oral health outcomes, are multifactorial and widely influenced by various social determinants including access to care, socioeconomic status, education, and food security.

## LIMITATIONS

Responses are self-reported and are subject to bias. This article cannot establish a causal relationship between oral health and chronic disease. Any observed relationship between oral health and chronic conditions may be influenced by various underlying factors not captured in the survey. Prevalence

of some chronic conditions were low in this study. More research is needed on the association between oral health and chronic disease with consideration of various covariates including race/ethnicity and income which were not addressed here.

## References

1. Borgnakke WS, Ylöstalo PV, Taylor GW, Genco RJ. Effect of Periodontal Disease on Diabetes: Systematic Review of Epidemiologic Observational Evidence. *J Clin Periodontol*. 2013 Apr;40 Suppl 14:S135-52. PMID: 23627324.
2. Griffin SO, Jones JA, Brunson D, Griffin PM, Bailey WD. Burden of Oral Disease among Older Adults and Implications for Public Health Priorities. *Am J Public Health*. 2012 Mar;102(3):411-8. PMID: 22390504.
3. Locker D, Quiñonez C. Functional and Psychosocial Impacts of Oral Disorders in Canadian Adults: a National Population Survey. *J Can Dent Assoc*. 2009 Sep;75(7):521. PMID: 19744362.
4. Koyama S, Saito M, Cable N, et al. Examining the Associations Between Oral Health and Social Isolation: A Cross-National Comparative Study between Japan and England. *Soc Sci Med*. 2021 May;277:113895. PMID: 33882441.
5. Halasa-Rappel YA, Tschampl CA, Foley M, Dellapenna M, Shepard DS. Broken Smiles: The Impact of Untreated Dental Caries and Missing Anterior Teeth on Employment. *J Public Health Dent*. 2019 Sept; 79(3):231-237. PMID: 30990228.
6. Peres MA, Macpherson LMD, Weyant RJ, et al. Oral Diseases: a Global Public Health Challenge. *Lancet*. 2019 Jul 20; 394(10194):249-260. PMID: 31327369
7. Oral Health in America: Advances and Challenges [Internet]. Bethesda (MD): National Institute of Dental and Craniofacial Research(US); 2021 Dec. PMID: 35020293.
8. Patel N, Fils-Aime R, Li C, Lin M, Robison V. Prevalence of Past-Year Dental Visit Among US Adults Aged 50 Years or Older, With Selected Chronic Diseases, 2018. *Prev Chronic Dis* 2021;18:200576. PMID: 33914679.
9. Nederfors T. Xerostomia: Prevalence and Pharmacotherapy. With Special Reference to Beta-adrenoceptor Antagonists. *Swed Dent J Suppl*. 1996;116:1-70. PMID: 8813731.
10. Ahmed N, Arshad S, Basheer SN, et al. Smoking a Dangerous Addiction: A Systematic Review on an Underrated Risk Factor for Oral Diseases. *Int J Environ Res Public Health*. 2021 Oct 20;18(21):11003. PMID: 34769523.
11. Parker ML, Thornton-Evans G, Wei L, Griffin SO. Prevalence of and Changes in Tooth Loss Among Adults Aged ≥50 Years with Selected Chronic Conditions - United States, 1999-2004 and 2011-2016. *MMWR Morb Mortal Wkly Rep*. 2020 May 29;69(21):641-646. PMID: 32463807.
12. Atanda AJ, Livinski AA, London SD, et al. Tooth Retention, Health, and Quality of Life in Older Adults: a Scoping Review. *BMC Oral Health*. 2022 May 18;22(1):185. PMID: 35585618.

## Authors

Monika Drogosz, MPH, is the Oral Health Epidemiologist at the Rhode Island Department of Health.

Stephanie Munthe, DDS, is an MPH candidate at Brown University.

Samuel Zwetchkenbaum, DDS, MPH, is the Dental Director at the Rhode Island Department of Health.