Dental and medical care visits among persons with diabetes in Ontario, Canada, who self-report oral health status

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PRACTICAL IMPLICATIONS OF THIS RESEARCH

- Population-based evidence shows that poor to fair self-reported oral health is associated with a greater likelihood of acute and chronic diabetes complications.
- Increased dental and medical care visits among persons with diabetes appear to have a protective effect on diabetes health.
- There is a growing need for collaboration between oral health professionals and general practitioners.
- Policy makers and governments must work together to prioritize oral health by funding dental care at all levels.

ABSTRACT

Periodontal disease is associated with diabetes mellitus and poor overall health. While the biological underpinnings of this relationship have been identified, less is known about the extent to which this relationship is affected by dental and medical care visits. Two studies lead by the primary author (KKP) explored the likelihood of diabetes complications among persons living with diabetes in Ontario, Canada, who were followed prospectively in administrative health data. The results from both studies confirmed that poor to fair self-reported oral health was associated with a greater risk for diabetes complications, and that poor dental and medical care visiting behaviours increased this risk. In general, the findings indicate that a greater number of dental and medical visits had a protective effect on the overall health of persons with diabetes. This discovery has important implications for all health care providers interested in managing oral and systemic health.

RÉSUMÉ

La maladie parodontale est associée au diabète sucré et à un mauvais état de santé général. Bien que les causes biologiques de ce lien ont bien été définies, la mesure par laquelle ce lien est influencé par des visites dentaires et médicales est peu connue. Deux études menées par l'auteur principal (KKP) ont exploré la probabilité de complications diabétiques chez les personnes atteintes de diabète en Ontario, au Canada, qui ont été suivies prospectivement dans les données administratives de santé. Les résultats des 2 études ont confirmé qu'un état de santé buccodentaire autodéclaré pauvre à moyen était associé à un risque plus élevé de complications diabétiques, et que de mauvais comportements en matière de visites de soins médicaux et dentaires augmentaient ce risque. Les résultats ont généralement révélé qu'un nombre plus élevé de visites dentaires et médicales ont un effet protecteur sur la santé globale des personnes atteintes de diabète. Cette découverte a d'importantes répercussions pour tous les fournisseurs de soins de santé qui s'intéressent à la gestion de la santé buccodentaire et systémique.

Keywords: collaborative care; diabetes complications; medical care visits; oral health status; type II diabetes
CDHA Research Agenda category: access to care and unmet needs

BACKGROUND

Diabetes mellitus (DM) is a chronic disease that can lead to complications such as heart disease, stroke, blindness, and kidney disease. In 2019, 3.6 million Canadians had DM; another 1.1 million are predicted to be diagnosed with DM within the next decade.[1] In the Province of Ontario, the prevalence of DM is higher than national estimates and is accompanied by increasing costs to the health care system[2] and the individual.[3] Implicated as the sixth complication of DM, periodontitis is an inflammatory condition that destroys bone and tissue surrounding teeth.[4–9] According to the most recent nationwide estimates from the Canadian Health Measures Survey, approximately 7.1 million Canadians had moderate to severe periodontal disease in 2009.[10] More recent estimates suggest that the prevalence of periodontal disease worldwide is between 45% and 50% of the global population.[11]

Numerous studies have shown a bidirectional relationship between DM and periodontal disease, more specifically periodontitis, where DM has an adverse effect on periodontal health and periodontal disease may

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have an adverse effect on dysglycemia, resulting in DM complications.[5,12] Furthermore, periodontal treatment has been shown to have a positive effect on blood sugar levels and lipid profiles among persons with DM.[12–15] Regular visits to an oral health professional offer an opportunity for prevention[16,17] as well as treatment options that may positively affect diabetes management and reduce the likelihood of disease complications.[18] However, even though evidence for the periodontal disease–DM association continues to amass, and the literature suggests positive effects of dental visits on diabetes management, persons with diabetes make fewer visits to oral health professionals than those without the condition.[18–21]

Canada is often lauded for its universal health care system that provides equitable access to medical care for Canadians. However, this health care system only insures oral health care that is received in-hospital or for those who belong to an institutionalized or at-risk population.[22] Unknown to many internationally, oral health care in Canada is predominantly organized, financed, and delivered privately, which poses a financial burden on many Canadians who do not have insurance yet are in need of professional oral care.[23,24] Among individuals with diabetes already facing the challenge of meeting treatment requirements, this cost is an additional barrier to care. In 2014, Ontario residents who self-reported diabetes in the Canadian Community Health Survey (CCHS) indicated that they made fewer dental visits than those without diabetes.[21] Persons with diabetes who made dental visits mostly did so only in the case of an emergency.[21] In contrast, visits to primary care physician offices and emergency departments were far more frequent.[18,25]

DISCUSSION OF 2 ONTARIO STUDIES

Lower utilization of oral health care services and higher utilization of medical care services among persons with diabetes directly reflects the differences in access afforded by a universal medical health care system compared to privatized oral health care in Canada.[26] However, little is known about the utilization of oral health and medical care services among these individuals in Ontario. Recent studies led by the primary author (KKP)[27,28] explored the likelihood of diabetes complications among approximately 5200 Ontario residents who participated in the 2003 and 2007–2008 cycles of the CCHS. Study participants were followed prospectively until March 2016 to determine their risk of a diabetes complication[27] and the odds of experiencing an acute or chronic complication.[28] The results from both studies confirm the hypothesis that poor to fair self-reported oral health is associated with greater diabetes complications. It was found that those reporting poor to fair oral health had a 30% greater risk of a diabetes complication, in a fully adjusted model. A multinomial regression analysis further found that those reporting poor to fair oral health were 10% and 34%, respectively, more likely to experience an acute or chronic complication than those who reported good to excellent oral health.

Interestingly, individuals with diabetes who reported poor to fair oral health and experienced greater health complications made fewer visits to the dentist. Almost 50% of those who experienced a complication had not seen a dentist in the past 12 months in comparison to approximately 35% of those who did not experience any complications. Study participants in this group also made fewer visits to a general practitioner, but more visits to a specialist for diabetes management. The time between the initial interview and the experienced diabetes complication was also shorter than that for those reporting good to excellent oral health.

In comparison, a majority of those in the good to excellent oral health group made 1 to 2 visits to the dentist in the past 12 months. Physician care was also higher among this group, with fewer visits to a specialist. When oral health and medical care services utilization was further explored by acute and chronic diabetes complications, the results only differed for medical visits. Those who experienced acute and chronic complications had significantly fewer visits to a general practitioner than those who did not experience any complications during the follow-up time.

In general, both studies showed that dental visits had a protective effect if participants reported making 2 or more visits in the past 12 months. Making 0 visits to the dentist in the past 12 months was associated with greater odds for acute and chronic diabetes complications. General practitioner visits also had a protective effect whereas only specialist visits were associated with a higher risk for complications, which differs from other literature suggesting that specialist care is associated with better diabetes management.[29] Individuals with diabetes who made regular visits to their general practitioner for diabetes management had reduced odds for acute and chronic complications, while making only specialist visits was associated with greater odds for acute and chronic complications, as well as an increase in overall risk of complications.

Although the body of scientific evidence for the bidirectional link between periodontal disease and diabetes continues to grow, further research is needed to understand the underpinning biological mechanism that connects oral health to systemic health conditions. Nevertheless, is more evidence really needed to drive changes in public health action and policy development? Clinical studies have found that individuals with periodontal diseases exhibit higher systemic inflammatory markers than those without.[30] Furthermore, inflammatory responses among individuals with diabetes are amplified,[31] making regular visits with both oral health professionals and medical care providers important for better management of the condition. However, there are many barriers to improving overall health in this population. At the individual level, socioeconomic variables, including income and education, are among the toughest barriers to overcome.

At the health care provider level, limited collaboration between oral health and medical providers can also play a role in limiting health improvements. Relevant training and education are needed for primary oral health and medical care providers, along with organizational support to bring these two groups closer together. The results from these two studies suggest that increasing both oral health and medical care utilization among persons with diabetes can have positive effects on diabetes health outcomes.[32,33] This finding supports the need to integrate oral care into Canada's universal health care system, which may ultimately reduce poor health outcomes among individuals with diabetes.[34]

CONCLUSION

Together, oral health and general health care providers have a role to play in improving diabetes health.[26] Recent interventions aiming to reduce the gap between oral and medical care have included diabetes screenings in the dental office,[18] as well the development of referral networks.[32] Oral care visits that include diabetes screenings may lead to the early diagnosis of diabetes and individuals at risk of developing the condition. Dental hygienists, in particular, play an important role in the screening process, and can mitigate the effects of periodontitis in clients with diabetes mellitus and other systemic conditions. Screenings followed by referrals to a physician can further provide lifestyle modifications and medications that delay the onset of complications.[18] With a focus on prevention, all health care providers can bridge the gap in treatment needs of persons with diabetes. Unifying health care programs or expanding insurance coverage for those in need is a strategy that has been applied for managing other diseases such as tuberculosis and HIV/AIDS.[35] However, expanding oral health coverage or including oral health care in a universal health care program for persons with diabetes requires further investigation.

Ultimately, diabetes and other chronic diseases are associated with growing health care costs and increasing morbidity and mortality. Greater utilization of preventive oral health and medical services may reduce the burden of poor health and increase the quality of life for Canadians.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to report.

REFERENCES

1. Canadian Diabetes Association. *Diabetes in Canada: Backgrounder*. Toronto: Diabetes Canada; 2020. Available from: https://www.diabetes.ca/DiabetesCanadaWebsite/media/Advocacy-and-Policy/Backgrounder/2020_Backgrounder_Canada_English_FINAL.pdf
2. Canadian Diabetes Association. *Diabetes in Ontario: Backgrounder*. Toronto: Diabetes Canada; 2020. Available from: https://www.diabetes.ca/DiabetesCanadaWebsite/media/Advocacy-and-Policy/Backgrounder/2020_Backgrounder_Ontario_English_FINAL.pdf
3. Riddle MC, Herman WH. The cost of diabetes care—An elephant in the room. *Diabetes Care*. 2018;41(5):929–32.
4. Taylor GW, Borgnakke WS. Periodontal disease: associations with diabetes, glycemic control, and complications. *Oral Dis*. 2008;14(3):191–203.
5. Chapple ILC, Genco R, Working Group 2 of Joint EFP/AAP Workshop. Diabetes and periodontal diseases: consensus report of the Joint EFP/AAP Workshop on Periodontitis and Systemic Diseases. *J Clin Periodontol*. 2013;40(Suppl 14):S106–S112.
6. Chee B, Park B, Bartold PM. Periodontitis and type II diabetes: a two-way relationship. *Int J Evid Based Healthc*. 2013;11(4):317–29.
7. Hajishengallis G. The inflammophilic character of the periodontitis-associated microbiota. *Mol Oral Microbiol*. 2014;29(6):248–57.
8. Löe H. Periodontal disease. The sixth complication of diabetes mellitus. *Diabetes Care*. 1993;16(1):329-334. PMID: 8422804.
9. Eke PI, Thornton-Evans GO, Wei L, Borgnakke WS, Dye BA, Genco RJ. Periodontitis in US adults: National Health and Nutrition Examination Survey 2009–2014. *J Am Dent Assoc*. 2018;149(7):576–88.e6.
10. Health Canada. *Summary report on the findings of the oral health component of the Canadian Health Measures Survey, 2007–2009*. Ottawa: Minister of Health; 2010.
11. Sanz M, Marco del Castillo A, Jepsen S, Gonzalez-Juanatey JR, D'Aiuto F, Bouchard P, et al. Periodontitis and cardiovascular diseases: consensus report. *J Clin Periodontol*. 2020;47(3):268–88.
12. Simpson TC, Weldon JC, Worthington HV, Needleman I, Wild SH, Moles DR, et al. Treatment of periodontal disease for glycaemic control in people with diabetes mellitus. *Cochrane Database Syst Rev*. 2015;11:CD004714.
13. Demmer RT, Jacobs DR, Singh R, Zuk A, Rosenbaum M, Papapanou PN, et al. Periodontal bacteria and prediabetes prevalence in ORIGINS: The Oral Infections, Glucose Intolerance, and Insulin Resistance Study. *J Dent Res*. 2015;94(9 Suppl):201S–211S.
14. Garde S, Akhter R, Nguyen MA, Chow CK, Eberhard J. Periodontal therapy for improving lipid profiles in patients with type 2 diabetes mellitus: a systematic review and meta-analysis. *Int J Mol Sci*. 2019;20(15):3826.
15. Kramer CK, Zinman B, Retnakaran R. Short-term intensive insulin therapy in type 2 diabetes mellitus: a systematic review and meta-analysis. *Lancet Diabetes Endocrinol*. 2013;1(1):28–34.

16. Maples S, Aldasouqi S, Little R, Baughman H, Joshi M, Salhi R. Detection of undiagnosed prediabetes and diabetes in dental patients: a proposal of a dental-office-friendly diabetes screening tool. *J Diabetes Mellitus.* 2016;6(1):25–37.

17. Strauss SM, Rosedale MT, Pesce MA, Rindskopf DM, Kaur N, Juterbock CM, et al. The potential for glycemic control monitoring and screening for diabetes at dental visits using oral blood. *Am J Public Health.* 2015;105(4):796–801.

18. Myers-Wright N, Lamster IB, Jasek JP, Chamany S. Evaluation of medical and dental visits in New York City: Opportunities to identify persons with and at risk for diabetes mellitus in dental settings. *Community Dent Oral Epidemiol.* 2018 Feb;46(1):102–108.

19. Wiener RC, Shen C, Sambamoorthi N, Sambamoorthi U. Preventive dental care in older adults with diabetes. *J Am Dent Assoc.* 2016;147(10):797–802.

20. Luo H, Bell RA, Wright W, Wu Q, Wu B. Trends in annual dental visits among US dentate adults with and without self-reported diabetes and prediabetes, 2004–2014. *J Am Dent Assoc.* 2018;149(6):460–69.

21. Zangiabadi S, Costanian C, Tamim H. Dental care use in Ontario: the Canadian community health survey (CCHS). *BMC Oral Health.* 2017;17(1):165.

22. Canadian Dental Association. *The state of oral health in Canada.* Ottawa: CDA; 2017.

23. Quiñonez CR, Locker D. Canadian opinions on publicly financed dental care. *Can J Public Health.* 2007;98(6):495–99.

24. Locker D, Maggirias J, Quiñonez C. Income, dental insurance coverage, and financial barriers to dental care among Canadian adults. *J Public Health Dent.* 2011;71(4):327–34.

25. McEwen LN, Herman WH. Health care utilization and costs of diabetes [Chapter 40]. In Cowie CC, Casagrande SS, Menke A, et al., editors. *Diabetes in America.* 3rd ed. Bethesda, MD: National Institutes of Health and National Institute of Diabetes and Digestive and Kidney Diseases; 2018. Available from: https://www.niddk.nih.gov/about-niddk/strategic-plans-reports/diabetes-in-america-3rd-edition

26. Lutfiyya MN, Gross AJ, Soffe B, Lipsky MS. Dental care utilization: Examining the associations between health services deficits and not having a dental visit in past 12 months. *BMC Public Health.* 2019;19(1):265.

27. Kaura Parbhakar K, Rosella LC, Singhal S, Quiñonez CR. Risk of complications among diabetics self-reporting oral health status in Canada: a population-based cohort study. *PLoS One.* 2020;15(1):e0218056.

28. Kaura Parbhakar K, Rosella LC, Singhal S, Quiñonez CR. Acute and chronic diabetes complications associated with self-reported oral health: a retrospective cohort study. *BMC Oral Health.* 2020;20(1):66.

29. Shah BR, Hux JE, Laupacis A, Zinman B, van Walraven C. Clinical inertia in response to inadequate glycemic control: Do specialists differ from primary care physicians? *Diabetes Care.* 2005;28(3):600–606.

30. Wellappuli N, Fine N, Lawrence H, Goldberg M, Tenenbaum H, Glogauer M. Oral and blood neutrophil activation states during experimental gingivitis. *JDR Clin Trans Res.* 2018;3(1):65–75.

31. Salvi GE, Kandylaki M, Troendle A, Persson GR, Lang NP. Experimental gingivitis in type 1 diabetics: a controlled clinical and microbiological study. *J Clin Periodontol.* 2005;32(3):310–16.

32. Mosen DM, Pihlstrom DJ, Snyder JJ, Shuster E. Assessing the association between receipt of dental care, diabetes control measures and health care utilization. *J Am Dent Assoc.* 2012;143(1):20–30.

33. Nasseh K, Vujicic M, Glick M. The relationship between periodontal interventions and healthcare costs and utilization. Evidence from an integrated dental, medical, and pharmacy commercial claims database. *Health Economics.* 2017;26(4):519–27.

34. Prasad M, Manjunath C, Murthy AK, Sampath A, Jaiswal S, Mohapatra A. Integration of oral health into primary health care: a systematic review. *J Family Med Prim Care.* 2019;8(6):1838–1845.

35. Dudley L, Garner P. Strategies for integrating primary health services in middle and low-income countries at the point of delivery. *Cochrane Database Syst Rev.* 2011 Jul 6;2011(7):CD003318.