

Title: Role of Dental Visits in Diabetic Adult Population: An NHANES Study

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Background

- Diabetes mellitus (DM) is a metabolic disease caused by inadequate insulin production or use.
- The prevalence of diabetes has drastically increased globally in the past four decades, with 537 million cases in 2021 and projected to reach 783 million by 2045. (Zhou, B., et al, 2016)
- Poor glycemic control and inflammation play a major role in diabetic complications, ranging from cardiovascular and renal issues to neurological, ocular, and oral diseases. (Nizami, N.A, et al, 2018)
- Routine Dental Visits are crucial for diabetic patients as they allow dental professionals to provide preventive oral health care services, early detection and treatment of oral inflammation, health education, and appropriate referrals. (Dolan et al, 2005)
- C-Reactive Protein (CRP) plays a significant role in diabetes by affecting pancreatic β -cells and mediating the development of inflammation, which worsens glycemic control in patients with DM (Sproston, et al 2018)
- A systematic review of randomized controlled trials found significant reductions in A1C levels at 3- and 6-months post-treatment, demonstrating the importance of early treatment for better long-term blood sugar regulation. (Baeza, M., et al., 2020)

Objective

- To assess the association of last dental visit (LDV) with A1C levels and CRP levels in people with diabetes in a nationally representative sample of the US population using NHANES (2015-2018)

Methods

Study design: This cross-sectional study utilized data from the National Health and Nutrition Examination Survey (NHANES) from 2015 to 2018.

Outcome: C-reactive Protein (CRP), Glycohemoglobin (A1C)

Primary Independent Variable: Last dental visit (LDV) was classified based on question variable "ohq030" – when did you last visit a dentist? Variable "ohq033" gave options for reason for last dental visit. Based on these two questions, categories were formed that were proxy for routine dental visit.

Other Independent Variables: age, education, race, gender, marital status, family income to FPL, health insurance, oral health status and diabetes status.

Statistical analysis: Linear regression models were conducted. NHANES survey weights were used. Statistical significance level was set at 0.05. Statistical analysis was performed using STATA(MP-16).

Table 1: Distribution of Demographic Variables and LDV status

Variable	Total [N = 1536] (%)	Last Dental Visit		
		> 1 year ago [N = 647] (%)	< 1 year (Not routine) [N=174] (%)	< 1 year (routine) [N=715] (%)
Age				
30-45 Years	200 (13.02)	112 (17.36)	22 (12.72)	66 (9.17)
46-60 Years	529 (34.42)	218 (33.68)	55 (31.68)	256 (35.77)
61-75 Years	600 (39.04)	225 (34.78)	63 (36.13)	312 (43.61)
76 Years and Above	208 (13.51)	92 (14.18)	34 (19.47)	82 (11.45)
Gender				
Male	817 (53.20)	350 (54.05)	78 (44.77)	390 (54.49)
Female	719 (46.80)	297 (45.95)	96 (55.23)	325 (45.51)
Race				
Non-Hispanic White	964 (62.75)	359 (55.51)	96 (55.26)	509 (71.14)
Non-Hispanic Black	193 (12.55)	94 (14.51)	29 (16.85)	70 (9.73)
Hispanic	226 (14.68)	116 (17.91)	36 (20.97)	73 (10.23)
Non-Hispanic Asian	89 (5.82)	35 (5.35)	9 (5.26)	46 (6.38)
Other Races/ Multiracial	64 (4.20)	44 (6.73)	3 (1.66)	18 (2.53)
Marital Status				
Married	921 (59.98)	332 (51.36)	91 (52.20)	498 (69.68)
Never Married	124 (8.08)	63 (9.66)	13 (7.47)	49 (6.81)
Living With Partner	92 (6.00)	54 (8.39)	14 (8.01)	24 (3.36)
Widowed/Divor/Separated	398 (25.93)	198 (30.59)	56 (32.32)	144 (20.16)
Educational Qualification				
College Grad or above	384 (25.02)	92 (14.19)	28 (15.83)	265 (37.07)
Less Than High School	249 (16.19)	151 (23.38)	35 (19.86)	63 (8.78)
High School Grad/Ged	394 (25.65)	184 (28.51)	49 (28.06)	161 (22.47)
Some College or AA Degree	509 (33.14)	219 (33.92)	63 (36.25)	226 (31.68)
Poverty Scale				
Above Fpg	1314 (85.53)	506 (78.24)	140 (80.50)	667 (93.35)
Below Fpg	222 (14.47)	141 (21.76)	34 (19.50)	48 (6.65)
Type of Insurance				
Private Insurance	438 (28.51)	138 (21.29)	37 (21.41)	263 (36.77)
Medicare With Medi-Gap	412 (26.82)	171 (26.49)	55 (31.64)	185 (25.94)
Medicaid	165 (10.73)	95 (14.74)	31 (17.58)	39 (5.42)
Other	417 (27.16)	169 (26.07)	41 (23.74)	207 (28.98)
No Insurance	104 (6.78)	74 (11.40)	10 (5.63)	21 (2.89)
Oral Health				
Excellent Very Good/ Good	979 (63.73)	319 (49.26)	90 (51.87)	570 (79.72)
Fair/ Poor	557 (36.27)	328 (50.74)	84 (48.13)	145 (20.28)

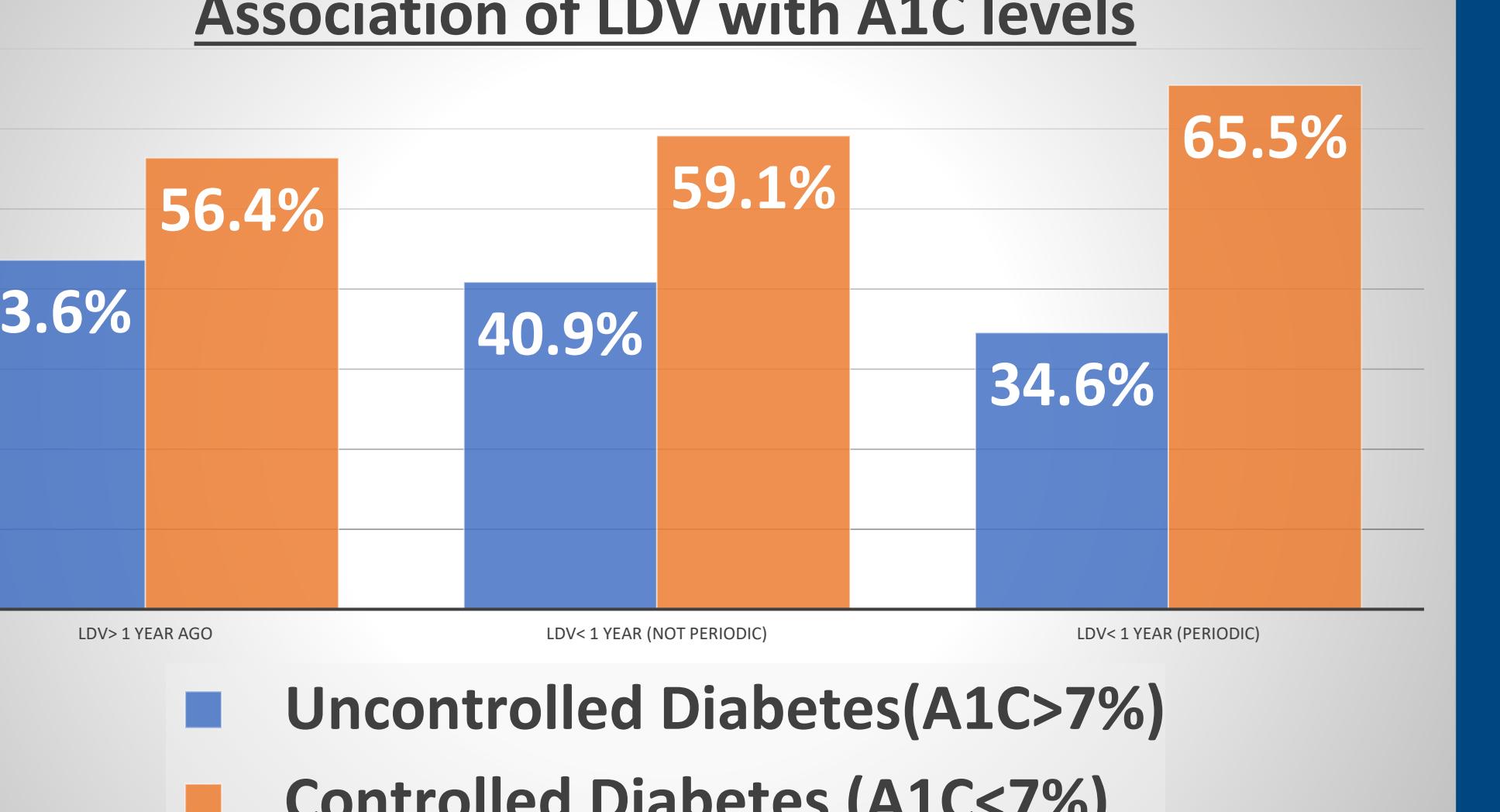
Table 2: Linear Regression Modeling of Glycohemoglobin (A1C) on LDV

LDV	Coefficient	Low	High	p-value
> 1 year	Reference			
< 1 year (not routine)	0.032	-0.226	0.291	0.8
< 1 year (routine)	-0.16	-0.427	0.107	0.231

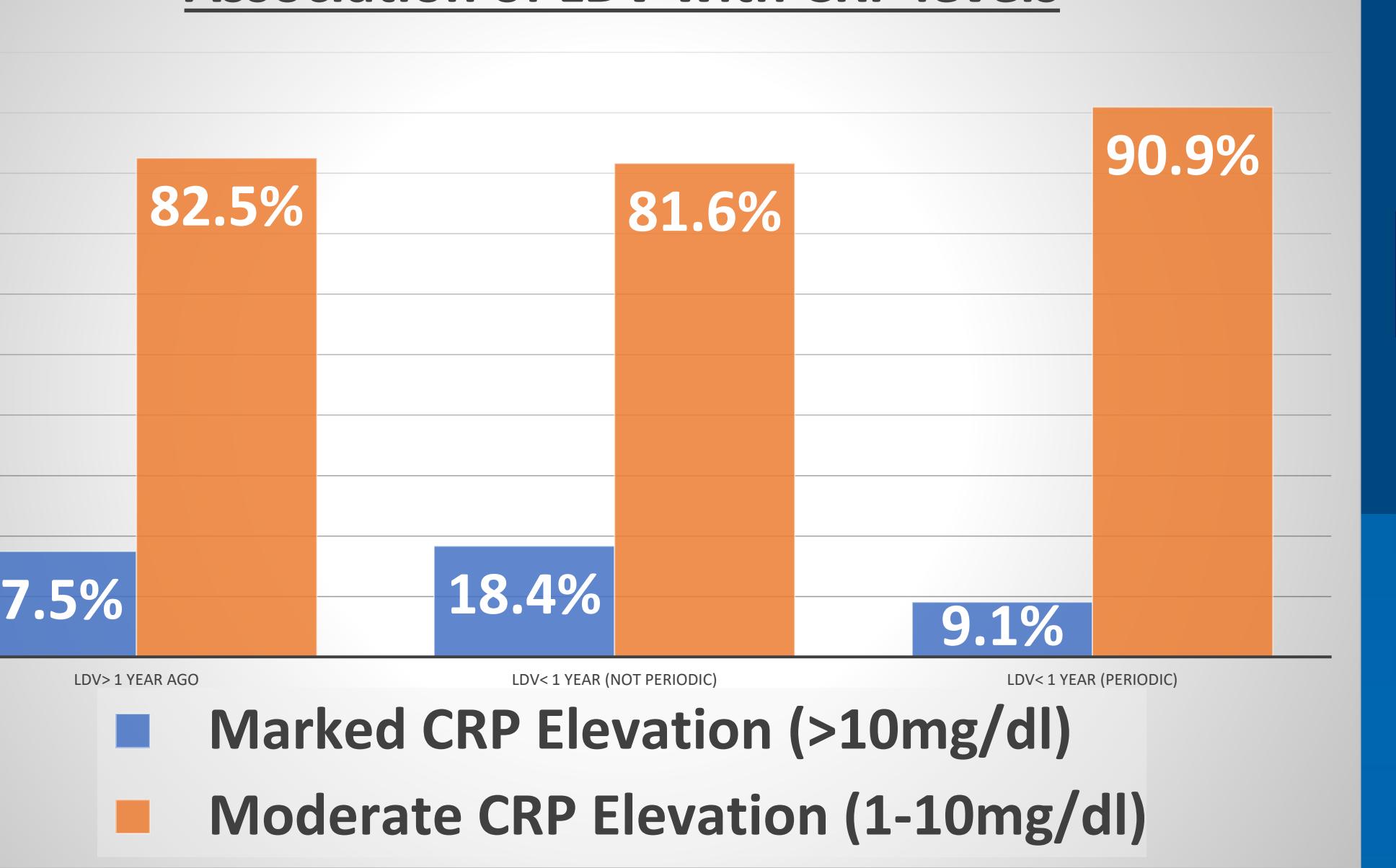
Table 3: Linear Regression Modeling of C-Reactive Protein level on LDV

LDV	Coefficient	Low	High	p-value
> 1 year	Reference			
< 1 year (not routine)	0.77	-2.378	3.919	0.621
< 1 year (routine)	-2.149	-3.206	-1.092	< 0.001 *

Association of LDV with A1C levels



Association of LDV with CRP levels



Results

- Out of the total 1536 participants, 647 (42.12%) last visited the dentist <1 year ago, while 889 (57.88%) visited the Dentist >1 year ago.
- The A1C level of participants with LDV <1 year and routine dental visit was 0.16% lower compared to those with LDV >1 year. However, the difference was not significant.
- The CRP level of participants with LDV <1 year and routine dental visit was significantly lower 2.15 mg/L; 95% CI 3.21 and -1.09 mg/L as compared to those with LDV >1 year.

Discussion

- There are no studies so far that have reported the role of LDV on A1c and CRP levels for diabetic population together.
- Our findings suggest that diabetics who visited a dentist in the past year for routine dental care had significantly lower CRP levels compared to those who had a visit >1 year ago.
- Interestingly we found that health insurance was a strong predictor for lower A1c levels in diabetics.

Limitations: Cross-sectional study cannot ascertain causal relationship. Diabetes data is self-reported. CRP level can be elevated in other inflammatory conditions apart from periodontitis. We excluded NHANES reported inflammatory conditions (asthma, arthritis, coronary heart disease and hepatitis) in our population to overcome this limitation.

Conclusion

This study found an association between dental visits and biomarkers of diabetes. Those with diabetes who visited a dentist in the past 12 months had lower A1C and CRP levels demonstrating controlled diabetes with lower inflammation. Regular dental visits are important for optimal wellness in the diabetic population.