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California Dentists' Opinions of the Interface Between Oral and Overall Health

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ABSTRACT This cross-sectional study investigated California dentists' knowledge and opinion of the interface between oral and overall health. A questionnaire and cover letter explaining the purpose of the study were mailed to 1,100 randomly selected California licensed general dentists. The survey measured dentists' knowledge and opinions of the interface between oral and overall health as well as their recommendations for strengthening this interface. Dentists believed that there was minimal interface between oral and overall health care.

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Dental disease is considered a "silent epidemic."[1] Oral conditions, including untreated caries, severe periodontitis and severe tooth loss, collectively affected 3.9 billion people worldwide in 2010.[2] That year, 35 percent of the worldwide population had untreated caries in permanent teeth.[2] "Approximately 91 percent of U.S. adults aged 20 to 64 had dental caries in permanent teeth in 2011–2012."[3] National Health Interview Survey data show that 7 percent of adults aged 18 to 64 had poor oral health in 2008.[4]

Oral diseases and conditions have significant health, economic and social impacts on the population. Dental care has been identified as the most common unmet health need among American children.[1] "Every year, children lose approximately 52 million school hours and adults lose 164 million work hours because of dental disease."[1] Patients with dental problems account for millions of emergency room visits annually.

Many systemic diseases and conditions, including cardiovascular disease,[6,7] osteoporosis,[7] HIV/AIDS,[8] diabetes mellitus[9,10] and cancer, among others,[11,12] have been linked to oral diseases. There is a close association between oral health and general health. Dental caries and periodontal diseases are sources of systemic infection. Furthermore, many medications that treat systemic diseases can have detrimental effects on oral health,[1] such as xerostomia (listed as a side effect for more than 400 medications), dysgeusia and stomatitis.[13,14] Xerostomia is associated with an increased incidence of fungal infections[12] and dental caries.[15]

Oral health care is an important component of overall health care.[1] The

treatment and prevention of dental problems by dental professionals help in the prevention of many systemic conditions and their complications.[16–20] Life-threatening infections can occur if oral infection is not treated before immunosuppressive therapy.[21] For example, according to the American College of Rheumatology, "It is vital for patients to receive appropriate dental evaluation and prompt treatment so they can continue their immune suppressant medications."[22]

The undeniable close relationship between oral and overall health necessitates that all primary care providers, including dentists, physicians, pharmacists and nurses, collaborate in caring for patients and in managing the oral health-general health interface.[1] Dentists can positively impact the early detection, prevention and treatment of many systemic diseases and conditions in collaboration with other health care professionals. However, many primary care providers and the general public often do not perceive the link between oral health and overall health. For example, dentists may fail to consider the medical ramifications of the oral health care they provide.

Little is known about dentists' opinions of the interface between oral and overall health in the U.S. The aim of this study is to investigate California dentists' opinions of the oral and overall health interface. The specific objectives of the study are to:

- Determine dentists' perception of the interface between oral and overall health.
- Determine dentists' knowledge of issues surrounding oral and general health interface.
- Determine dentists' recommendations for strengthening the oral and overall health interface.

TABLE 1

Demographic and Practice Characteristics of Dentists

Items	Frequency	Percentage (%)
Type of practice setting at primary place of employment (n = 113)		
Private practice	89	78.8
Corporate dental setting	7	6.2
Community clinic	5	4.4
Hospital	–	–
Academic institution	3	2.6
Other (e.g., federal, military, VA)	9	8.0
Current job title (n = 114)		
Practice owner/Partner	66	57.9
Dentist/Staff dentist	44	38.6
Other (e.g., resident, managing orthodontist, etc.)	4	3.5
Area/Setting of your primary place of employment (n = 117)		
Urban	39	34.2
Suburban	65	57.0
Rural	10	8.8
Gender (n = 113)		
Male	80	70.8
Female	33	29.2
Race/Ethnicity (n = 112)		
African American/non-Hispanic black	–	–
American Indian or Alaska Native	–	–
Asian American/Pacific Islander	25	22.3
Caucasian/non-Hispanic white	72	64.3
Mexican American/Hispanic	10	8.9
Other	5	4.5
	Mean (SD)	
Age (n = 111)	53 (13.94)	
Number of years practicing dentistry (n = 109)	24.71 (13.15)	
Hours of work per week at primary place of employment (n = 112)	32.85 (8.66)	

Methods

The research protocol for this cross-sectional study was approved by the Loma Linda University Health Institutional Review Board (IRB). The study targeted all general licensed dentists practicing in California. The large number of dentists practicing in California as well as their diversity made it an ideal setting for this exploratory study.

Data Collection and Survey Instrument

Fifteen Likert-type questions were used to measure dentists' opinions of various issues surrounding the interface between oral and overall health. Additionally, seven Likert-type questions were used to measure dentists' recommendations for improving the oral-overall health interface. Each item was rated using a bipolar semantic

TABLE 2

Dentists' Opinions of Oral and Overall Health Interface

Item (n = 116)	Mean (SD)	Strongly Disagree/ Disagree N (%)	Neutral N (%)	Strongly Agree/ Agree N (%)
a. Physicians prescribing immunosuppressive and cytotoxic pharmaceuticals infrequently inquire about a patient's dental status (n = 115).	4.09 (1.0)	7 (6.1)	17 (14.8)	91 (79.2)
b. Physicians prescribing immunosuppressive and cytotoxic pharmaceuticals rarely advise patients about the importance of maintaining dental health while taking the medications (1 = 115).	3.81 (1.0)	12 (10.5)	25 (21.7)	78 (67.8)
c. Many primary care providers are aware of the relationship between oral health and the treatment/management of many systemic diseases (n = 115).	2.82 (1.1)	47 (40.9)	34 (29.6)	34 (29.8)
d. Many primary care providers often regard oral health as less important than other health needs of patients.	3.97 (0.8)	9 (7.7)	18 (15.5)	93 (80.2)
e. The dental discipline remains relatively segregated from other health care disciplines.	4.05 (0.8)	7 (6.1)	10 (8.6)	99 (85.3)
f. Little time is devoted to oral health topics in the education of nondental health professionals.	4.18 (0.7)	1 (0.9)	14 (12.1)	101 (87.1)
g. The separation of dental and other primary health care disciplines has grown over time.	3.28 (1.0)	26 (22.5)	42 (36.2)	48 (41.3)
h. Dental caries and periodontal diseases are generally thought of as infections by primary health care professionals.	2.91 (1.0)	44 (38.0)	36 (31)	36 (31.1)
i. As a dentist, I often consider the medical ramifications of the oral health care I provide (n = 117).	4.53 (0.7)	2 (1.8)	5 (4.3)	110 (94.0)
j. I generally regard oral health as an important component of overall medical (n = 117).	4.8 (0.5)	1 (0.9)	–	116 (99.1)
k. Many medications are prescribed by physicians without consideration of their oral health ramifications (n = 117).	4.08 (0.9)	7 (6.0)	17 (14.5)	93 (79.5)
l. The labels of most medications that can have xerostomic effects (dry mouth) do not contain information on the potential impacts on oral health (n = 117).	4.11 (0.8)	3 (2.6)	19 (16.2)	95 (81.2)
m. The inadvertent prescribing of medications that can have xerostomic effects without considering their oral health implications is a major problem (n = 117).	4.15 (0.8)	5 (4.3)	19 (16.2)	95 (81.2)
n. Patients taking medications that can have xerostomic effects are adequately informed about the importance of maintaining dental health while taking the medications (n = 117).	2.56 (1.2)	72 (61.5)	16 (13.7)	29 (24.8)
o. Pharmacists are a great resource to my patients for advice on drugs with oral health untoward effects.	3.66 (1.1)	20 (17.2)	24 (20.7)	72 (62.1)

differential scale anchored by strongly disagree (1) and strongly agree (5).

Dentists were asked to rate their knowledge of issues surrounding the oral and overall health interface (seven true or false items). The study also collected the following demographic and practice characteristics data (potential confounders): type of practice settings at primary place of employment, current job title, setting of primary place of employment, years practicing dentistry, gender, year of birth, racial-ethnic background and hours worked per week.

Data were collected using a self-administered, postage-paid anonymous paper survey that was mailed to the 1,256 randomly selected dentists' addresses in winter 2015. These dentists' addresses were obtained from a register provided by the California Department of Consumer Affairs. The simple random sampling was conducted using Microsoft Excel 2010. The survey booklet included the survey and a cover letter inviting the dentists to complete the survey. Upon completion of the survey, dentists were instructed to fold it with the business reply on the outside, secure it with tape and mail it back

TABLE 3

Dentists' Opinions on Strategies to Improve Oral Health

Item (n = 117)	Mean (SD)	Strongly Disagree/ Disagree N (%)	Neutral N (%)	Strongly Agree/ Agree N (%)
a. Oral health should be more closely regarded as an important component of overall medical care.	4.59 (0.6)	1 (0.9)	1 (0.9)	115 (98.3)
b. Dentistry should be identified as a medical subspecialty.	3.84 (1.1)	14 (11.9)	27 (23.1)	76 (65.0)
c. Drug labelling materials need to clarify that the most common dental diseases are infections.	3.91 (0.9)	4 (3.5)	33 (28.2)	80 (68.4)
d. Medicare should cover medically essential dental care/services.	4.16 (1.0)	7 (6.0)	17 (14.5)	93 (79.5)
e. Drug labeling should be modified as necessary to improve patients' understanding of the relationship between oral disease and risk of medical complications.	4.39 (0.6)	–	8 (6.8)	109 (93.2)
f. There is a need for more interprofessional care by primary care providers in managing oral health and overall health concerns of patients.	4.5 (0.5)	–	2 (1.7)	115 (98.3)
g. There is a need for improved integration of dentistry with other primary health care services.	4.41 (0.6)	1 (0.9)	6 (5.1)	110 (94.1)

to the researchers. No follow-ups or reminders were mailed to the dentists.

The survey took approximately 10 minutes to complete. Completing the survey indicated the dentists' consent. As an incentive, participating dentists were entered into a drawing to win an iPad 2 or one of 10 Amazon gift cards worth $25 each.

Data Analysis

Data were inputted into Microsoft Excel 2010 and then uploaded to PASW Statistics 22 (SPSS Inc., Chicago) for analysis. Descriptive statistics, such as means, standard deviations and frequencies, were computed for all study variables. Responses to all the 22 Likert-type items were collapsed into three categories: strongly agree/agree, neither agree nor disagree and strongly disagree/disagree. One-way analysis of variance (ANOVA) was computed to compare the mean attitude scores of dentists by practice location (urban, suburban and rural) and race/ethnicity; post hoc analysis was performed using Scheffe's method for all statistically significant differences ($p < 0.05$). Differences in scores by gender were analyzed using the independent t-test. Pearson correlation was run to explore the association between age and dentist scores on the 22 items. An a priori power estimation was conducted using G*Power version 3 software in order to determine the adequate sample size relative to the goals of the study.

Results

From the 1,256 survey packets that were mailed out, 256 were returned or not delivered for various reasons. Thus, 1,100 surveys were considered delivered. A total of 117 responses were received from these 1,100 surveys for a 10.6 percent response rate. Most dentists worked in private practice (n = 89; 76.1 percent), were male (n = 80; 70.8 percent) and were practice owners-partners (n = 66; 57.9 percent) (**TABLE 1**). The mean age of the dentists was 53 (SD = 13.9) years (range = 26 to 82 years; **TABLE 1**).

Most dentists indicated that they had encountered a situation in their practices whereby a patient's oral health was compromised because of prescription medications (n = 94; 84.7 percent). Most dentists strongly agreed/agreed that physicians prescribing immunosuppressive and cytotoxic pharmaceuticals infrequently inquire about a patient's dental status (n = 91; 79.2 percent): "Many primary care providers often regard oral health as less important than other health needs of patients" (n = 93; 80.2 percent) and "Little time is devoted to oral health topics in the education of non-dental health professionals" (n = 101, 87.1 percent) (**TABLE 2**).

Most dentists strongly agreed/agreed with the statements: "The labels of most medications that can have xerostomic effects (dry mouth) do not contain information on the potential impacts on oral health" (n = 95; 81.2 percent), "Many medications are prescribed by physicians without consideration of their oral health ramifications" (n= 93; 79.5 percent) and "The inadvertent prescribing of medications that can have xerostomic effects without considering their oral health implications is a major problem" (n = 95; 81.2 percent) (**TABLE 2**).

Most dentists strongly agreed/agreed that drug labeling should be modified

TABLE 4

Dentists' Knowledge of Oral and Overall Health Issues

Item (n = 117)	True N (%)	False N (%)	Don't Know N (%)
a. The use of many pharmaceuticals among individuals with oral infections poses an increased risk of medical complications (n = 115).	86 (74.8)	14 (12.2)	15 (13.0)
b. Many Americans do not receive even basic dental care that they need.	106 (90.6)	2 (1.7)	9 (7.7)
c. The risk of medical complications from bacterial dental infections increases among individuals who are immunocompromised by diseases or medications.	116 (99.1)	1 (0.9)	–
d. Dental cavities, periodontal diseases are infections (n = 116).	109 (94.0)	7 (6.0)	–
e. The oral cavity and its functions can be adversely affected by many medications used in treating systemic conditions.	113 (96.6)	–	4 (3.4)
f. Poor dental health can compromise the ability of patients to achieve good medical outcomes.	113 (96.6)	–	7 (3.4)
g. I have adequate knowledge of the interaction between oral health and the treatment/management of many systemic diseases.	84 (71.8)	15 (12.8)	18 (15.4)

as necessary to improve patients' understanding of the relationship between oral disease and the risk of medical complications (n = 109; 93.2 percent) and that there is a need for more interprofessional care by primary care providers in managing oral health and overall health concerns of patients (n = 115; 98.3 percent) (TABLE 3).

Most dentists were knowledgeable of the oral health issues investigated. Most dentists agreed with the statement, "I have adequate knowledge of the interaction between oral health and the treatment/management of many systemic diseases" (n = 84; 71.8 percent) and only 33 did not agree with the statement (28.2 percent) (TABLE 4).

Dentists' Opinions by Gender, Age, Practice Location and Race/Ethnicity

There was no significant difference in dentists' opinions by gender on 20 of the 22 items investigated ($p > 0.05$). However, female dentists had stronger opinions than male dentists on the remaining two items as follows: "Medicare should cover medically essential dental care/services" (4.52 versus 4.10; $p = 0.033$) and "Drug labeling should be modified as necessary to improve patients' understanding of the relationship between oral disease and the risk of medical complications" (4.64 versus 4.33; $p = 0.011$).

There was no significant difference in mean dentists' attitude scores by practice on 17 of the 22 items investigated ($p > 0.05$). On four items, those dentists practicing in urban areas had higher mean scores than those practicing in suburban areas ($p < 0.05$). The dentists practicing in urban areas had significant higher mean scores than those practicing in rural areas on the remaining item: "Drug labelling materials need to clarify that the most common dental diseases are infections" ($p = 0.019$).

The study results showed no significant mean differences by the race/ethnicity of the dentist on 19 of the 22 items ($p > 0.05$). Furthermore, age was not correlated with dentists' beliefs on 21 of the 22 items. However, younger dentists were more likely to agree with the statement "Medicare should cover medically essential dental care/services" than older dentists ($r = -0.237$).

Discussion

The study findings show that many dentists regard oral health as an important component of overall medical care and that they consider the medical ramifications of the oral health care they provide. As reported elsewhere,[23] this suggests that dentists understand the connection between periodontal diseases and systemic diseases and conditions. Similarly, a previous study of 7,400 U.S. general dentists found that most had a positive attitude toward medical screening in a dental setting.[24] Furthermore, most general dentists in California, West Virginia and Pennsylvania believed "that intervening with patients with diabetes was an important or very important part of their role as a dentist."[25] This heightened appreciation can be explained by several high-profile reports that highlighted the issue, including *Oral Health in America: A Report of the Surgeon General* in 2000.[1] Similarly, in 1995 the Institute of Medicine also recommended the close integration of dentistry with medicine.[26]

However, most dentists believed that the dental discipline remains

relatively segregated from other health care disciplines and that the separation has grown over time. This suggests that there is minimal collaboration between medical and dental providers in practice. Similarly, a previous study found that few general dentists discussed the association between systemic diseases and conditions and oral health.[27] Furthermore, general dentists were reported to be not confident to manage patients with dry mouth.[28] Kunzel and colleagues[29] found that most general dentists believed that the management of patients with diabetes was peripheral to their role. The separation of dental and other health disciplines has serious consequences on patient care especially in light of this study's findings, some of which are described below:

- Physicians prescribing immunosuppressive and cytotoxic pharmaceuticals infrequently inquire about a patient's dental status.
- Physicians prescribing immunosuppressive and cytotoxic pharmaceuticals rarely advise patients about the importance of maintaining dental health while taking the medications.
- Dental caries and periodontal diseases are not generally thought of as infections by primary health care professionals, including some dentists (**TABLE 4**).
- Medications that can have xerostomic effects are inadvertently prescribed without considering their oral health implications.
- Many medications are prescribed by physicians without consideration of their oral health ramifications.
- Patients taking medications that can have xerostomic effects are inadequately informed about the importance of maintaining dental health while taking the medications.

Collectively, these findings suggest that the evidence and scientific knowledge on the connection between general and oral health are not being readily translated into clinical practice by all the dentists. This can be explained by the existence of several barriers such as limited formal training, lack of knowledge, lack of reimbursement for some services, lack of time, lack of confidence and negative beliefs and attitudes.[25,30]

Much can and should be done to bridge oral and overall health care. First, as noted in a previous study, there is need for more education and awareness on the oral-systemic link among dentists and other health care providers.[23] Furthermore, dental schools should increase their integration of total health into their curriculum. Enhanced awareness and education about the importance of oral considerations in general health care diagnosis and treatment planning by dentists are essential for optimal care. Continuing dental education in this area is available for practicing dentists.

The evidence and scientific knowledge on the connection between general and oral health are not being readily translated into clinical practice by all the dentists.

Second, the dentists in this study noted that there is need for more interprofessional collaboration by all primary care providers. They also believed that "there is a need for improved integration of dentistry with other primary health care services" and that dentistry should be identified as a medical subspecialty. This suggests that these dentists appreciate the need to holistically and systematically address patient care and the importance of working closely with other primary care providers to further the oral and overall health care needs of their patients. Previous studies reported that dentists agreed to physicians conducting routine dental assessment and counseling patients on the prevention of dental problems.[31] Interestingly, dentists believed that, "Pharmacists are a great resource to my patients for advice on drugs with untoward oral health effects." This is encouraging and augurs well for interprofessional collaboration between these two professions. All primary care providers should work collaboratively in managing the oral and general health concerns of their patients.[1,32] Dentists can refer patients with potential health issues identified during regular dental checkups to physicians for follow up. More interdisciplinary care will result in improved dental diagnosis and treatment planning as part of a holistic care plan.

The study results showed that the dentists' beliefs about the interface between oral and overall health were not generally significant related with the dentists' age, race-ethnicity, practice location and gender. However, there were significant differences in dentists' beliefs on the item, "Medicare should cover medically essential dental care/services" by gender (female = higher), location (urban higher than suburban) and age (negative correlation). More research needs to be conducted to further explore reasons for this finding.

The study is limited by the small sample size and the low response rate of 10.6 percent, which limit the generalizability of the findings. It is possible that those who responded to this study had opinions different from those who did not, making nonresponse bias

a concern. The low response rate can be explained by the fact that we did not send a second mailing or reminders to the dentists. However, a previous study involving dentists reported a similarly low response rate (12 percent).[25] Furthermore, the study sample's gender distribution and mean age closely resembled those of the California Dental Association (CDA) members. For example, in 2015, 70.5 percent (n = 16,363) of CDA members were male (compare with sample = 70.8 percent) and had a mean age of 53 years (exactly the same mean for this sample) (K. Ross-Patchin, director of membership, personal communication, March 31, 2016). This suggests that our study sample is somewhat representative of the population of CDA members. Consequently, this study provides useful insight into the dentists' opinions and knowledge of the oral-systemic health link. Further research into dentists' opinions and knowledge pertaining to the oral-systemic health link utilizing larger samples are needed.

Conclusion

Despite many dentists having a positive attitude toward the role of oral health in overall health care, they believed that there was minimal interface between oral and overall health care in practice. More interdisciplinary and collaborative care by all health care providers is necessary to appropriately manage their patients' oral and overall health care needs. ■

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