



## Dentists' Awareness about the Link between Oral and Systemic Health

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### Abstract

**BACKGROUND:** Oral health is essential for overall wellness. Increasing research suggests a connection between periodontal and systemic disorders. The objective of the study was to assess the level of knowledge among dentists on the correlation between oral health and overall systemic health.

**MATERIALS AND METHODS:** The data was obtained through the use of a self-administered questionnaire that had been tested in a preliminary trial. The level of dentists' understanding regarding the connection between oral health and systemic health was evaluated using a five-point Likert scale. The data was inputted and analyzed using SPSS.

**RESULTS:** Out of the total of 588 dentists, 500 dentists successfully filled out the questionnaire, resulting in a response rate of 85.03%. 93% of the subjects, with a mean age of  $25.82 \pm 4.21$  years, expressed agreement with the correlation between dental health and systemic health. A majority of dentists (84.4%) were cognizant of the correlation between periodontal disease and diabetes, whereas a significant proportion (70.2%) recognized the link between periodontal disease and heart disease. Similarly, 85.6% of respondents held the belief that oral disease had a detrimental effect on the quality of life of patients. A significantly higher proportion of female dentists than male dentists demonstrated awareness of the association between periodontal disease and unfavorable pregnancy outcomes, diabetes, and rheumatoid arthritis ( $P < 0.001$ ). An overwhelming majority of dentists (97%) held the belief that increased patient awareness of the oral-systemic relationship will lead to a higher demand for dental care. Following adjustments, private dentists exhibited a 4.65-fold higher likelihood compared to public dentists in their belief that enhancing access to oral care might be achieved by increasing patient understanding of the oral-systemic relationship ( $P = 0.011$ ).

**CONCLUSIONS:** The majority of dentists were knowledgeable of the connection between oral health and systemic health. Their belief was that patients' access to oral care would be enhanced if they were informed about the correlation between oral and systemic health. Hence, it is imperative to educate patients about the connection between oral and systemic health in order to enhance their oral well-being.

**Keywords:** Oral care, oral health, dental professionals, systemic health

### Introduction

Observational and clinical research have found links between dental disease, namely periodontal disease, and chronic systemic disorders such as diabetes, coronary artery disease, unfavorable pregnancy outcomes, and rheumatoid arthritis (RA) [1,2,3,4]. There is a suggestion that the inflammatory process triggered by certain substances in periodontal disease can allow oral bacteria, lipopolysaccharides, and proinflammatory molecules to enter many parts of the body. This may lead to the development of chronic systemic illnesses and infectious diseases [5]. *Porphyromonas gingivalis*, a bacteria that causes periodontal disease, has been discovered as a powerful factor that contributes to vascular and atherosclerotic alterations in cardiovascular disease [6]. Furthermore, the examination of DNA in the synovial joint fluid of individuals with rheumatoid

arthritis (RA) revealed the presence of periodontal bacteria, indicating their potential involvement in the development of RA. The user's text consists of the number 7 enclosed in square brackets. Periodontal disease and diabetes mellitus have a bidirectional link. Diabetes significantly increases the likelihood of developing periodontal disease, whereas uncontrolled periodontal disease can worsen insulin resistance and disturb the regulation of blood sugar levels [2]. Furthermore, studies have demonstrated that periodontal care can enhance glycemic control in individuals with diabetes [8].

Cardiovascular disorders, diabetes, malignancies, and lung illnesses are the primary causes of death for millions of people worldwide [9]. The increasing prevalence of chronic diseases highlights the need for the dentistry community to obtain evidence-based information on oral and systemic diseases. Moreover, understanding the connection between oral and systemic health in patients might significantly influence their ability to obtain oral treatment. A survey conducted among dentists in the United States revealed that knowledge about the connections between oral health and overall health can motivate consumers to seek dental care at dental clinics. [10]. However, it was discovered that a majority (two-thirds) of patients suffering from chronic periodontal disease were not aware of the connection between periodontal care and systemic disorders [11]. Dental professionals must prioritize updating their knowledge and informing patients about the connection between periodontal disease and systemic disorders, as well as the oral symptoms of systemic diseases, and the influence of oral health on individuals' quality of life. A prior qualitative investigation documented the dentists' perspectives on the correlation between oral disease and systemic disease [10]. Enhancing dentists' comprehension of the oral-systemic connection will enable them to educate patients effectively, encouraging them to enhance their oral and overall well-being by seeking the expertise of dental-care professionals. Moreover, this would also result in enhanced cooperation among dentists and other healthcare practitioners. Nevertheless, there is a dearth of quantitative evidence in the literature about dentists' awareness of these correlations. Understanding these associations can have a substantial impact on improving oral health outcomes for patients. Hence, the aim of the research was to document the level of knowledge among dentists on the connection between dental health and overall systemic health, as well as the factors influencing this awareness.

### **Materials and Methods**

The current investigation was performed using a cross-sectional design. The dentists participating in the study were chosen from both commercial and public dental clinics as well as dental institutes. The researchers constructed a self-administered questionnaire by doing a thorough literature search [1,2,3,4,5,8,10,11] and engaging in a comprehensive debate about the instrument. The completed version of the questionnaire was distributed to faculty members specializing in public dental health for assessment and feedback. These methods were implemented to guarantee the instrument's content and face validity and reliability. Furthermore, a convenient sample of 30 dentists was chosen to pilot test the questionnaire in order to assess its comprehensiveness and the extent of the survey's coverage. The data of these 30 dentists were excluded from the study. Furthermore, this contributed to enhancing the legibility and precision of the device. In addition, Cronbach's alpha was computed to assess the internal consistency of the questions that assess the oral-systemic link, yielding a value of 0.79, which indicates a satisfactory level of internal consistency.

Data on demographic information, such as participants' occupation, year of graduation, professional qualifications, average monthly salary, degree awarding institution, and awareness of the oral-systemic relationship, were collected from the study participants. The attitudes of the participants were evaluated through the use of 11 items that explored the connection between oral health and systemic health, the correlation between periodontal disease and systemic diseases, the oral symptoms of systemic diseases, and the impact of dental disorders on individuals' quality of life. These items were rated using a 5-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree). In order to facilitate statistical analysis and interpretation, the replies were classified into three categories: agree, neutral, and disagree. The category "agree" was formed by merging the options of "strongly agree" and "agree," whereas the options of "disagree" and "strongly disagree" were combined to create the "disagree" category.

Furthermore, the researchers documented the dentist's eagerness to provide knowledge to patients and identified any obstacles that hindered the dissemination of oral health education.

In 2018, there were a total of 8865 dentists registered in the Punjab province. The sample size was determined for the Lahore region by considering the number of dental professionals (>2000), a 5% confidence limit, and the percentage frequency of the outcome variable. A total of 588 dentists were personally called to obtain their comments. The research assistants conducted visits to both public hospitals and private clinics in the city in order to distribute physical copies of the surveys. The study recruited a sample of dentists using a convenience sampling method. The dentists were contacted twice in the event that they were unable to allocate the necessary time to complete the questionnaire during their initial visit. Each subsequent visit occurred at an interval of 2-3 weeks. The institutional review board granted ethical approval. Obtained informed written consent and adhered to ethical standards in accordance with the criteria of the World Medical Association's Declaration of Helsinki.

The statistical analysis encompassed descriptive statistics, including percentages, means, and standard deviations, for several variables within the study. The Pearson's Chi-square test was employed to compare the responses of male and female dentists, dentists with fewer and more years since graduation, and dentists with low and high monthly salary. The impact of awareness of the oral-systemic relationship on access to oral care was analyzed using bivariate and multivariate analyses. Independent variables such as kind of employment, years since date of graduation, basic dental certification, and monthly income were examined for their influence. A significance level of less than 0.05 ( $P < 0.05$ ) was employed for statistical analysis. The data entry and analysis were conducted using the SPSS software (IBM SPSS Statistics for Windows, version 22.0. Armonk, NY: IBM Corp).

## Results

The questionnaire was returned by 500 out of 588 dentists, resulting in a response percentage of 85.03%. The average age of the participants was  $25.82 \pm 4.21$  years. The majority of them, specifically 66.2%, were female. Additionally, 79.6% of them were employed in private dental clinics, and 87.6% had obtained their basic dental certification from private dental institutions. Among the dentists surveyed, 76.2% had less than or equal to 5 years of experience since graduating, and 79.4% had a monthly income of <500 \$ U.S. [Table 1]. The individuals who expressed disagreement, extreme disagreement, or selected the neutral options were classified as "unaware" of the issue about the oral-systemic relationship. Participants who indicated agreement or strong agreement were classified as "aware" of the connection between the oral and systemic systems. A score measuring awareness, ranging from 11 to 55, was computed for 11 questions related to the oral-system relationship. The study sample comprised 34.2% ( $N = 171$ ) of participants who demonstrated awareness of 11 topics pertaining to the oral-systemic link. Out of the participants, 3.6% ( $N = 18$ ) had no knowledge of 11 questions regarding the oral-systemic link, whereas 62.2% ( $N = 311$ ) of the sample had partial awareness of the remaining questions on the oral-systemic link.

**Table 1** Demographic characteristics of the dentists in Lahore (n=500)

Variables	Number (%)
Gender	
Male	169 (33.8)
Female	331 (66.2)
Type of job	
Private	398 (79.6)
Public	55 (11.0)
Both	47 (9.4)
Basic dental qualification obtained from	
Private institution	438 (87.6)
Public institution	62 (12.4)
Years since graduation	
$\leq 5$	381 (76.2)

>5	119 (23.8)
Monthly income (\$U.S.)	
<500	397 (79.4)
≥500	103 (20.6)
Age, mean±SD	25.82±4.21

SD: Standard deviation

**Table 2** demonstrates the distribution of participants' comments regarding the oral-systemic link. The results were described by combining the responses that were agreed and strongly agreed. Throughout the investigation, a significant majority of 93.2% of the participants expressed agreement or strong agreement regarding the correlation between oral health and systemic health. Similarly, the majority of respondents acknowledged the presence of the two-way connection between diabetes and periodontal disease (84.4%), oral symptoms of systemic disease (84%), and the adverse effects of oral disease on patients' quality of life (85.6%). 70.2% of the participants were aware of a correlation between periodontal disease and heart disease. The study found that the lowest levels of agreement were observed for the relationship between periodontal disease and respiratory disease, with just 24.4% of participants agreeing or strongly agreeing. Similarly, the association with renal disease had a low agreement level of 31.6%, while the association with stroke had a somewhat higher agreement level of 37%. Analyzed data were used to investigate the disparities in responses among male and female respondents, dentists with a monthly income below \$500 U.S. and those with a monthly income of \$500 U.S. or more, and participants with less than or equal to 5 years of experience since graduation and those with more than 5 years of experience. The responses that were agreed and strongly agreed were merged to form "agree responses" and demonstrated in Table 3. A considerably greater proportion of females than males held the belief that oral health was connected to systemic health ( $P < 0.001$ ). Additionally, females were more knowledgeable about the association between periodontal disease and negative pregnancy outcomes ( $P < 0.001$ ), diabetes ( $P < 0.001$ ), and RA ( $P < 0.001$ ). In comparison to male participants, a larger proportion of female respondents believed that systemic disorders are evident through oral signs and symptoms ( $P < 0.001$ ), and that oral diseases can have a detrimental impact on patients' quality of life ( $P < 0.001$ ).

**Table 2.** Knowledge of dentists regarding the correlation between dental and systemic health

Responses	Disagree N (%)	Neutral N (%)	Agree N (%)
I know that oral health is associated with systemic health	12 (2.4)	22 (4.4)	466 (93.2)
I know that periodontal disease is associated with heart disease	51 (10.2)	98 (19.6)	351 (70.2)
I understand that periodontal disease is associated with stroke	125 (25.0)	190 (38)	185 (37.0)
I believe that periodontal disease is related to adverse pregnancy outcomes	95 (19.0)	100 (20)	305 (61.0)
I am aware of the existence of two-way relationship between periodontal disease and diabetes mellitus	38 (7.6)	40 (8.0)	422 (84.4)
I know that periodontal disease is related to rheumatoid arthritis	120 (24.0)	199 (39.8)	181 (36.2)
I understand that there is an association between periodontal disease and respiratory disease	137 (27.4)	242 (48.4)	121 (24.2)
I am aware of a relationship between periodontal disease and chronic kidney disease	100 (20.0)	242 (48.4)	158 (31.6)
I believe that a link exists between periodontal disease and oral cancers	67 (13.4)	133 (26.6)	300 (60.0)

I understand that many systemic diseases have oral manifestations which further complicate oral and systemic diseases	24 (4.8)	56 (11.2)	420 (84.0)
I am aware of the negative effects of oral disease on the quality of life of individuals	22 (4.4)	50 (10.0)	428 (85.6)

**Table 3.** Distribution of awareness of dentists regarding the correlation between oral and systemic health by gender, monthly income, and years since graduation

Responses	Gender			Monthly income			Year since graduation		
	Male N (%)	Female N (%)	P-Value	<500 \$ N (%)	≥500 \$ N (%)	P-Value	≤5 years N (%)	>5 years N (%)	P-Value
I know that oral health is associated with systemic health	143 (30.7)	323 (69.3)	<0.001 *	371 (79.6)	95 (20.4)	0.081	361 (77.5)	105 (22.5)	0.063
I know that periodontal disease is associated with heart disease	110 (31.3)	241 (68.7)	0.398	256 (72.9)	95 (27.1)	<0.001 *	247 (70.4)	104 (29.6)	<0.001 *
I understand that periodontal disease is associated with stroke	45 (24.3)	140 (75.7)	0.075	131 (70.8)	54 (29.2)	<0.001 *	121 (65.4)	64 (34.6)	0.177
I believe that periodontal disease is related to adverse pregnancy outcomes	80 (26.2)	225 (73.8)	<0.001 *	245 (80.3)	60 (19.7)	0.243	223 (73.1)	82 (26.9)	0.22
I am aware of the existence of two-way relationship between periodontal disease and	121 (28.7)	301 (71.3)	<0.001 *	338 (80.1)	84 (19.9)	<0.001 *	316 (74.9)	106 (25.1)	0.615

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diabetes mellitus									
I know that periodontal disease is related to rheumatoid arthritis	37 (20.4)	144 (79.6)	<0.001 *	156 (86.2)	25 (13.8)	0.001*	133 (73.5)	48 (26.5)	<0.001 *
I understand that there is an association between periodontal disease and respiratory disease	47 (38.8)	74 (61.2)	0.789	95 (78.5)	26 (21.5)	0.013*	65 (53.7)	44 (27.8)	0.006*
I am aware of a relationship between periodontal disease and chronic kidney disease	67 (42.4)	91 (57.6)	0.198	121 (76.6)	37 (23.4)	0.043*	114 (72.2)	60 (20.0)	<0.001 *
I believe that a link exists between periodontal disease and oral cancers	111 (37.0)	189 (63.0)	0.614	239 (79.7)	61 (20.3)	0.918	240 (80.0)	107 (25.5)	0.958
I understand that many systemic diseases have oral manifestations which further complicate oral and systemic diseases	139 (33.1)	281 (66.9)	<0.001 *	323 (76.9)	97 (23.1)	0.008*	313 (74.5)	106 (24.8)	
I am aware of the negative effects of oral disease on the	131 (30.6)	297 (69.4)	<0.001 *	338 (79.0)	90 (21.0)	0.060	322 (75.2)		0.030*

quality of life of individuals									
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\*Statistically significant

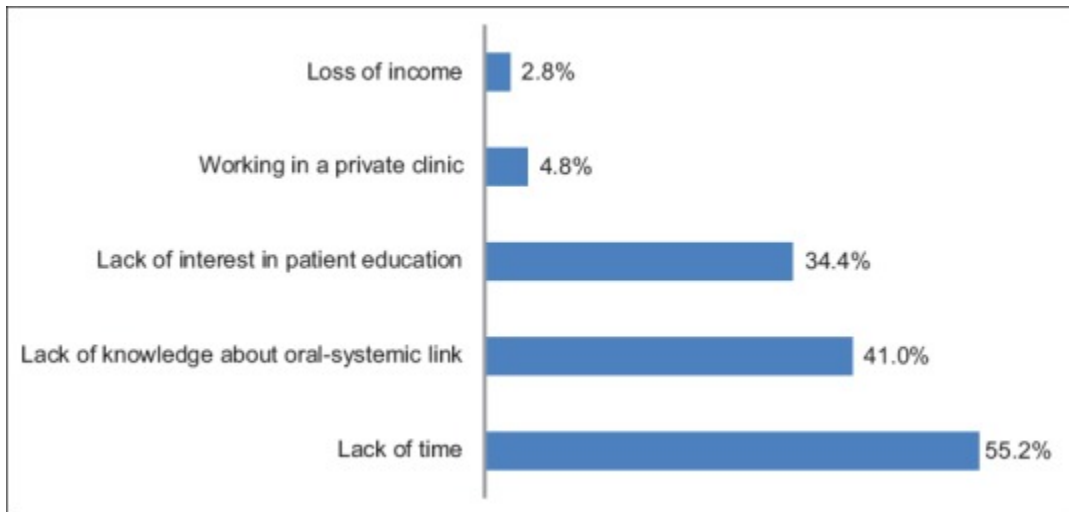
A significantly greater proportion of dentists earning less than \$500 per month recognized the correlation between periodontal disease and heart disease ( $P < 0.001$ ), stroke ( $P < 0.001$ ), diabetes ( $P < 0.001$ ), RA ( $P < 0.001$ ), and respiratory disease ( $P < 0.013$ ) compared to those earning at least \$500 per month. When comparing the years of experience since graduation, a higher proportion of dentists with  $\leq 5$  years of experience compared to those with  $> 5$  years of experience believed in the connection between periodontal disease and heart disease, stroke, respiratory disease, oral cancer, and the quality of life. These variations were statistically significant ( $P < 0.001$ ).

According to the survey, a significant majority of 97% of the participants expressed the belief that an increased number of patients would actively seek oral care if they were aware of the connection between oral health and overall health. The bivariate analysis revealed that dentists in private practice had significantly greater chances (odds ratio [OR] 4.81) of believing in the awareness of the oral-systemic relationship and enhancement of access to oral care compared to those in public clinics ( $P 0.002$ ). In the same vein, dentists who earned a lower monthly income (OR 3.44) and had  $\leq 5$  years of experience (OR 3.9), as well as those who obtained their basic dental certification from private universities (OR 6.59), were more inclined to acknowledge the connection between oral and systemic health and the need for better access to oral care. The results of the multivariate logistic regression analysis revealed that private practitioners were 4.65 times more likely than public dentists to believe in an oral-systemic relationship and increased access to oral care ( $P = 0.011$ ) [Table 4]. Every participant expressed their readiness to inform patients about the correlation between dental health and systemic health. Nevertheless, the primary obstacles to patient education were identified as limited time (55.2%), insufficient knowledge (41%), and a shortage of interest in educating patients (34.4%) [Figure 1].

**Table 4.** Bivariate and multivariate logistic regressions: Factors correlated with dentists comprehension about link between oral and systemic health

Factors	Awareness of dentists about link between oral and systemic health			
	OR (95% CI)	P-Value	AOR (95% CI)	P-Value
Type of job				
Private clinic	4.81 (1.58-14.65)	0.002*	4.65 (1.43, 15.13)	0.011*
Public clinic				
Monthly income (\$U.S.)				
<500	3.44 (1.13-10.48)	0.021*	0.86 (0.15, 4.89)	0.864
$\geq 500$				
Years since graduation (years)				
$\leq 5$	3.9 (1.28-11.86)	0.01*	1.41 (0.22-9.11)	0.717
$> 5$				
Basic dental qualification obtained from				
Private college	6.59 (2.14-20.33)	$< 0.001^*$	5.46 (0.99-29.85)	0.05
Public college				

\*Statistically significant. CI: Confidence interval, OR: Odds ratio, AOR: Adjusted Odds ratio



**Figure 1.** Barriers to patient education about the oral-systemic link

## **Discussion**

The research investigation revealed that the majority of dentists possessed knowledge on the correlation between oral health and systemic health. The U.S. Surgeon General's Report emphasizes that oral health is crucial for overall health, and that maintaining good oral health can help in the prevention process.[12] The oral cavity is recognized as a crucial indicator of overall health, as one's general well-being is dependent on maintaining excellent oral health.[13,14] Failure to address oral issues can result in severe oral consequences, causing financial and social hardships, and negatively impacting the patients' quality of life.[12] A recently published epidemiological cohort study conducted over a span of 44 years has found a greater risk of death linked to inadequate oral health.[15]

Periodontal disease is strongly linked to coronary heart disease and myocardial infarction.[16,17]. Furthermore, studies have demonstrated a correlation between periodontal bacteria and dyslipidemia, atherosclerosis, and hypertension.[18,19,20] Nevertheless, it remains unclear whether this association is causal, and there is no definitive evidence to support this claim.[16,17] The American Academy of Periodontology endorses the American Heart Association's assertion that there is a correlation between periodontal disease and heart disease, regardless of shared risk factors. The academy highlights the need of individuals and health-care providers being cognizant of the heightened susceptibility to heart disease resulting from periodontal disease.[21] Empirical research has demonstrated that periodontal treatment can lead to a decrease in serum cholesterol levels and inflammatory markers (interleukin-6, C-reactive protein)[22] and an enhancement in endothelial functions[23] and atherosclerotic profile.[24]

A much robust correlation exists between periodontal disease and cerebrovascular conditions.[17] A meta-analysis of cohort studies revealed a substantial elevation in the risk of stroke (relative risk 1.63) associated with periodontal disease.[25] A new study has established a correlation between periodontal disease and the occurrence of ischemic stroke. Additionally, it has been discovered that receiving regular dental care can decrease the likelihood of experiencing a stroke.[26] Furthermore, an actual reciprocal association has been discovered between periodontal disease and diabetes, and research has demonstrated that the treatment of either ailment can have a beneficial impact on the other.[2, 27] An evident association was found between effective periodontal therapy and the occurrence of full-term birth (OR 6.02; 95% confidence interval 2.57–14.03).[28] The majority of participants in our survey demonstrated knowledge on the association between periodontal disease and chronic systemic disease, aligning with the existing body of research. Similarly, in



a prior qualitative study, dentists primarily examined the correlation between periodontal disease and heart disease, diabetes, and the outcomes of pregnancy.[10]

Throughout a prior qualitative investigation, dentists recommended prioritizing the maintenance of patients' oral and overall health as primary caregivers. Furthermore, some dentists expressed a strong conviction that educating patients about the connection between oral and systemic health is essential for providing the best possible dental care.[10] Our study found that 97% of dentists agreed that consumers' understanding of the connection between oral and systemic health could lead to an increase in the number of people seeking dental care. Dentists in the private sector were 4.65 times more inclined to acknowledge the influence of the oral-systemic connection in relation to enhancing dental care accessibility, compared to dentists in the public sector. This is likely due to the fact that dentists who work in private clinics manage their dental practice as a company. Consequently, they can more effectively assess the influence of an increased patient volume seeking oral healthcare on the efficiency and financial success of their clinics. On the other hand, the government provides salary and additional perks to dentists employed in the public sector. Consequently, public dentists were less inclined to evaluate how the consumption of dental care affected their practice's income.

The current study demonstrated a statistically significant correlation between lower monthly incomes of dentists and their awareness of the relationship between oral and systemic health. This includes the connection between periodontal disease and certain chronic diseases ( $P < 0.001$ ). Dentists with lower monthly income may have a reduced patient load in their dental clinics, allowing them more time to stay updated on oral and systemic problems. In our study, we identified similar patterns of increased awareness of the connection between oral health and overall health among female dentists and those who had graduated within the past five years. Earlier research revealed that female dentists had a lower weekly working hours compared to their male.[29] it is probable that female dentists had a greater amount of leisure to peruse the most recent dental literature, thereby elucidating why a higher proportion of females were knowledgeable about the oral-systemic connection. Recent dental school graduates may have a greater chance of remembering material compared to those who graduated several years ago. This may indicate a deficiency in the availability of opportunities for ongoing professional development for dentists who are currently practicing, or a lack of pathways and resources in the country for them to update their scientific knowledge.

In 2013, a total of about 54 million individuals worldwide died primarily to heart disease, diabetes, malignancies, and respiratory disorders.[30] The global incidence of these diseases is experiencing a rapid upward trend, paralleled by the growing population of elderly individuals, so exacerbating the situation. Over 100 systemic illnesses exhibit oral manifestations, while over 500 drugs might induce oral signs and symptoms.[31] Furthermore, a growing number of older individuals are keeping their original teeth and hence need dental care.[32] However, it is essential to have affordable healthcare for individuals who have excellent dental health.[33] Hence, providing patients with education regarding the significance of the correlation between oral and systemic health can be highly advantageous in optimizing the healthcare advantages for patients.

The research we've conducted has yielded valuable evidence from a substantial sample of dentists that can be employed to expand the knowledge and understanding of the dental community, hence improving patients' oral seeking habits. However, there were specific constraints. The current results may not accurately reflect a significant population of dentists in a densely populated metropolis due to the fact that the sample primarily consisted of females, dentists with basic dental qualifications gained from private dental institutions, and dentists who practiced in private dental clinics. Additionally, there is a potential for an excessive number of responses being reported due to dentists acknowledging their understanding of the connection between dental health and overall health, but not consistently evaluating the most recent information on the topic. A future study should investigate if providing information about the oral-systemic relationship leads to an increase in patients seeking oral care, routine dental visits, or dental operations.

### **Conclusions and Recommendations**

The research investigation revealed that the majority of dentists possessed knowledge on the correlation between oral health and systemic health. A significant majority of dentists acknowledged the correlation between periodontal disease, diabetes, and heart disease. Likewise, the majority of dentists recognized the detrimental effect of dental disease on the patients' quality of life. The consensus among dentists is that increased awareness of the connection between oral and systemic health would result in a higher number of patients seeking dental care. Insufficient time and limited understanding were the primary obstacles to educating patients about the oral-systemic relationship.

Continuing education programs should prioritize the education of dental, medical, and other health-care professionals on the strong and up-to-date evidence about the connection between oral health and overall health. When teaching patients, it is important to provide them with robust and current research. However, it is crucial to refrain from making statements regarding the cause-and-effect relationship between periodontal disease and other systemic illnesses. Dentists, physicians, and other healthcare providers should use these data to improve the availability of dental treatment and better the oral health of their patients. It is important for general physicians and other health-care providers to consistently acquaint themselves with the most recent studies regarding the connection between oral and systemic health. It is advisable for them to form robust partnerships with dental experts in order to build an effective system for referring patients. This will enhance the overall well-being of individuals and enable them to maintain better physical and mental health.

### **Conflicts of interest**

There are no conflicts of interest.

### **Acknowledgment**

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