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Omicron and periodontal health; a clinical exploration of gingivitis and periodontitis

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Abstract

Introduction: The COVID-19 pandemic has profoundly affected global health, with variants such as Omicron posing new challenges due to their increased transmissibility and potential to evade immunity. Periodontal diseases, which are highly prevalent worldwide, have been linked to various systemic conditions, including respiratory infections.
Objectives: To determine how periodontal problems affect Omicron infection susceptibility, symptom severity, and outcome in individuals infected with this variety and discover oral microbiota biomarkers that indicate severe Omicron patients.
Materials and Methods: To gather data, a quantitative descriptive study was instituted, utilizing a well-structured questionnaire comprising multiple-choice and Likert scale questions. The sample population, dentists in Erbil, was reached through email, followed by statistical analyses involving mean scores, standard deviations, and practices degree to interpret the data.
Results: Results displayed a varied range of perceptions, with significant discrepancies highlighted through high standard deviations in specific responses, pointing to the necessity for homogenized guidelines or educational outreach. The overall mean score categorized the sentiment as 'Medium,' indicating a moderate level of consensus on the relationship between the Omicron variant and periodontal issues.
Conclusion: This exploration unveils not only a nuanced understanding among the dentist community but also showcases domains where unanimity is deficient, calling for intensified research and educational efforts to harmonize perspectives in this pressing matter, especially amid the prevalence of the Omicron variant. The findings signify an imperative to foster aligned understandings through enhanced educational interventions in the dental community in Erbil, Kurdistan, Iraq, potentially steering towards a more cohesive approach in handling cases with pre-existing periodontal conditions amid the Omicron surge.

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Introduction

The COVID-19 pandemic has had an unprecedented global impact, affecting virtually every aspect of human life from public health to economies and social structures (1). As the world grapples with waves of infections, variants of concern like the Omicron strain present new challenges that add layers of complexity to an already dire situation (2). This study seeks to address these important issues and give timely, potentially essential insights into how we comprehend, manage, and maybe minimize this pandemic (3). With healthcare systems across the globe already strained, research that can inform targeted interventions is more crucial than ever (4). The Omicron variant has elicited considerable concern due to its increased transmissibility, potential to evade immunity, and rapid spread (5). These traits threaten to overwhelm healthcare systems that are still recovering from the ongoing pandemic's initial phases (6,7). Numerous studies have explored Omicron's epidemiological and virological effects, but few have examined its clinical effects, especially on periodontal disease (6,8). Preliminary investigations have indicated that periodontal disease could be a significant factor in determining the severity of COVID-19 outcomes (9). Understanding

Key point

This research examined the association between periodontal diseases and COVID-19 Omicron. A systematic questionnaire was conducted to obtain quantitative descriptive data from Erbil, Kurdistan, Iraqi dentists. Dentists agreed somewhat on how periodontal disorders affect Omicron infection severity. The results indicate that oral health is important in treating Omicron infections, emphasizing the need for improved education and therapeutic recommendations to improve patient outcomes during the pandemic.

this association is crucial since periodontal disease affects a large number of individuals worldwide and ranks 11th in prevalence (10). Given this background, this research aims to clinically examine how periodontal disease affects Omicron infections (11).

We intend to study mechanical links between periodontal infections and respiratory disorders, especially how they may affect Omicron variant severity and transmission (12). This discovery is relevant since the unique Omicron variation affects the upper respiratory system. This study focuses on this area to address a major knowledge vacuum that might affect healthcare policy and clinical practices immediately. We used quantitative and qualitative methods to attain our research goals. The research collects clinical opinions on periodontal disease and Omicron infection from dentists in Erbil, Kurdistan, Iraq, using a professionally constructed questionnaire. The questionnaire includes multiple-choice and Likert scale questions to fully grasp respondents' opinions (13). The data will be analyzed using a range of statistical methods, allowing us to discern patterns and draw robust conclusions. The importance of this study cannot be overstated, especially in the current pandemic context where healthcare systems worldwide are already stretched thin (14). By establishing the relationship between periodontal diseases and the Omicron variant, our study aims to provide timely data that can inform both public health policies and clinical guidelines. Moreover, the study can serve as a foundation for further research (15), including in-depth clinical trials that could validate our initial findings and perhaps lead to targeted therapies or preventative measures for those at high risk of severe Omicron infection (16). The rest of this article is structured as follows: Following this introduction, we present a detailed review of the literature that sets the theoretical framework for our research. We then elaborate on our research methodology, including the design of the questionnaire and sampling framework (17). Next, we discuss the study's ethical considerations, followed by an analysis of our data. Finally, we offer a discussion section, where we interpret our findings, address the study's limitations, and suggest avenues for future research. The Omicron variant has sparked significant concern globally due to its heightened transmissibility and potential to bypass immune responses, adding new challenges to containment efforts and healthcare systems (18). Given this context, understanding the Omicron variation and periodontal disorders is crucial. Periodontal disorders have been linked to poorer respiratory infection outcomes and may worsen Omicron instances (19). Due to its preference for the upper respiratory system, the variant's spread or severity must be investigated in relation to oral health issues such periodontal disease (20). This understanding might improve pandemic prevention and treatment tactics, aiding public health efforts (21). The main objective of this study is to investigate the clinical impact of periodontal diseases on Omicron infections (22). To determine how periodontal problems affect Omicron infection susceptibility, symptom severity, and outcome in individuals infected with this variety. Secondary goal: discover oral microbiota biomarkers that indicate severe Omicron patients. This study addresses clinical features to fill a gap in the literature and provide healthcare practitioners relevant insights for treating Omicron-infected individuals.

Objectives

To determine how periodontal problems affect Omicron infection susceptibility, symptom severity, and outcome in individuals infected with this variety and discover oral microbiota biomarkers that indicate severe Omicron patients.

Materials and Methods

Study design

The quantitative descriptive approach was used for this research because of its capacity to gather data objectively and to do statistical analysis on that data. This method is especially useful for studying the Omicron coronavirus variety because it guarantees accurate variable measurements and makes it easier to compare factors impacting periodontal disorders. The study attempts to minimize subjectivity and provide repeatable findings that may be evaluated via later research by using quantitative methodologies.

Study setting

The investigation is being conducted in Erbil, Kurdistan, Iraq, a city chosen for its varied population and abundance of oral medical services. A survey questionnaire was developed to collect data on the views and observations of practicing dentists in Erbil about periodontal diseases and the Omicron variant. This target group is included in the study.

Sampling framework

The dental population in Erbil, Kurdistan, Iraq, is represented in the sample by using a stratified random sampling approach. A 95% confidence interval with a 5% margin of error was used to determine the sample size. Dentists in active practice in Erbil who have expertise in treating periodontal disorders are eligible to participate; however, dentists who do not treat such illnesses or who are not actively in the field are not.

Data collection

A high response rate is guaranteed by administering the surveys over email and including reminders. The survey collects information from dentists about their knowledge of the Omicron variant, their views on its effect on periodontal diseases, their clinical observations, the effectiveness of prevention and treatment methods,

patient demographics, and more through a mix of open-ended questions, multiple-choice questions, and Likert scales.

Pilot study

The questionnaire's clarity and efficacy are tested in pilot research with 15 to 20 dentists before the main survey. After receiving feedback from the pilot research, the questions and general design are fine-tuned.

Data collection method

Email distribution is used as the data gathering strategy, using a database of active dentists in Erbil compiled from public records and professional networks. We will send weekly reminders to non-respondents and set the timeline for data collection at four weeks.

Response rate enhancement strategies

The goal response rate is 60%–70%, which is in line with what is often seen in comparable research in the industry. A concise summary of the research findings provided as an incentive, collaboration with local dental associations to promote participation, and personalized email reminders are all methods that can be employed to increase the response rate.

Data analysis

Descriptive statistics, such as the mean, standard deviation, and frequency distributions, are used in data analysis to summarize the survey results. This methodology guarantees a thorough and organized approach to studying the link between periodontal diseases and the Omicron variation, which will provide important findings with clinical and scholarly applications.

Statistical analysis

Data description, analysis, and presentation were performed using the Statistical Package for Social Science (SPSS, version 22, Chicago, Illinois, USA). The chi-square test examined associations between the severity of periodontal disease and the impact of Omicron infection. Moreover, T-test compared mean differences in specific outcomes between groups with varying periodontal health statuses. Regression analysis determined the predictive value of periodontal disease on the severity of Omicron infection outcomes.

Results

The study included 60 participants with a mean age of 47.68 years (±11.054). The gender distribution among the participants was 38 (63.3%) males and 22 (36.7%) females. The survey shows that the average score was 3.82, which means that most people think that gum problems such as gingivitis and periodontitis may affect Omicron infection. The results show that out of all the questions, question 2 had the most agreement (Mean = 4.20, SD = 0.953), while question 17 had the lowest agreement (Mean = 3.53, SD = 1.282). In light of the growing body of evidence linking poor oral health to Omicron outcomes, this agreement highlights the importance of dental care as a possible moderator.

There is widespread agreement among respondents (81.6%) that periodontitis has a role in determining the course of Omicron, as shown by the low standard deviation (SD = 0.979). In addition, 88.3% of people who took the survey think that people with gum issues are more likely to have Omicron infections, which shows that this risk factor is well-known. Antiviral toothpaste and chlorhexidine mouthwash are two examples of dental care therapies that the research found to be beneficial in reducing these risks.

Results from the poll addressing healthcare providers' opinions are significant. A large majority of responders (81.7%) believe that patients with gum disease and increased IL-6 levels are more likely to need admission to the intensive care unit. This finding highlights the possible consequences for patient outcomes related to the assumed association between periodontal diseases and the intensity of Omicron infections.

Furthermore, almost 70% of those who took the survey expressed the opinion that good dental hygiene helps stop the spread of the Omicron strain. The synergy surrounding oral hygiene as a potential factor in preventing the spread of the virus is emphasized by this consensus, which further emphasizes the perceived significance of integrating oral hygiene practices into comprehensive preventive approaches.

Omicron infections are exacerbated by poor oral health conditions, including oral cancer, according to 70% of responders. Healthcare providers seem to agree that preexisting oral health issues might increase the severity of Omicron infections; this data points to a possible area of concern that needs to be addressed in clinical therapy.

It is worth noting that around 25% of respondents expressed disagreement with the notion that lowering the viral load in the mouth aids in prevention. However, there is still a small group of people who hold the opinion that targeting the virus in the mouth might be an effective preventative approach. This minority stance indicates that there is a significant amount of consensus among doctors about this matter.

A large majority of doctors think that good dental hygiene is critical for treating Omicron infections, as seen by the consistently low standard deviations across all questions. As a result of this consensus among medical experts, it is clear that there is a need to include oral health concerns in larger plans to combat the Omicron variety (Figure 1).

Table 1 provides a comprehensive synopsis of the survey data collected from healthcare providers, which investigates the relationship between gum disease, periodontitis, and Omicron infection. All twenty questions were rated on a 5-point Likert scale from "Strongly Disagree" to "Strongly

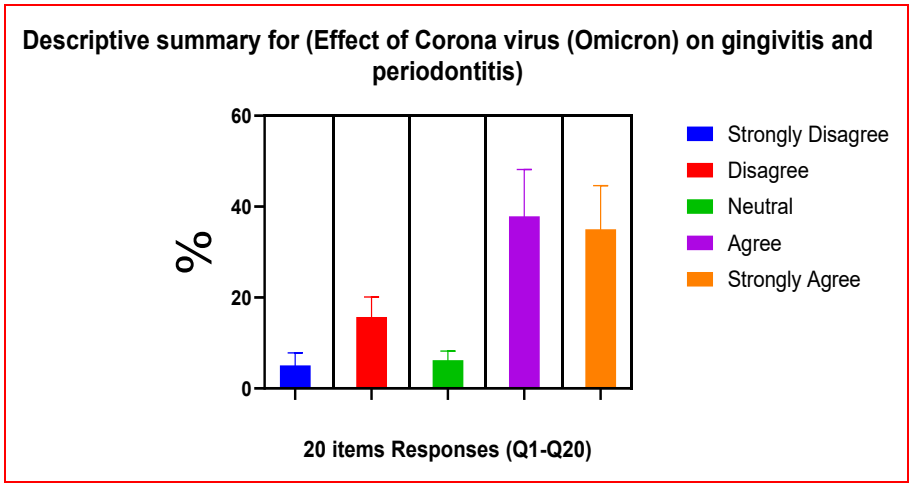

Figure 1. Distribution of answers.

Agree."

A high level of agreement among respondents on the importance of good dental hygiene in preventing Omicron infections was shown by the overall mean score of 3.82. The fact that the replies were so tightly clustered around the mean (SD = 0.253) shows that everyone was thinking along the same lines.

The majority of questions have mean scores higher than 3.5, which indicates that there is widespread or strong agreement. The fact that all respondents reached a unanimous decision on Q2 ("High risk of Omicron complications in patients with gum issues") is highlighted by its very high mean score of 4.20 and low standard deviation of 0.953.

A large number of questions show strong agreement, while a smaller number show more variability, as seen by larger standard deviations. As an example, compared to other inquiries, Q11's unusually high standard deviation of 1.362 and mean of 3.90 indicate a wider range of results, suggesting less unanimity.

The lowest mean score was 3.53, and the highest standard deviation was 1.282 for question 17, indicating that respondents had varied viewpoints and that this may have been an issue of contention or confusion.

Table 1. Survey results on the effect of gingivitis and periodontitis on infection with the Omicron variant of the coronavirus

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Means	Standard Deviations	Practices Degree
Q1	1 (1.7%)	5 (8.3%)	5 (8.3%)	26 (43.3%)	23 (38.3%)	4.08	0.979	High
Q2	1 (1.7%)	5 (8.3%)	1 (1.7%)	27 (45%)	26 (43.3)	4.20	0.953	High
Q3	0	9 (15%)	2 (3.3%)	30 (50%)	19 (31.7%)	3.98	0.983	High
Q4	1 (1.7%)	5 (8.3%)	3 (5%)	33 (55%)	18 (30%)	4.03	0.920	High
Q5	1 (1.7%)	9 (15%)	3 (5%)	20 (33%)	27 (45%)	4.05	1.126	High
Q6	4 (6.7%)	11 (18.3%)	4 (6.7%)	26 (43.3%)	15 (25%)	3.62	1.236	High
Q7	2 (3.3%)	6 (10%)	3 (5%)	18 (30%)	31 (51.7%)	4.17	1.122	High
Q8	4 (6.7%)	9 (15%)	5 (8.3%)	22 (36.7%)	20 (33.3%)	3.75	1.257	High
Q9	4 (6.7%)	11 (18.3%)	2 (3.3%)	28 (46.7%)	15 (25%)	3.65	1.233	High
Q10	6 (10%)	8 (13.3%)	4 (6.7%)	30 (50%)	12 (20%)	3.57	1.240	High
Q11	4 (6.7%)	10 (16.7%)	4 (6.7%)	12 (20%)	30 (50%)	3.90	1.362	High
Q12	4 (6.7%)	11 (18.3%)	5 (8.3%)	9 (15%)	31 (51.7%)	3.87	1.396	High
Q13	4 (6.7%)	9 (15%)	5 (8.3%)	25 (41.7%)	17 (28.3%)	3.70	1.225	High
Q14	5 (8.3%)	12 (20%)	5 (8.3%)	20 (33.3%)	18 (30%)	3.57	1.332	High
Q15	4 (6.7%)	14 (23.3%)	4 (6.7%)	14 (23.3%)	24 (40%)	3.67	1.386	High
Q16	2 (3.3%)	11 (18.3%)	4 (6.7%)	20 (33.3%)	23 (38.3%)	3.85	1.219	High
Q17	5 (8.3%)	12 (20%)	3 (5%)	26 (43.3%)	14 (23.3%)	3.53	1.282	High
Q18	3 (5%)	10 (16.7%)	5 (8.3%)	23 (38.3%)	19 (31.7%)	3.75	1.216	High
Q19	3 (5%)	13 (21.7%)	5 (8.3%)	23 (38.3%)	16 (26.7%)	3.60	1.238	High
Q20	3 (5%)	9 (15%)	3 (5%)	23 (38.3%)	22 (36.7%)	3.87	1.214	High

The effectiveness of Omicron in treating gingivitis and periodontitis has been shown to have mixed results, as indicated by a modest mean score of 2.86. In a poll where only a small percentage of respondents agreed with the themes, Question 14 had the greatest level of agreement (Mean = 3.98, SD = 1.066), and Question 6 had the lowest (Mean = 2.20, SD = 1.086). These complicated results reflect the multi-faceted views of healthcare providers on the connection between dental hygiene and Omicron infections.

Table 2 summarizes the survey replies that evaluated how people felt the Omicron coronavirus strain affected gum disease and periodontitis. The questionnaire consisted of fourteen items ranging from "Strongly Disagree" to "Strongly Agree." You can see each question's mean score, standard deviation, and a qualitative metric called "Practices Degree" in the table.

With mean ratings of 3.32 and 3.78, respectively, Q1 and Q2 demonstrated significant agreement, marking them as 'strong' practice degree items. Q2, which had the highest mean score, was agreed upon by 48.3% of respondents, with 26.7% rating it as a strong agreement. Despite the high level of agreement, the items showed a lot of response variability, with standard deviations of 1.444 and 1.136, respectively.

The mean scores for questions Q3–Q12, which are categorized as 'Medium' or 'Low' practice degree questions, ranged from 2.17 to 2.83. Half of the respondents disagreed with Q6, which had a mean score of 2.20 and a 'Low' practices degree. This was the area of most disagreement.

The 'High' practices degree group includes questions 13 and 14, which showed strong agreement with mean scores of 3.97 and 3.98, respectively. There was unanimous agreement on these subjects, with over 80% of respondents reporting strong agreement or agreement. 'Medium' practices degree was the classification given to the survey sentiment by the combined average score of 2.86 and standard deviation of 0.327. There was a wide range of opinions expressed in the questions, and the low standard deviation suggests that most people's responses clustered around the mean.

Table 2 and Figure 2 are complementary visual representations of the distribution of answers across the survey items. The figure presents a graphical depiction of the diverse viewpoints regarding the impact of the Omicron variant on gingivitis and periodontitis, thereby illuminating the intricate relationship between medical community perceptions and expert opinions.

Moreover, the survey found that most people had symptoms, including tongue burning, as a result of Omicron. Omicron may produce poor breath, although only 40% of people think such, and less than 50% think that it causes mouth ulcers. In addition, the majority of responses were against the assertions that Omicron patients experiencing gum problems are more likely to die from complications such as dental plaque, gum swelling, and infection.

Discussion

This study examined Erbil, Kurdistan, Iraqi dentists' views on the association between periodontal illnesses such gingivitis and periodontitis and the Omicron version of the coronavirus (14-16). To achieve this, we employed a quantitative descriptive approach, utilizing a specially-designed questionnaire (17-19). The questions ranged from strongly disagree to strongly agree on a Likert scale and were distributed via email to a targeted group of dental professionals (21-23).

Table 2. Descriptive summary for effect of coronavirus (Omicron) on gingivitis and periodontitis

No. of Question	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Means	Standard Deviations	Practices Degree
Q1	9 (15%)	12 (20%)	6 (10%)	17 (28.3%)	16 (26.7%)	3.32	1.444	High
Q2	3 (5%)	8 (13.3%)	4 (6.7%)	29 (48.3%)	16 (26.7%)	3.78	1.136	High
Q3	16 (26.7%)	15 (25%)	10 (16.7%)	12 (20%)	7 (11.7%)	2.65	1.376	Medium
Q4	18 (30%)	20 (33.3%)	5 (8.3%)	10 (16.7%)	7 (11.7%)	2.47	1.384	Low
Q5	12 (20%)	18 (30%)	5 (8.3%)	20 (33.3%)	5 (8.3%)	2.80	1.325	Medium
Q6	15 (25%)	30 (50%)	6 (10%)	6 (10%)	3 (5%)	2.20	1.086	Low
Q7	15 (25%)	20 (33.3%)	5 (8.3%)	15 (25%)	5 (8.3%)	2.58	1.331	Medium
Q8	18 (30%)	29 (48.3%)	3 (5%)	5 (8.3%)	5 (8.3%)	2.17	1.196	Medium
Q9	15 (25%)	26 (43.3%)	6 (10%)	10 (16.7%)	3 (5%)	2.33	1.174	Low
Q10	10 (16.7%)	22 (36.7%)	6 (10%)	12 (20%)	10 (16.7%)	2.83	1.380	Medium
Q11	12 (20%)	25 (41.7%)	9 (15%)	10 (16.7%)	4 (6.7%)	2.48	1.186	Low
Q12	12 (20%)	26 (43.3%)	8 (13.3%)	10 (16.7%)	4 (6.7%)	2.47	1.186	Low
Q13	1 (1.7%)	8 (13.3%)	2 (3.3%)	30 (50%)	19 (31.7%)	3.97	1.025	High
Q14	2 (3.3%)	7 (11.7%)	1 (1.7%)	30 (50%)	20 (33.3%)	3.98	1.066	High
Overall	-	-	-	-	-	2.86	0.327	Medium

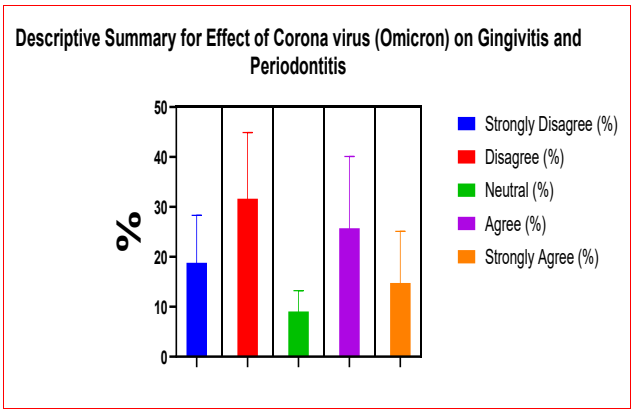

Figure 2. Distribution of answers of survey (14 items).

The survey data revealed varying degrees of agreement across different questions, falling under 'High,' 'Medium,' and 'Low' categories as per our Practices Degree evaluation (24,25). Overall, the mean sentiment across all questions was medium, with a mean score of 2.86 and a standard deviation of 0.327 (26). Questions related to the severity of periodontal diseases and their correlation with the Omicron variant (Q1, Q2, Q13, Q14) received notably high mean scores, indicating a high level of agreement among the respondents (27). On the other hand, questions pertaining to common preventative measures and general awareness (Q4, Q6, Q9, Q11, Q12) had lower mean scores, showing either neutrality or disagreement among the participants (28).

Study scores averaged 2.86 with a standard deviation of 0.327. Dentists polled agreed somewhat. In our research, a higher mean score indicates more agreement or worry regarding the association between periodontal diseases and the Omicron variation, whereas a lower score indicates the reverse (29). The 'Practices Degree,' which we divided into 'High,' 'Medium,' and 'Low' categories, adds another layer to our interpretation. Questions that received high mean scores (Q1, Q2, Q13, Q14) are especially noteworthy because they directly relate to the severity and clinical implications of periodontal diseases in the setting of the Omicron variant. This suggests that there is a significant level of concern among dental professionals about these particular aspects (30).

The 'Medium' mean score is fascinating. The dentistry community in Erbil, Kurdistan, Iraq, may be ambivalent about the topic. The questions with 'High' practice degrees show concern about the seriousness of periodontal diseases in relation to the Omicron variant, but there is a lack of consensus or even scepticism about preventative measures and general awareness (31). This 'Medium' mood may represent various causes. The developing nature of COVID-19 and its variations in data and study may be causing cautious or restrained conclusions. The community may not have covered or debated the matter as much, resulting to more moderate opinions (32).

The overall 'Medium' sentiment provides valuable insights into areas that require further education, awareness, and research, both within the dental community and the public health sphere at large (33).

With high mean ratings, Q1, Q2, Q13, and Q14 seem to connect with responders, indicating considerable concern or agreement. It's impossible to understand what these questions represent without the actual substance, but the high mean scores suggest they touched on areas where dentists agree (34). The strong agreement on these topics may be due to many causes. The strong agreement may be due to well-established clinical results or guidelines that unify opinion. High scores may indicate areas of acute concern that have been repeatedly highlighted in professional settings and literature (35). High levels of agreement on these topics may affect clinical practice. High agreement on treatment effectiveness or prevention strategies might lead to more standardized periodontal disease management in the Omicron variety. The collective opinion on these topics might be used to update or create protocols (36). Questions such as Q3, Q5, Q7, Q8, and Q10 that had medium mean scores indicate areas where there is neither strong agreement nor strong disagreement among the dental professionals surveyed. These areas could represent facets of periodontal disease and Omicron interaction that are not yet well-understood, or perhaps controversial or under-researched topics within the dental community (37).

The medium-level agreement on these questions shows further study is required to clarify these topics. These findings suggest dental professionals should continue their education. These findings may suggest clinical recommendations that require greater attention and focused study funding (37).

Medium agreement allows for individual interpretation and execution of practices, which may be both a benefit and a drawback. Dentists may utilize their clinical judgement in areas where there is no agreement, but it makes standardizing treatment and formulating evidence-based standards difficult (38).

The low mean scores observed for questions Q4, Q6, Q9, Q11, and Q12 indicate a lack of consensus among

the respondents. This suggests that these areas are either contentious, poorly understood, or subject to divergent practices or beliefs among dental professionals (39). Low agreement on these topics may be due to many causes. The research and rules on these areas may be unclear or inconsistent. Alternatively, these inquiries may address unresearched regions, requiring personal therapeutic experience, which might vary greatly (40). Educational programs, more thorough recommendations, or more research may be needed to address these areas of doubt due to poor consensus. Such themes might be suitable for professional lectures, workshops, or academic study (41).

The study was conducted in accordance with the Helsinki Declaration, ensuring that all participants were treated ethically. This ethical backbone adds credibility to the research (42).

Omicron and periodontal diseases are sensitive topics requiring particular ethical care. Ensuring that patient data remains confidential and that the study design does no harm are crucial aspects that were thoroughly considered (43).

Conclusion

This study provides valuable insights into the perceptions of dental professionals in Erbil, Kurdistan, Iraq, on the relationship between periodontal diseases and the Omicron variant. While there was high agreement on certain aspects, notably reflected in questions Q1, Q2, Q13, and Q14, there was a noticeable lack of consensus on other areas. These findings underscore the need for further research and potentially revised clinical guidelines.

Limitations of the study

The limitations of this study include its reliance on self-reported data from dentists, which may be subject to bias. The sample size was also relatively small and confined to a specific geographic area, limiting the generalizability of the findings. Additionally, the cross-sectional design of the study prevents the establishment of causality between periodontal diseases and the severity of Omicron infections. Further longitudinal studies with larger, more diverse populations are needed to validate these results.

Authors' contribution

Conceptualization: Nuha Agab Hamed.
Data curation: Nuha Agab Hamed.
Formal analysis: Nuha Agab Hamed.
Investigation: Nuha Agab Hamed.
Methodology: Nuha Agab Hamed.
Project administration: Nuha Agab Hamed.
Resources: Nuha Agab Hamed.
Software: Nuha Agab Hamed.
Supervision: Mohammed Abdul Jabbar and Mohammed Khudhur Abdljalel.
Validation: Nuha Agab Hamed.
Visualization: Nuha Agab Hamed.
Writing–original draft: Nuha Agab Hamed.
Writing–review & editing: Nuha Agab Hamed, Mohammed Abdul Jabbar and Mohammed Khudhur Abdljalel.

Conflicts of interest

The authors declare that they have no competing interests.

Ethical issues

The research conducted in this study adhered to the principles outlined in the Declaration of Helsinki and was approved by the Ethics Committee of the College of Dentistry, University of Anbar (Ref.13). Prior to any intervention, all participants provided written informed consent. The authors have fully complied with ethical issues, such as plagiarism, data fabrication, and double publication. This prospective clinical study summarized only participant-provided clinical data and their clinical samples and did not interfere with the patient's therapy, posing no physical dangers to the participants. Additionally, the confidentiality of the participants' information was ensured.

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