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Oral–Systemic Health Interactions: Cardiovascular Risk Assessment In Patients Undergoing Prosthodontic Rehabilitation

ABSTRACT
Cardiovascular disease represents a major systemic concern in prosthodontic practice, particularly among older and medically compromised patients who may experience physiological stress during dental rehabilitation. This study aimed to assess cardiovascular risk awareness among patients undergoing prosthodontic rehabilitation and to examine its influence on perceived procedural experience and restorative treatment planning modifications. A cross-sectional observational design was employed, and data were collected from 55 adults receiving prosthodontic care using a structured, self-administered questionnaire comprising 30 Likert-scale items across four domains: health awareness, cardiovascular considerations, prosthodontic experience, and treatment planning adaptations. Descriptive statistics were used to summarize demographic characteristics and response patterns. Inferential analyses included Mann–Whitney U tests to compare procedural experience between cardiovascular-risk and non-risk groups, Chi-square tests to assess associations between cardiovascular risk and treatment planning modifications, and Spearman's rank correlation to evaluate relationships between cardiovascular awareness and restorative planning. Results demonstrated high levels of cardiovascular and systemic health awareness among participants. Patients with cardiovascular risk reported significantly higher perceptions of clinical attentiveness, procedural adjustments, and treatment planning modifications ($p < 0.01$). Significant associations were observed between cardiovascular risk status and restorative planning adaptations ($p < 0.05$). A strong positive correlation was identified between cardiovascular awareness and perceived treatment planning modification ($\rho = 0.69$, $p < 0.001$). These findings underscore the importance of integrating structured cardiovascular assessment into prosthodontic rehabilitation to support patient-centred, risk-informed clinical decision-making and enhance perceived safety and confidence during care.

Keywords: Prosthodontic Rehabilitation, Cardiovascular Risk, Restorative Treatment Planning, Medically Compromised Patients, Patient Perceptions

1. INTRODUCTION

The association of oral health with cardiovascular status has been gaining growing scientific interest due to steady evidence of overlap of inflammatory mediators and overlapping risk factors. Oral conditions, especially those related to periodontal and periapical tissues, have been proven to contribute to systemic vascular health conditions and play a role in differences in the cardiovascular risk profile[1]. Multifactorial mechanisms of oral infections, chronic inflammation and endothelial dysfunction associated with cardiovascular disease continue to highlight the biomedical importance of the integration of dental and medical assessment frameworks[2]. Within this context, prosthodontic rehabilitation entails a prolonged time in the chair, several

clinical appointments, and physiologic stressors that may directly influence individuals with underlying cardiovascular vulnerability[3]. Understanding these systemic interactions is still vital to improving the safety and effectiveness of prosthodontic treatment planning.

Emerging literature stressed the importance of controlling the modifiable oral health factors in order to reduce adverse cardiovascular risk, supporting closer collaboration between dentists and physicians[4]. Several patient-based studies report limited awareness of systemic--oral links among persons diagnosed with cardiovascular disease that reveal opportunities for strengthening patient education and clinical communication within dental teams[5]. Observational evidence is also available to further show that poor dental health, especially unresolved periodontal and restorative issues, may be correlated with obstructive coronary artery pathologies in support of holistic patient assessment[6]. Recent scoping analyses have also suggested the possible shared risk determinants and inflammatory pathways of dental caries, a highly prevalent chronic oral disease, with cardiovascular disorders, increasing the clinical reach of systemic-oral associations[7]. Moreover, the broader reviews point to linkages between dental diseases and a variety of systemic conditions, pointing to a complex interaction of microbial, immunological and lifestyle-mediated mechanisms applicable to the medically compromised persons[8]. For cardiovascular disease patients, clinical procedures that involve local anaesthesia require additional caution due to potential hemodynamic effects associated with vasoconstrictors, which also necessitate careful prosthodontic planning[9]. Periodontitis is a common chronic inflammatory disease and has been repeatedly linked with a higher cardiovascular risk, reinforcing the need for an early diagnosis and an integrated management strategy in this population[10]. In response to such findings, healthcare settings have increasingly seen the value in targeted oral health education for individuals at increased cardiovascular risk, with demonstrated patient engagement and overall treatment adherence[11]. Preventive behaviours, including regular tooth brushing, have also been linked with lower chronic disease risk, suggestive of further importance of reinforcing oral hygiene in systemically vulnerable groups[12]. A recent systematic review brings together these findings by showing strong links between dental and cardiovascular diseases and the urgency of comprehensive and concerted risk management strategies in routine dental care[13].

Despite the increasing evidence of the relationship between conditions in the mouth and heart disease, little attention has been given to the specific effects that cardiovascular risk has on the rehabilitation with prosthodontic devices, a speciality that often works with older adults and medically compromised patients. Prosthodontic procedures may present physiological demands that potentially interact with cardiovascular instability, but experiences and perceptions of physiological interactions remain unexplored by patients. Although clinical guidelines exist to integrate systemic health evaluation in the decision-making process of dental care, there is very little practical evidence that describes how cardiovascular considerations influence restorative planning from the perspective of the patient. This leads to uncertainty about how prosthodontists adjust the structure of appointments, the choice of procedures, and patient clinical precautions in patients with increased cardiovascular risks.

Existing research underscores associations between oral health and cardiovascular disease but provides little information about the transition from these systemic considerations to decision-making during prosthodontic rehabilitation. No study has been specifically designed to investigate patient-reported comfort and perceived treatment modifications and awareness of cardiovascular influences in prosthodontic settings. Furthermore, there is a lack of structured assessment tools for incorporating cardiovascular screening into the restorative planning workflows. Lack of patient-centred information limits the development of guidelines based on the best available evidence about cardiovascular risk in the prosthodontic practice. This difference highlights the need for specific studies to assess the cardiovascular considerations, patient perceptions and clinical adaptations during prosthodontic rehabilitation.

Objectives of the Study

1. To assess cardiovascular risk awareness and perceived medical–dental interactions among patients undergoing prosthodontic rehabilitation.
2. To evaluate how cardiovascular risk influences perceived modifications in prosthodontic procedures and restorative treatment planning.

2. MATERIALS AND METHODS

2.1 Study Design

The study design chosen was a cross-sectional observational study design to assess cardiovascular risk awareness and the effect on patient-reported experiences and perceived treatment planning changes in the course of prosthodontic rehabilitation. The information was gathered at one time point with a structured questionnaire that was given at a regular clinical visit without changing current prosthodontic treatment. This design has allowed the cardiovascular awareness, procedural comfort, and restorative planning adaptations to be measured simultaneously in practical clinical conditions in the real world, so that they are relevant to the practice of prosthodontics.

2.2 Study Setting and Population

The study was carried out in the prosthodontic and restorative dental practice centres that offer routine rehabilitation services. 55 adult patients receiving prosthodontic rehabilitation were registered. The inclusion criteria were that the participants should be over 30 years and had either received or were receiving prosthodontics and could provide informed answers. Instead, patients who had unstable systemic conditions, cognitive impairment, or who were unwilling to participate were excluded. The participants used in the study were a normal group of prosthodontic patients who had different cardiovascular histories.

2.3 Sample Size and Sampling Procedure

The sample size was recruited in a consecutive manner, such that all qualified patients who came to the clinic at the time of study were invited to join the study. This ensured the reduction of selection bias and resembled the natural progression of patients in the prosthodontic practice. The sample size was sufficient for descriptive analysis and identification of correlations between cardiovascular risk status and patient-reported treatment experiences in non-parametric statistical analysis.

2.4 Data Collection Instrument

A structured and self-administered questionnaire was used to gather data and included 30 questions to be rated on a five-point Likert scale. The questionnaire was also structured on four areas, including general health and dental awareness, cardiovascular consequences of dental treatment, prosthodontic rehabilitation, experience and restorative treatment planning and clinical precautionary actions. Items evaluated medical history reveal, heart diagnosis and drug use, communication, procedure comfort, clinical changes, interdisciplinary consultation, and felt safety. Demographic and clinical data, such as age, sex, education, the type of prosthodontic treatment, and cardiovascular state, were also documented to help in the subgroup analysis.

2.5 Ethical Considerations

Clear information on the purpose of the study, procedures and voluntary participation was given to the participants. Informed consent was provided before the completion of questionnaires in written form. Responses were coded and no access to identifiable data was made in order to guarantee confidentiality. When dental treatment continued, there was no effect of refusal or withdrawal. Clinical procedures were all as per the standard, and no experimental intervention was provided.

2.6 Statistical Analysis

The statistical analysis of data was done through descriptive and inferential statistics. The frequency, the percentage, the mean, and the standard deviations were applied in the form of descriptive statistics to characterize the demographic characteristics, the cardiovascular awareness, the prosthodontic experiences, and the perception of the treatment planning. The participants were divided into cardiovascular-risk and non-risk groups according to self-reported cardiovascular diagnosis and/or taking cardiovascular medication. The Likert-scale data were evaluated in terms of normality and, therefore, non-parametric tests were used. The Mann-Whitney U test was used to measure the difference in experience of the group in the prosthodontic rehabilitation. The Chi-square test of independence was used to analyze the relationship between cardiovascular risk status and categorical variables of treatment planning. The cardiovascular awareness and perceived treatment planning adaptations were analyzed using the Spearman rank correlation analysis to determine the relationship between the two. The statistical significance was deemed as $p < 0.05$.

3. RESULT

3.1 Demographic and Clinical Characteristics of Participant

The researchers used 55 individuals who were undertaking prosthodontic rehabilitation. The sample was mainly comprised of females (32, 58.2%), with 23 (41.8%) male participants. The population was mainly middle-aged and older adults, with the highest % of 30.9 in the 40–69-year-old age group, 23.6 in the 60–69-year-old age group, and 20.0 in the 70 years and above group. In terms of education, most of the respondents used the secondary education (38.2 %), then the undergraduate (32.7 %) and postgraduate (29.1 %) levels. The cohort was functionally independent, as most of the participants were employed or retired. Most of the participants had been diagnosed with a cardiovascular condition, and almost 50% were on cardiovascular drugs, which validated the study population's cardiovascular risk focus, as shown in Table 1. The prosthodontic rehabilitation types were diverse, as the fixed, removable and implant-supported prostheses were all represented.

Table 1. Demographic and Clinical Characteristics of Participants (N = 55)

Variable	Category	n	Percent
Gender	Female	32	58.2
	Male	23	41.8
Age group (years)	30–39	9	16.4
	40–49	17	30.9
	50–59	5	9.1
	60–69	13	23.6
	≥70	11	20.0
Education	Secondary	21	38.2
	Undergraduate	18	32.7
	Postgraduate	16	29.1
Cardiovascular diagnosis	Yes	30	54.5
	No	25	45.5
Cardiovascular medication use	Yes	27	49.1
	No	28	50.9

3.2 Health Awareness, Prosthodontic Experience, and Treatment Planning

Health awareness and positive treatment experience were high, as shown by the use of mean-based analysis. The respondents indicated they had an excellent knowledge of how systemic and cardiovascular health may affect dental care. Results in terms of mean scores of experiences in the field of prosthodontic rehabilitation showed good tolerance of the procedures, and in particular, the appropriateness of visiting the dentist and the adjustment of the procedures by the dentist was accepted by the majority. The mean scores also indicated a high level of consistency in medical considerations, as treatment planning and precautionary measures also had a higher mean score, as shown in Table 2.

Table 2. Mean Likert Scores for Questionnaire Domains (N = 55)

Questionnaire Domain	Mean Score
General health awareness	4.12
Cardiovascular awareness	4.05
Prosthodontic rehabilitation experience	4.18
Treatment planning and clinical adaptations	4.21

3.3 Group Differences in Prosthodontic Rehabilitation Experience

Participants were categorised into cardiovascular-risk and non-risk groups based on self-reported diagnosis status. Group comparisons using the Mann–Whitney U test demonstrated statistically significant differences across all prosthodontic rehabilitation experience variables. Participants with cardiovascular risk consistently reported higher levels of agreement regarding clarity of treatment explanation, suitability of dental visits, procedural comfort, careful administration of local anaesthesia, manageable appointment duration, reduced physical stress, procedural adjustments, and overall confidence during rehabilitation. As illustrated in Table 3, all comparisons reached statistical significance ($p < 0.01$), indicating that individuals with cardiovascular conditions perceived greater clinical attentiveness and comfort during prosthodontic rehabilitation compared with those without cardiovascular risk.

Table 3. Mann–Whitney U Test Results for Prosthodontic Experience (Q15–Q22)

Item	p-value
Treatment explanation	< 0.001
Visit suitability	< 0.001
Relaxation during procedures	0.003
Local anesthesia care	< 0.001
Appointment duration	0.007
Physical stress	0.008
Procedural adjustment	< 0.001
Confidence during treatment	< 0.001

3.4 Association Between Cardiovascular Risk and Treatment Planning

The chi-square analysis showed that cardiovascular risk status was statistically significant in relation to all restorative treatment planning and precautionary variables (Q23-Q30). Participants at cardiovascular risk more commonly reported changes in treatment plan (χ^2 =6.25) and changes in appointment scheduling ($\chi^2$7.86) than did non-risk participants. Considerable correlations were also recorded between precautionary clinical measures ($\chi^2 = 8.6$, $p = 0.003$) and physician consultation advice ($\chi^2 = 9.4$, $p = 0.002$), as shown in Table 4. Perceived procedural safety and cardiovascular-informed decision-making also exhibited considerable relationships ($p < 0.05$), and this denotes the systematic involvement of cardiovascular factors in at-risk patient restorative planning.

Table 4. Chi-square Associations Between Cardiovascular Risk and Treatment Planning

Item	p-value
Treatment modification	0.012
Scheduling adaptation	0.005
Procedural precautions	0.003
Physician consultation	0.002
Perceived safety	0.011
Medical influence on treatment	0.011
Satisfaction with health management	0.007
Cardiovascular-based planning	0.024

3.5 Correlation and Predictive Analysis of Cardiovascular Risk and Treatment Planning

Spearman's rank correlation analysis revealed a strong and statistically significant positive relationship between cardiovascular awareness and restorative treatment planning adaptation ($\rho = 0.69$, $p < 0.001$), as demonstrated by Table 5. This finding indicates that participants with higher awareness of cardiovascular health issues were more likely to perceive and acknowledge modifications in prosthodontic treatment planning tailored to systemic risk. The strength of the correlation suggests a meaningful association rather than a trivial effect, highlighting the role of patient awareness in recognising clinically informed decision-making. These results support the premise that cardiovascular health literacy may enhance patient understanding of risk-based prosthodontic planning and reinforce the importance of structured medical history assessment in delivering patient-centred prosthodontic care.

Table 5. Spearman Correlation Analysis

Variables	ρ	p-value
Cardiovascular awareness vs treatment planning	0.69	< 0.001

4. DISCUSSION

The present study investigated the impact of the cardiovascular risk considerations on the clinical course, comfort and treatment planning experiences of patients undergoing prosthodontic rehabilitation. The results showed that the participants showed a general awareness of the importance of sharing medical information and recognised the relevance of systemic health during dental care. A notable percenage of the reported cardiovascular diagnoses or medication use reflects the systemic

complexity usually found in prosthodontic populations. Patients were also satisfied with procedural information, pace of appointments and clinical modifications made to accommodate their health needs. High levels of comfort and confidence in the prosthodontic procedures indicated that the clinical environment supported medically vulnerable people well. Furthermore, treatment planning adjustments, interdisciplinary referrals and precautionary measures seemed to be consistently incorporated into clinical decision-making. Collectively, these findings suggested that prosthodontic rehabilitation was presented in a way that was sensitive to cardiovascular risk, with validation of the critical relationship between systemic health assessment and treatment planning for restorations. The observed association between perceptions relating to cardiovascular health and dental decision-making is consistent with evidence that poor oral health is associated with increased cardiovascular risk; this adds to the need for integrated frameworks for assessment[14]. Similar to the current findings, previous reviews emphasize that medically compromised patients, including cardiovascular disease, often have to be treated with altered dental care interventions, particularly when advanced prosthodontic procedures (for example, implant therapy) are required[15]. Broader literature in the area of medically compromised prosthetic patients supports the value of integrating systemic evaluation within the restorative planning process consistent with the adaptations shown in the results of this study[16]. There is also a focus in recent research on practical advice on structured management in patients with systemic diseases, including cardiovascular diseases, which is analogous to the patterns of clinical precautionary practices reported by the research participants[17]. Clinical approaches which have been described in prior work highlight the importance of chairside modifications, risk minimization and patient-centred scheduling when dealing with cardiovascular compromised individuals, which is very similar to the procedural modifications identified in this study[18]. Contemporary reviews of the literature on narrative reinforce the inclusion of cardiovascular status in dental decision-making and reinforce the importance of an interdisciplinary collaboration, which was recognized by several of the present respondents[19]. In addition, recent work on understanding the risk factors for cardiovascular disease by dental professionals highlights the importance of knowledge in the dental team, in agreement with the patient-reported perception that considerations of cardiovascular factors influenced their experience of treatment planning[20].

This study had a number of limitations that must be taken into account when interpreting the findings. The cross-sectional design limited the possibility to determine the causality between cardiovascular conditions and specific outcomes of prosthodontic treatment. The fact that self-reported questionnaires were used can have introduced recall bias or subjective interpretation of health status, particularly regarding cardiovascular diagnoses. The sample size, whilst sufficient for descriptive and associative analysis, reflected a single clinical setting and may not be a good representation of the variability in a larger or multi-centre setting in prosthodontics. In addition, a lack of clinical biomarkers or objective cardiovascular assessments constrained the levels of medical profiling. While Likert-scale responses gave useful information on patient perceptions, they were not able to capture the complexity of the procedure or individualised clinical judgement that influences prosthodontic rehabilitation. Finally, the lack of longitudinal follow-up made it impossible to assess long-term outcomes or the durability of cardiovascular consideration modifications made in the treatment.

Despite these limitations, the findings do have meaningful implications for prosthodontic practice, restorative planning and interdisciplinary clinical decision-making. The high level of patient awareness of systemic-dental interactions emphasises the importance of healthcare teams in dentistry to involve themselves regularly with a complete medical history assessment, especially in relation to cardiovascular issues. The presented modifications in treatment prove that prosthodontic rehabilitation can be successfully adjusted for medically vulnerable patients when the clinicians consider structured precautionary protocols. These findings support the importance of the prosthodontist and restorative dentist as part of the team of health professionals in providing care to the patient and the need for awareness of the impact that dental procedures may have on the cardiovascular stability of the patient. The consistency of the patient perceived safety and comfort of treatment would seem to suggest that the use of cardiovascular assessment in routine prosthodontic planning is associated with improved clinical effectiveness and patient satisfaction. Future clinical guidelines may benefit from the inclusion of standardized cardiovascular screening tools, as part of prosthodontic workflows, to enhance risk stratification and facilitate safer and more individualised rehabilitation strategies.

5. CONCLUSION

The results of the current research showed that the consideration of cardiovascular risks had a significant impact on the development of patient experiences and perceived treatment changes in the context of the prothentic rehabilitation. The participants were sensitive to the necessity of disclosing medical histories, and a significant number of them indicated that they possessed cardiovascular-related issues or medications that affected their use of dental care. The answers showed that there were positive attitudes towards communication, procedural comfort, and clinical adaptations of the prosthodontists to suit systemic weaknesses. Adjustments to treatment planning, interdisciplinary referral and schedule adjustments of appointments were frequently identified, which represents the utilization of cardiovascular evaluation in the daily decision-making of prosthodontics. All these observations underline the importance of integrating formal medical assessment into the workflow of restorative measures to help increase safety and trust in a patient. Despite the fact that the cross-sectional design did not allow for defining causal relationships, the trends showed significant information about patient-centred risk assessment and clinical responsiveness. The new studies that need to be enlarged in the future are the longitudinal assessments to clarify the impact of the cardiovascular factors on the overall

prosthodontic results and the life of the prostheses. These findings would be beneficial in larger, multi-centre studies that would verify them in a variety of populations and clinical settings. Also, the creation of standardized cardiovascular screening instruments adapted to dental care may facilitate more standardized risk stratification and clinical judgment. The collaboration between the prosthodontists, cardiologists and primary care providers should also be considered as a way of enhancing comprehensive care models amongst the medically compromised individuals.

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