

Disability and the impact of need for periodontal care on quality of life: A cross-sectional study

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Abstract

Objective: The need for periodontal care may negatively impact daily life. We compared the need for periodontal care and its impact on daily life between disabled and healthy adults in the Eastern Province, Saudi Arabia.

Methods: In this cross-sectional study of 819 adults, a questionnaire was used to assess personal background factors; the impact of periodontitis on pain, avoiding foods, embarrassment, sleeplessness, work absence, and discontinuing daily activities; and risk factors (smoking, diabetes, toothbrushing, insurance, professional tooth cleaning, and dental visits). The outcome was clinically assessed need for periodontal care impacting daily life. The relationship between the outcome and risk factors adjusted for personal background and disability was assessed using ordinal regression.

Results: Healthy and disabled persons had a high need for periodontal care (66.8%). Current smokers had a higher likelihood and health-insured persons had a lower likelihood of need for periodontal care impacting daily life regardless of whether disability was considered.

Conclusions: Most adults needed periodontal care, and disabled persons experienced a greater impact on life. Current smokers and uninsured persons were more likely to need periodontal care impacting daily life. Our findings are important for the prevention of periodontitis through tobacco cessation and extending insurance coverage.

Keywords

Periodontitis, treatment need, disabled persons, daily life, insurance coverage, diabetes mellitus, smoking, toothbrushing, Saudi Arabia

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Introduction

Periodontitis is a chronic inflammatory disease affecting the supporting tissues around the teeth and is considered one of the leading causes of tooth loss in adults.¹ It is associated with a number of health conditions

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such as heart disease, preterm birth, and cancer.^{2,3} Several factors reportedly increase the risk of periodontitis, including diabetes,⁴ smoking,⁵ and poor oral hygiene.⁶ Affected periodontal tissues need care to maintain function and prevent the spread of infection to other sites in the body. Periodontal care includes simple procedures provided by general dentists and advanced procedures that require trained periodontists.^{7,8} The need for periodontal care might be affected by health care system factors including health insurance⁸ and patients' care-seeking behaviors, such as dental visits.⁹

A 2013 systematic review concluded that fewer studies have addressed the impact of periodontal disease than other oral diseases on quality of life.¹ The authors identified only seven studies with useful information from 1947 to 2011. They reported that periodontitis had a negative impact on quality of life by inducing pain, functional limitations, and physical and psychological discomfort.

Disabled persons have physical or mental conditions that affect or limit their activities of daily living and may need special accommodations.¹⁰ The World Health Organization estimated that the prevalence of disability among adults ranged from 11.8% in higher-income countries to 18.0% in lower-income countries.¹¹ Disabled persons are liable to have health care problems because of limited accessibility,¹² inadequate health insurance coverage¹³ and health professionals' attitudes.^{13,14} In one study, people with intellectual disabilities reportedly had poorer oral hygiene and periodontal conditions but a similar caries level compared with the general population.¹⁵ The same findings were reported among people with various types of disability.^{16,17} Thus, periodontal problems seem to be of particular importance among disabled individuals. However, there is limited evidence regarding whether the presence of a disability increases the

impact of oral disease on the quality of daily life among adults.¹⁸

The Saudi Central Department of Statistics and Information reported that 143,000 adults were out of labor because of disability and that 400,000 disabled persons were registered with the Ministry of Social Affairs.¹⁹ Studies have shown that disabled Saudi children have a high prevalence of malocclusion,²⁰ caries,^{20,21} poor oral hygiene,^{21,22} and trauma,²³ but less information about disabled Saudi adults is available. The aims of this study were 1) to assess the need for periodontal care among adults in the Eastern Province of Saudi Arabia and how this need impacts daily life, 2) to compare healthy and disabled persons regarding the need for periodontal care and its impact on daily life, and 3) to assess the associations of different risk factors with disability as well as with the need for periodontal care impacting daily life.

Materials and methods

A cross-sectional study was conducted in 2016 to assess oral health in the Eastern Province of Saudi Arabia after obtaining the approval of the Institutional Review Board of the University of Dammam (IRB-2017-2-048). The study was performed in accordance with the Helsinki declaration. Eight cities were included: Dammam, Qatif, Dhahran, Anak, Dareen, UmulSahik, Al-Nabia, and Khobar. Subjects were recruited from hospitals, oral health campaigns, community clubs, and associations supporting disabled persons following the community service outreach activities of the College of Dentistry, University of Dammam. The inclusion criteria were an age of ≥ 18 years (adult), Saudi nationality, and consent to participate in the study. In total, 1098 adults were invited to participate. Subjects were included in the current report if complete observations were available for variables addressed in the study ($n = 819$, 74.6%).

Data were collected by performing a clinical examination and questionnaire based on the basic screening survey methodology developed by the Association for State and Territorial Dental Directors of the United States.²⁴ The questionnaire was written in Arabic and pilot-tested for clarity on a sample of 30 subjects whose data were not included in the study. It included 17 items divided into 3 sections. The first section collected personal background information using four questions regarding sex (male or female), age in years, education (not educated, primary school, middle school, high school, or university), and marital status (married or not married). The second section assessed the impact of the need for periodontal care on six aspects of quality of life: pain, avoiding foods, feeling embarrassed, not being able to sleep, absence from work, and dropping life activities. The subjects were asked to indicate the frequency with which oral problems had affected these aspects during the previous month on a 3-point scale: 1, not at all; 2, sometimes; or 3, at all times. The last section in the questionnaire assessed factors associated with the risk of periodontal disease using seven questions: having health insurance (yes or no), visiting the dentist (never, during last year, or before last year), receiving a professional cleaning at the dental clinic (never, during last year, or before last year), having diabetes (no, controlled, or uncontrolled), having a disability (none, motor, sensory, intellectual, or multiple), smoking (never, formerly, or currently), and brushing teeth (never, twice or more daily, more than three times weekly, or less than three times weekly).

The need for periodontal care was visually assessed using a mirror. An explorer was used to remove food remains. A subject was judged to be in need of periodontal care before his or her next dental checkup if heavy plaque accumulation, calculus deposition, gingival bleeding, gingival swelling,

a gingival or periodontal abscess, or mobility was found in any tooth.²⁴ After a calibration exercise with a periodontist, 3 researchers conducted the examination on 20 subjects whose results were not included in the analysis where their agreement was acceptable ($\kappa \geq 0.6$).

After receiving an explanation of the purpose of the study and providing written informed consent, each participant underwent the clinical examination and completed the questionnaire. Some participants with disabilities (sensory, motor, or intellectual) could not understand and/or respond to the consent form or questionnaire. Their caretaker or guardian was asked to provide explanations to the participant or respond/sign on his or her behalf. The participant was seated on a mobile dental chair, and a mobile dental light on a stand was used for illumination. Participants in need of care were referred for treatment at the clinics of the College of Dentistry, University of Dammam.

The scores for impact on daily life were added across the six aspects of quality of life to give a total score ranging from 6 to 18. This total score was categorized as either level 1 (minimal impact, 6 points) or level 2 (considerable impact, 7–18 points). The total impact score was multiplied by the presence of a need for periodontal care to produce the need for care weighted by its impact on daily life, which was the study outcome. This was an ordinal scale with three scores: 0 = no need for care, 1 = need for care with minimal impact on daily life, and 2 = need for care with considerable impact on daily life.

The chi-square test (and t test for age) was used to compare healthy and disabled subjects regarding personal background and risk factors as well as impact on daily life. The chi-square test was also used to compare the impact of the need for periodontal care on daily life in persons with various types of disabilities and a need

for periodontal care. Univariate ordinal regression was used to assess the relationship between risk factors and need for periodontal care impacting daily life. Two multivariable regression models were created: one included all risk factors entered into the univariate regression adjusted for age, sex, marital status, and education, and the other included these factors plus disability status. Regression coefficients and 95% confidence intervals (CIs) were calculated. Analysis was performed using SPSS version 20.0. Significance was set at the 5% level.

Results

Table 1 shows the comparison of personal background and risk factors between healthy and disabled persons. Disabled persons represented 21.1% of the study sample. Of 169 persons with disabilities, 50.9% had sensory disabilities, 33.7% had motor disabilities, 12.4% had intellectual disabilities, and 3.0% had multiple disabilities. There was a significantly higher percentage of females among the disabled than healthy persons (60.9% and 49.2%, $P=0.008$) and of university-educated persons among the healthy than disabled persons (38.4% and 19.2%, $P<0.0001$). There were no statistically significant differences between the healthy and disabled persons regarding age (mean = 32.3 and 34.0 years), being married (55.7% and 49.7%), having health insurance (27.3% and 27.9%), visiting the dentist within the last year (46.6% and 46.7%), or receiving a professional cleaning at the dental office within the last year (25.9% and 21.7%). A significantly higher percentage of healthy than disabled persons were free from diabetes (92.3% and 83.4%, $P=0.003$). There were no significant differences between the healthy and disabled persons in current smoking (27.3% and 17.9%) or brushing twice or more daily (54.6% and 55.8%).

There was no significant difference in the need for periodontal care between the healthy and disabled persons (66.5% and 67.3%, overall = 66.8%). Figure 1 shows the comparison of the impact of oral problems on daily life among healthy and disabled persons with a need for periodontal care. A higher percentage of healthy than disabled persons felt pain (64.0% and 60.4%). A higher percentage of disabled than healthy persons avoided food (58.7% and 53.1%), felt embarrassed (32.1% and 23.1%), and were sleepless (42.6% and 32.0%). A significantly higher percentage of disabled than healthy persons were absent from work (33.7% and 13.8%, $P<0.0001$) and discontinued daily activities (38.5% and 18.8%, $P<0.0001$). There was no significant difference in the need for periodontal care among persons with sensory, motor, or intellectual disabilities (66.3%, 69.2%, and 66.7%). Figure 2 shows the comparison of the impact of oral problems on daily life among persons with different types of disability and a need for periodontal care. A > 10% difference in the effect on work activities was observed between persons with motor and sensory disabilities (41% and 28%). Smaller differences were observed between other groups in other aspects. None of these differences were statistically significant.

Table 2 shows the risk factors associated with a need for periodontal care with considerable impact on daily life. Current smoking was associated with a significantly higher likelihood of a need for care (regression coefficient = 1.24, 95% CI = 0.80, 1.68), whereas former smoking had no significant association. Brushing twice or more daily was significantly associated with a lower likelihood of a need for care (regression coefficient = -0.72, 95% CI = -1.19, -0.24), as was brushing fewer than three times weekly (regression coefficient = -0.74, 95% CI = -1.30, -0.18). Similarly, health insurance was associated with a significantly

Table 1. Comparison of healthy and disabled persons regarding background and risk factors (n = 801).

	Healthy n = 632	Disabled n = 169	All n = 801	P value
Sex				
Male	313 (50.8)	63 (39.1)	376 (48.4)	0.008*
Female	303 (49.2)	98 (60.9)	401 (51.6)	
Age	32.3 ± 10.8	34.0 ± 11.8	32.7 ± 11.2	0.15
Marital status				
Married	330 (55.7)	76 (49.7)	406 (54.5)	0.18
Not married	262 (44.3)	77 (50.3)	339 (45.5)	
Education				
Not educated	39 (6.8)	19 (12.6)	58 (8.0)	<0.0001*
Primary school	56 (9.8)	24 (15.9)	80 (11.1)	
Middle school	67 (11.7)	16 (10.6)	83 (11.5)	
Secondary school	190 (33.3)	63 (41.7)	253 (35.0)	
University	219 (38.4)	29 (19.2)	248 (34.3)	
Health-insured				
Yes	168 (27.3)	46 (27.9)	214 (27.4)	0.89
No	447 (72.7)	119 (72.1)	566 (72.6)	
Previous dental visits				
Visited a dentist last year	284 (46.6)	77 (46.7)	361 (46.6)	0.97
Visited a dentist > 1 year ago	212 (34.8)	56 (33.9)	268 (34.6)	
Never visited a dentist	114 (18.7)	32 (19.4)	146 (18.8)	
Professional cleaning at dentist's office				
Had a professional cleaning last year	159 (25.9)	35 (21.7)	194 (25.0)	0.41
Had a professional cleaning > 1 year ago	167 (27.2)	51 (31.7)	218 (28.1)	
Never had a professional cleaning	289 (47.0)	75 (46.6)	364 (46.9)	
Diabetes				
Has uncontrolled diabetes	13 (2.1)	6 (3.8)	19 (2.4)	0.003*
Has controlled diabetes	35 (6.6)	20 (12.7)	55 (7.1)	
Does not have diabetes	574 (92.3)	131 (83.4)	705 (90.5)	
Smoking				
Currently smoking	159 (27.3)	29 (17.9)	188 (25.3)	0.05
Former smoker	30 (5.2)	9 (5.6)	39 (5.2)	
Never smoked	393 (67.5)	124 (76.5)	517 (69.5)	
Brushing				
Brushes twice or more daily	341 (54.6)	92 (55.8)	433 (54.9)	0.05
Brushes ≥ 3 times weekly	78 (12.5)	9 (5.5)	87 (11.0)	
Brushes < 3 times weekly	116 (18.6)	33 (20.0)	149 (18.9)	
Never brushes	89 (14.3)	31 (18.8)	120 (15.2)	

All data are presented as n (%) except age, which is presented as mean ± standard deviation.

*Statistically significant at P < 0.05.

lower likelihood of a need for care (regression coefficient = -0.52, 95% CI = -0.85, -0.18). Diabetes, previous dental visits, and professional cleaning at the dentist's office were not significantly associated with the

study outcome. In the multivariable regression (model 2), current smoking was associated with a significantly higher likelihood of a need for periodontal care (regression coefficient = 1.60, 95% CI = 0.92, 2.28).

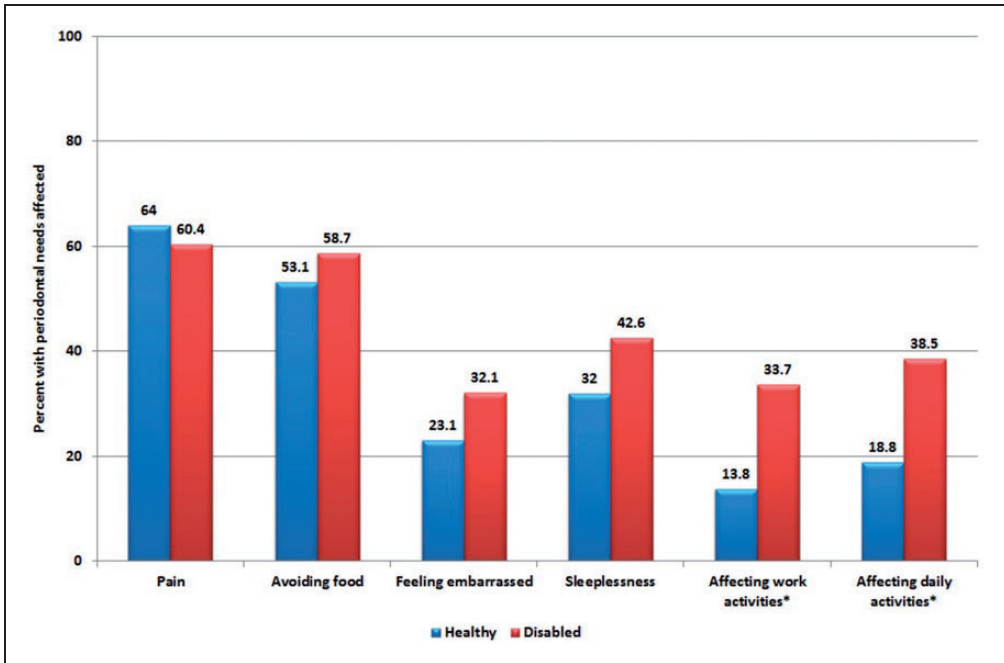


Figure 1. Impact of the need for periodontal care on daily life in healthy and disabled persons.

*Statistically significant difference between groups.

Being insured was associated with a significantly lower likelihood of a need for care (regression coefficient = -0.54 , 95% CI = -1.01 , -0.08). When the disability status was added to model 3, the effects of current smoking (regression coefficient = 1.61 , 95% CI = 0.93 , 2.29) and insurance (regression coefficient = -0.55 , 95% CI = -1.02 , -0.08) were virtually the same as in model 2.

Discussion

In the present study, most adults from the Eastern Province needed periodontal care, and this impacted daily life in terms of pain and avoidance of foods. While there was no significant difference in the need for periodontal care between healthy and disabled persons, disabled persons were significantly more likely to be absent from work and to discontinue daily activities when they

needed care. There was no difference in this association by type of disability. Current smokers and those without health insurance had a significantly higher likelihood of a need for periodontal care that impacted daily life, and disability did not affect this likelihood. Our findings have implications in helping the workforce to meet dental treatment needs in the Eastern Province of Saudi Arabia by ensuring adequate numbers of periodontists. Health care policy planners might benefit from understanding the effect of health insurance in limiting the negative impact of the need for periodontal care on daily life and in increasing the access of disabled persons to health care so that the presence of a disability does not increase the risk already associated with oral disease. The Disability Code was passed in Saudi Arabia in 2000 and granted disabled persons access to free health care, including dental treatment,

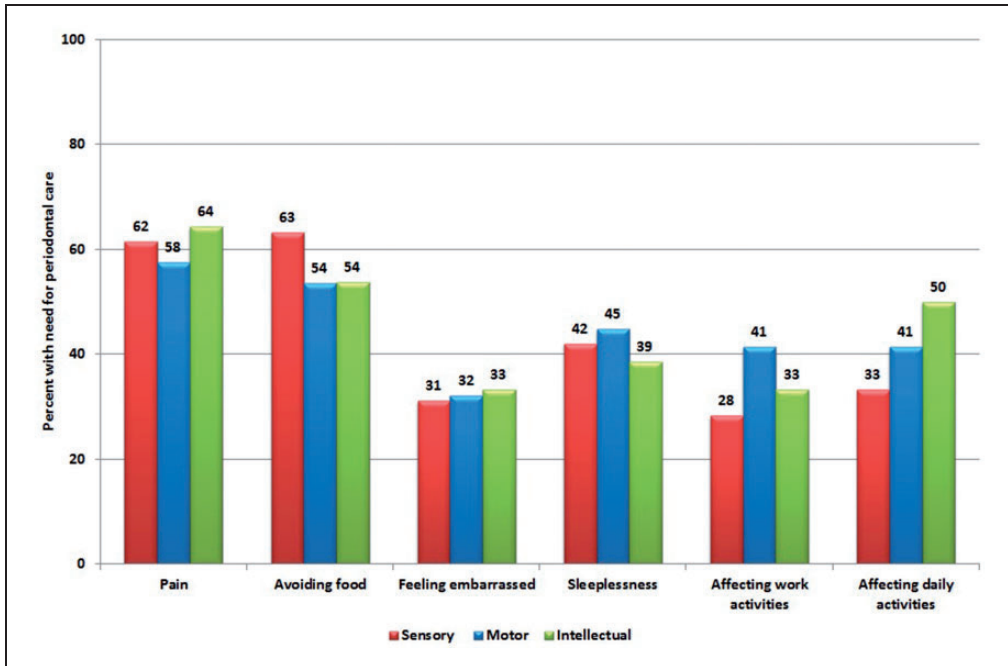


Figure 2. Impact of the need for periodontal care on daily life in persons with motor, sensory, and intellectual disabilities.

through public agencies.²⁵ The findings of our study are in agreement with those of previous reports, indicating the importance of enforcing such regulations. Further studies are needed to identify subjects with the greatest need of health insurance to maximize the benefit and reduce the cost of care. Our results are also important in developing health education programs that target the prevention of periodontal disease by addressing smoking because its effect seems to outweigh other risk factors.

In this study, 66.8% of subjects had a need for periodontal care impacting daily life. Treatment needs reportedly range from 92.0% in Denmark,²⁶ 85.2% in Spain,²⁷ 75.0% in Austria,²⁷ 63.3% in Germany,²⁸ and 54.5% in Finland²⁷ to 8.9% in Jonkoping, Sweden,²⁹ indicating large variation among countries depending on differences in disease levels, health care system structures, disease definitions, and

methodological issues.²⁷ In the present study, the definition of a need for periodontal care was based on different disease aspects that were combined to derive an overall yes/no decision regarding the need for care. This might partly explain the high level of need reported among the relatively young population in our study. The high prevalence might also be explained by the proportion of current smokers (25.3%), which is higher than the national figure of current smokers reported by the World Health Organization (12.2%)³⁰ and that reported by the Saudi Health Interview Survey (11.4%).³¹ However, the proportion of smokers in this study is consistent with the median prevalence of 22.6% reported by Bassiony.³² In our study, the prevalence of smoking was lower among the disabled. This is in agreement with Lee et al.,³³ who reported a higher frequency of never-smokers among Koreans with disabilities than

Table 2. Factors associated with a need for periodontal care with considerable impact on daily life.

Factors	Regression coefficient (95% confidence interval)		
	Model 1	Model 2	Model 3
Smoking			
Current vs. never	1.24 (0.80, 1.68)*	1.60 (0.92, 2.28)*	1.61 (0.93, 2.29)*
Former vs. never	0.28 (-0.45, 1.01)	0.30 (-0.61, 1.21)	0.30 (-0.62, 1.21)
Diabetes			
Uncontrolled vs. not	-0.07 (-1.10, 0.96)	-0.002 (-1.45, 1.45)	0.002 (-1.45, 1.45)
Controlled vs. not	0.10 (-0.53, 0.73)	0.44 (-0.47, 1.35)	0.43 (-0.48, 1.34)
Brushing			
≥2 times daily vs. never	-0.72 (-1.19, -0.24)*	0.05 (-0.65, 0.75)	0.05 (-0.65, 0.75)
≥3 times weekly vs. never	-0.39 (-1.01, 0.24)	0.10 (-0.73, 0.94)	0.12 (-0.72, 0.96)
<3 times weekly vs. never	-0.74 (-1.30, -0.18)*	0.24 (-0.57, 1.05)	0.23 (-0.58, 1.05)
Health-insured			
Yes vs. no	-0.52 (-0.85, -0.18)*	-0.54 (-1.01, -0.08)*	-0.55 (-1.02, -0.08)*
Previous dental visits			
During last year vs. never	0.23 (-0.18, 0.65)	0.53 (-0.10, 1.15)	0.52 (-0.10, 1.15)
Before last year vs. never	0.07 (-0.37, 0.52)	0.25 (-0.40, 0.89)	0.25 (-0.40, 0.90)
Professional cleaning			
During last year vs. never	-0.27 (-0.64, 0.10)	-0.16 (-0.75, 0.43)	-0.16 (-0.75, 0.43)
Before last year vs. never	-0.30 (-0.67, 0.06)	0.26 (-0.29, 0.82)	0.26 (-0.30, 0.81)

*Statistically significant at $P < 0.05$.

Model 1: univariate ordinal regression for each factor

Model 2: multivariable ordinal regression for all factors together adjusted for age, sex, marital status, and education

Model 3: multivariable ordinal regression for all factors together adjusted for age, sex, marital status, education, and disability status

among the general population (55.8% and 48.5%) with differences by type of disability. However, Nagarajan and Okoli³⁴ concluded in their 2016 systematic review that adolescents with physical disabilities were more likely than others to be smokers. Similar to our study, other researchers have reported a significant association between smoking and periodontal disease but not between brushing and periodontal disease in populations with modest oral hygiene practices (odds ratio = 1.50 and 1.16).³⁵

The prevalence of disability among the study sample (21.1%) was much higher than the national figure reported by Al-Jadid (3.73%).²⁵ This might be attributed to the definition of disability used in our study (dependent upon self-reports), or it might

reflect a higher prevalence in the Eastern Province than in other regions in Saudi Arabia. The latter cannot be ascertained because of the unavailability of data at the regional level. This prevalence was, however, similar to the worldwide level of 19.4% in the Global Burden of Disease report.¹¹

There was no significant difference in the need for periodontal care between healthy and disabled persons. This might be due to the similar distribution of risk factors (including smoking and toothbrushing) and health care system factors (including health insurance and previous dental visits). There was a higher prevalence of diabetes among the disabled than healthy persons, although most of the disabled persons had controlled diabetes, which might have

reduced its effect on periodontal tissues.³⁶ The prevalence of diabetes in our study (9.5%) was lower than that reported by the World Health Organization (14.4%)³⁷ and by the International Diabetes Foundation (17.6%).³⁸ Current evidence links chronic periodontitis to diabetes³⁹; type 2 diabetes increases both the risk⁴⁰ and severity⁴¹ of periodontitis and consequently the need for periodontal care and its impact on daily life. The low prevalence of diabetes in our study might explain the lack of a significant association with the need for periodontal care. We recommend investigation of the consistency of this lack of relationship between the two diseases in similar settings with a low prevalence of diabetes.

There were no significant differences in the need for periodontal care with an impact on daily life among persons with different types of disabilities. This might be attributed to the relatively small overall sample size of persons with disabilities. Because of this, we were not able to assess the interaction between various risk factors and the study outcome. Further studies are needed for a more detailed assessment of these potential differences.

In the present study, health insurance coverage was associated with a lower likelihood of the need for periodontal care impacting daily life. This finding is in agreement with that by Marlow et al.,⁴² who reported that uninsured African Americans with diabetes had a higher rate of clinical attachment loss events of ≥ 2 mm than those who were insured (rate ratio = 1.75), and the authors attributed this to a difference in health care access. The cost of periodontal care might be substantial and comparable with the cost of care of some noncommunicable diseases, increasing with disease severity.⁴³ Insurance coverage would help to address this cost issue. However, Singh et al.⁴⁴ reported that 65.4% of insured workers in New Delhi, India had periodontal pockets versus 84.5% of uninsured

workers. However, in their regression analysis, the addition of the insurance status to the model including age as an explanatory variable had little effect on accounting for the variation in periodontal disease (R^2 change = 0.04). The authors attributed this to the high prevalence of periodontitis in both groups.

Our results can be generalized to adults in their thirties with mostly a secondary school education and higher, modest frequency of health insurance, and low prevalence of diabetes and in which half of the population visits the dentist, undergoes professional cleanings, and brushes twice daily. Our findings may not apply to groups with a higher prevalence of diabetes.

Our study is limited by its cross-sectional design, which cannot prove causality; this can only be proven in longitudinal studies. Similarly, we do not claim that our sample is representative of Saudi Arabia. It included individuals from several cities in the Eastern Province, and we recommend further studies with nationally representative samples. The breakdown of the need for periodontal care in future studies into care provided at primary care facilities and care provided at secondary or tertiary care facilities would help in better workforce planning. Our study also assessed the need for periodontal care using dentists' perspectives. Future studies will be important to understand the views of disabled persons on health care quality and barriers to receiving care.

Conclusions

Saudi adults in the Eastern Province, whether healthy or disabled, had a high need for periodontal care. Among persons with a need for this care, disabled persons were more likely than healthy persons to have a negative impact causing them to be absent from work and to discontinue daily activities. The need for periodontal care with a considerable impact on daily life was more

likely among current smokers and those who were uninsured with no additional effect attributed to disability. Our findings should be considered in the planning of the workforce to meet dental treatment needs and in extending insurance coverage to disabled persons to reduce inequalities in their access to health care. Similarly, it is important to establish smoking cessation programs to control periodontitis.

Declaration of conflicting interest

The authors declare that there is no conflict of interest.

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