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Impact of prosthodontic rehabilitation on oral health-related quality of life in the Serbian Armed Forces personnel

Uticaj protetske rehabilitacije na kvalitet života povezan sa oralnim zdravljem pripadnika Vojske Srbije

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Abstract

Background/Aim. Although prosthodontic rehabilitation restores the structural integrity of the stomatognathic system, its impact on patients' oral health–related quality of life (OHRQoL) remains insufficiently explored, particularly within the military population. The aim of this study was to evaluate the association between the type of prosthetic rehabilitation and OHRQoL, with a specific focus on functional, esthetic, and psychosocial dimensions, as well as to investigate the relationship between these findings and objective oral health indicators. **Methods.** A cross-sectional study was conducted to assess patient-reported outcomes using the Oral Health Impact Profile-14 (OHIP-14) questionnaire. The study included active duty personnel of the Serbian Armed Forces with natural dentition, as well as personnel with fixed or removable prostheses. Dental status was evaluated through comprehensive clinical examinations conducted by two experienced examiners. Biological parameters included the Caries Activity Factor (CAF) index, the Community Periodontal Index of Treatment Needs (CPITN), the plaque index (PI), and the gingival index (GI). Chronic systemic disease was recorded and included as a covariate in the analyses. Nonparametric statistical tests and multivariable regression analyses were employed to identify independent predictors of OHRQoL. **Results.** Participants with prostheses reported significantly higher OHIP-14 scores than those with natural dentition ($p < 0.0001$). No significant differences were observed between fixed and removable prostheses in overall OHIP-14 scores, except within the functional limitation domain, in which fixed prostheses demonstrated a measurable advantage. Multivariable analysis identified oral status, CAF and CPITN indices, and the presence of chronic systemic diseases as independent predictors of OHRQoL, whereas PI, GI, and age were not statistically significant after adjustment. **Conclusion.** According to the results of this study, prosthetic rehabilitation is associated with improved functional outcomes, but it did not fully alleviate the psychosocial burden associated with tooth loss. The severity of biological oral diseases and general health status were significant predictors of OHRQoL, suggesting that these factors may influence overall quality of life.

Keywords:
dental prosthesis; military personnel; oral health; quality of life; serbia; surveys and questionnaires.

Apstrakt

Uvod/Cilj. Mada se protetskom rehabilitacijom obnavlja strukturni integritet stomatognatog sistema, njen uticaj na kvalitet života povezan sa oralnim zdravljem (*health–related quality of life* – OHRQoL) pacijenata još uvek nije dovoljno ispitan, posebno u vojnoj populaciji. Cilj rada bio je da se proceni povezanost između tipa protetske rehabilitacije i OHRQoL, sa posebnim naglaskom na funkcionalne, esteteske i psihosocijalne dimenzije, kao i da se ispita odnos tih nalaza sa objektivnim pokazateljima oralnog zdravlja. **Metode.** Sprovedena je studija preseka kako bi se procenili ishodi koje prijavljuju sami ispitanici korišćenjem upitnika *Oral Health Impact Profile*-14 (OHIP-14). U istraživanje su bili uključeni pripadnici stalnog sastava Vojske Srbije sa prirodnom denticijom, kao i pripadnici sa prisustvom fiksnih ili mobilnih zubnih nadoknada. Status zuba je procenjivan kroz sveobuhvatne kliničke preglede koje su sprovodila dva iskusna ispitivača. Biološki parametri obuhvatili su indeks

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aktivnosti karijesa (*Caries Activity Factor* – CAF), parodontalni indeks potreba za tretmanom (*Community Periodontal Index of Treatment Needs* – CPITN), plak indeks (*plaque index* – PI) i gingivalni indeks (GI). Hronična sistemska bolest je zabeležena i uključena kao kovarijata u analizama. Neparametrijski statistički testovi i multivarijantna regresiona analiza korišćeni su za identifikaciju nezavisnih prediktora OHRQoL. **Rezultati.** Učesnici sa zubnim nadoknadama imali su značajno više skorove upitnika OHIP-14 od učesnika sa prirodnim zubima ($p < 0{,}0001$). Nisu primećene značajne razlike između fiksnih i mobilnih zubnih nadoknada u ukupnim rezultatima na OHIP-14 skali, osim u domenu funkcionalnih ograničenja, u kom je pokazana merljiva prednost fiksnih nadoknada. Multivarijabilnom analizom kao nezavisni prediktori OHRQoL identifikovani su oralni status, indeksi CAF i CPITN, kao i prisustvo hroničnih sistemskih oboljenja, dok PI, GI i starost nisu pokazali statističku značajnost nakon prilagođavanja modela. **Zaključak.** Prema rezultatima ovog istraživanja, protetska rehabilitacija je povezana sa boljim funkcionalnim ishodima, ali nije u potpunosti umanjila psihosocijalno opterećenje povezano sa gubitkom zuba. Težina bioloških oralnih oboljenja i opšte zdravstveno stanje bili su značajni prediktori OHRQoL, što ukazuje na to da ti faktori mogu uticati na ukupni kvalitet života.

Ključne reči:
zubna proteza; vojni kolektiv; usta, zdravlje; kvalitet života; srbija; ankete i upitnici.

Introduction

Oral health (OH) is a fundamental component of general health and overall well-being, significantly influencing nutrition, communication, and social interaction. Despite being largely preventable, oral diseases remain among the most prevalent noncommunicable conditions worldwide, affecting approximately 3.5 billion people, nearly half of the global population [1]. Untreated dental caries in permanent teeth represents the most common health condition globally, affecting approximately 2.5 billion individuals, while severe periodontal disease impacts nearly 1 billion people, and complete tooth loss has been reported in approximately 350 million cases [2]. The consequences of poor OH extend beyond physical discomfort, contributing to impaired mastication, speech difficulties, and a reduced quality of life (QoL) [3, 4]. Contemporary dentistry and its specialties offer numerous solutions for the rehabilitation of compromised OH. Among them, prosthodontics plays a particularly important role in maintaining and improving OH by restoring missing teeth and associated structures, rehabilitating impaired masticatory function, and improving esthetics and facial appearance. Given the multidimensional impact of OH conditions and their rehabilitation, understanding the role of prosthodontic treatment in promoting OH is essential for evidence-based clinical practice and the improvement of patient-related outcomes.

Patient-reported outcome measures, such as the Oral Health Impact Profile (OHIP), indicate that nearly 47.5% of the elderly population reports poor oral health–related QoL (OHRQoL), with physical pain and psychological disability being the most affected domains [5]. These findings underscore the importance of incorporating subjective assessments that capture patient perceptions and psychosocial impacts alongside objective clinical evaluations [6]. Subjective measures, including self-reported OH status, functional limitations (FLs), and QoL questionnaires, provide valuable insights into the lived experience of oral conditions and their social consequences [7]. Furthermore, self-reported OHRQoL represents an important indicator of both disease burden and therapeutic outcomes [8]. Conversely, OH, as a critical component of overall well-being, can be objectively assessed using reliable and standardized indices recommended by the World Health Organization (WHO) to evaluate various aspects of dental and periodontal status [9]. Among these, the Caries Activity Factor (CAF) index, the Community Periodontal Index of Treatment Needs (CPITN), the Silness and Löe plaque index (PI), and the gingival index (GI) are widely used tools in both clinical and epidemiological research [10–13].

OHRQoL instruments are inherently culturally sensitive, as they reflect perceptions, values, and social norms that vary across populations and cultural contexts [14]. These tools assess the subjective impact of OH on daily life, which is strongly influenced by cultural expectations related to esthetics, function, and social interaction. When combined with objective OH parameters, they provide a comprehensive framework for assessing OH, guiding clinical decision-making, and supporting OH promotion initiatives. The integration of patient-reported outcomes and objective clinical parameters ensures a holistic approach to identifying risk factors that threaten oral and dental health, while simultaneously raising patient awareness and ultimately improving QoL.

Due to the scarcity of research examining the relationship between OHRQoL and different types of prosthodontic treatments within the military population, the present study was designed to address this gap.

The aim of the study was to evaluate patient-reported functional, esthetic, and psychosocial impacts of prosthodontic restorations on OH and to correlate these findings with objective OH outcomes.

Methods

Study design

The study was designed as a cross-sectional observational investigation and conducted in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines [15]. The study was carried out over a 20-month period, from 2016 to 2017.

Ethical approval was obtained from the Institutional Ethics Committee of the Military Medical Academy, Belgrade, Serbia (from May 23, 2012). All study procedures were performed in compliance with the principles of the Declaration of Helsinki for research involving human subjects. Prior to enrollment, all participants were fully informed about the study objectives and data collection procedures and provided written informed consent.

Participants

Participants were recruited from a pool of permanent Serbian Armed Forces (SAF) military personnel of both sexes, in accordance with predefined inclusion and exclusion criteria. Eligible participants were professional SAF members aged 18–64 years who had either complete natural dentition (ND) or fixed prostheses (FPs) or removable prostheses (RPs) in one or both dental arches. Exclusion criteria included civilian SAF employees, acute dental conditions requiring urgent treatment, conditions or therapies that could preclude clinical examination or questionnaire completion, and the use of complete dentures in one or both jaws. Chronic systemic diseases (CSDs) were not an exclusion criterion and were recorded and included as a covariate in the multivariable analyses.

Group analyses

Dental status was evaluated through comprehensive clinical examinations conducted by two calibrated examiners in dental offices located within SAF facilities where officers were stationed. Standard diagnostic instruments, including dental mirrors, probes, artificial lighting, and dental chairs, were used. Based on clinical findings, participants were categorized into three study groups: those wearing FPs in one or both arches (n = 247), those with RPs in one or both arches (n = 31), and those with ND in both arches (n = 1,360).

Biological oral health outcome measures

OH parameters were assessed using standardized indices: CAF, CPITN, PI, and GI. All examinations were conducted under adequate illumination using a mouth mirror and a WHO periodontal probe, where applicable.

The CAF index was evaluated by clinical inspection of all teeth for active lesions, identified by softness, opacity, and plaque retention. Each participant was scored as follows: 0 (no active caries), 1 (one active lesion), or 2 (two or more active lesions). The CAF index was calculated as the sum of individual scores [16].

Periodontal health was assessed using the CPITN system. Dentition was divided into six sextants and examined with a WHO probe (ball tip 0.5 mm). The highest score *per* sextant was recorded as follows: 0 (healthy periodontium), 1 (bleeding on probing), 2 (presence of calculus), 3 (pocket depth 4–5 mm), or 4 (pocket depth ≥ 6 mm). Treatment needs were determined according to CPITN guidelines [17].

Plaque accumulation was measured using PI on six index teeth (16, 12, 24, 36, 32, and 44) [18]. After drying, the gingival third of each tooth was examined and scored as follows: 0 (no plaque), 1 (thin film at the gingival margin), 2 (moderate accumulation within the gingival pocket), and 3 (abundant plaque on the tooth and gingival margin). PI was calculated as the mean of all scores.

Gingival inflammation was assessed using GI on the same index teeth [19]. Color, consistency, and bleeding on probing were evaluated and scored as follows: 0 (normal gingiva), 1 (mild inflammation, slight color change, no bleeding), 2 (moderate inflammation, redness, edema, bleeding on probing), 3 (severe inflammation, marked redness, ulceration, spontaneous bleeding). GI was expressed as the mean score *per* participant.

Patient-reported outcome measures

Patient-reported outcomes were assessed using the OHIP-14 questionnaire [20], adapted for Serbian [21]. The Serbian version of the OHIP-14 has been previously validated by the SAF population [8]. All participants completed OHIP-14 based on their experiences following prosthetic rehabilitation [22]. Questionnaires were administered independently in a quiet and private setting, with clear written and oral instructions, minimizing potential bias and ensuring reliable data collection. OHIP-14 comprises 14 items across seven dimensions: FL, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap. Responses were recorded on a 5-point Likert scale (0 = never, 1 = hardly ever, 2 = occasionally, 3 = fairly often, 4 = very often).

Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics for macOS, version 31.0 (IBM, Armonk, NY, USA) and GraphPad Prism v.10.4.2.534 (GraphPad Software, San Diego, CA, USA). Normality of continuous variables was assessed using the Shapiro–Wilk test and visual inspection of histograms and quantile-quantile (Q–Q) plots. As OHIP-14 total and domain scores demonstrated non-normal distributions, intergroup comparisons among prosthetic categories were performed using the Kruskal–Wallis test. *Post hoc* pairwise comparisons were conducted using Dunn's multiple comparisons test, with the Holm–Šidák correction applied to control for multiple testing. Multivariable linear regression analyses were performed to identify independent predictors of OHRQoL. The total OHIP-14 score and the FLs domain were analyzed separately as dependent variables. Independent variables included prosthetic status (coded ordinally as ND, FPs, and RPs), age, presence of CSD, CAF, CPITN, PI, and GI indices. All predictors were entered simultaneously using the enter method. Model assumptions were verified through inspection of residual and Q–Q plots. Multicollinearity was assessed using variance inflation factors, all within acceptable limits (< 2.5), indicating model stability. Adjusted R^2 values,

standardized β coefficients, 95% confidence intervals (CI), and *p*-values are reported. A two-tailed *p*-value < 0.05 was considered statistically significant.

Results

Participants

A total of 1,638 participants were included in the study. Males were in the majority [1,456 (88.90%)], compared with females [182 (11.10%)]. The mean age of the overall sample was 33.20 ± 9.60 years. Male participants were significantly older than female participants (33.70 ± 9.60 vs. 27.50 ± 6.60 years; $p < 0.0001$). Participants with ND represented the youngest subgroup (31.77 ± 9.09 years), followed by those with FPs (38.70 ± 9.21 years), whereas participants with RPs constituted the oldest subgroup (42.10 ± 10.13 years), demonstrating a progressive increase in age across prosthetic categories. CSD was reported in 120 (7.30%) participants, while 1,518 (92.70%) participants were systemically healthy. According to oral status, 1,360 participants had ND, 247 had FPs, and 31 had RPs. Participants with CSD were notably older than systemically healthy individuals (41.90 ± 8.00 vs. 32.30 ± 9.30 years).

Oral Health Impact Profile-14

A statistically significant difference in the overall OHIP-14 score was observed among the three groups (ND, FPs, and RPs) (Kruskal–Wallis test: $H = 39.78$, $df = 2$, $p < 0.0001$). *Post hoc* analysis using Dunn's multiple comparisons test with Holm–Šidák correction revealed that patients with FPs had significantly higher OHIP-14 scores compared with those with ND ($p < 0.0001$). Similarly, patients with RPs exhibited significantly higher OHIP-14 scores than participants with ND ($p < 0.0001$). No statistically significant difference was found between the FPs and RPs groups ($p = 0.0892$) (Figure 1A). Significant

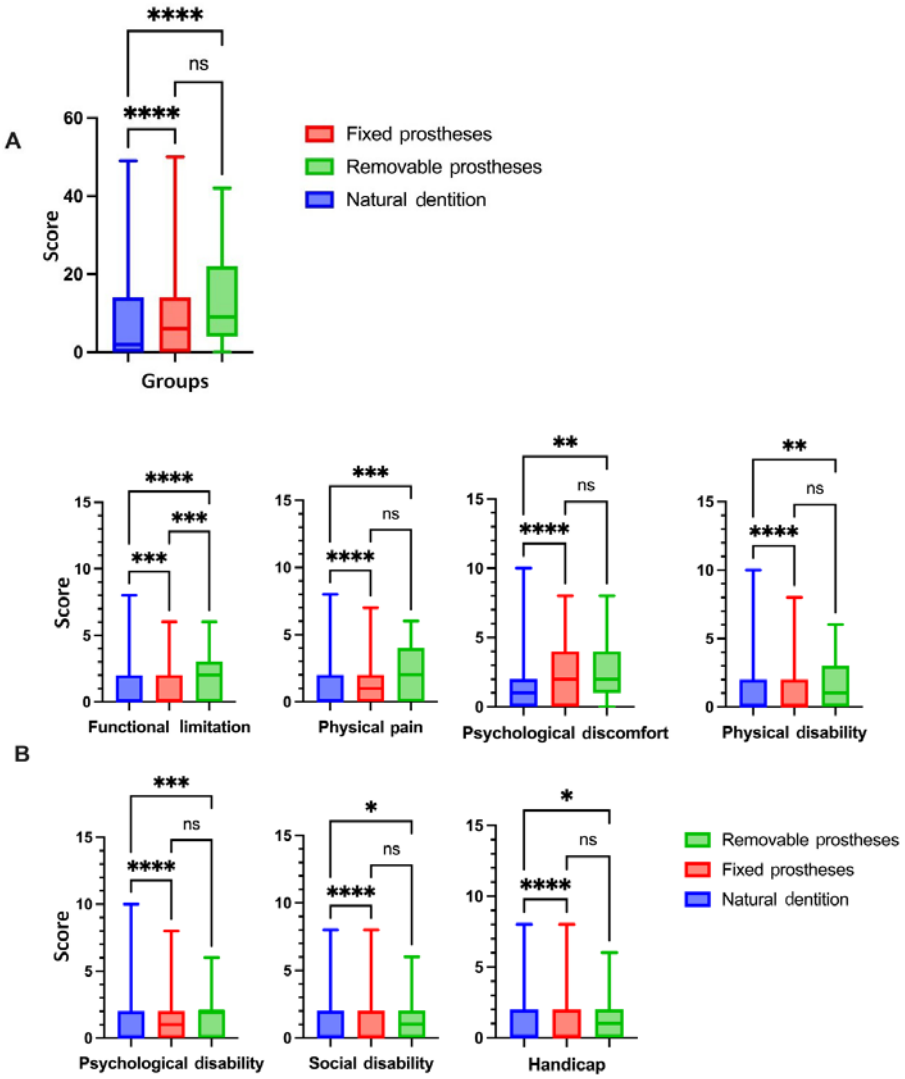

Fig. 1 – Oral Health Impact Profile-14 (OHIP-14) intergroup comparisons: A) total OHIP-14 score; B) OHIP-14 domains (Kruskal–Wallis test; *post-hoc* pairwise comparisons using Dunn's test with Holm–Šidák correction). ns – non-significant;* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; **** $p < 0.0001$.

differences among the three groups were also observed across all seven OHIP-14 domains (all Kruskal–Wallis tests: $p < 0.0001$), indicating a systematic effect of prosthetic status on OHRQoL. However, the pattern of intergroup differences was domain-specific. Across the majority of domains (physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap), *post hoc* analysis consistently showed that both FPs and RPs groups had significantly higher domain scores compared to participants with ND ($p < 0.05$ for all comparisons). No significant differences were detected between the FPs and RPs groups ($p > 0.05$). This suggests that, although FPs improved structural rehabilitation, they did not provide additional psychosocial or handicap-related benefit compared with RPs. In contrast, the FLs domain demonstrated a distinct and clinically relevant gradient, with all three groups differing significantly from one another ($p < 0.001$ for all pairwise comparisons) (Figure 1B). This identifies FLs as the only domain in which fixed prosthetic rehabilitation conferred a statistically significant functional advantage over RPs, whereas RPs were associated with the greatest functional impairment.

Multivariable regression analysis

To further explore determinants of OHRQoL beyond the group-level differences identified by the Kruskal–Wallis and Dunn's *post hoc* tests, a multivariable linear regression model was constructed with the total OHIP-14 score as the dependent variable. Independent predictors included age, oral status, presence of chronic disease, as well as CAF, CPITN, PI, and GI indices (Table 1). The overall regression model was statistically significant ($F = 25.22$, $p < 0.001$) and explained approximately 9.5% of the variance in total OHIP-14 scores (adjusted $R^2 = 0.094$). Oral status remained a statistically significant independent predictor of the total OHIP-14 score (B = 0.996, 95% CI: 0.017–1.974, $p = 0.046$), even after adjustment for age and clinical OH indicators. Oral status was coded as an ordinal variable (1 = ND, 2 = FPs, 3 = RPs), indicating that each incremental worsening in prosthetic category was associated with an approximately one-point increase in OHIP-14 score, reflecting a progressive deterioration in overall OHRQoL, with RPs exerting the greatest negative impact. Additionally, the presence of CSD was associated with significantly higher OHIP-14 scores (B = 1.671, 95% CI: 0.085–3.256, $p = 0.039$), suggesting an independent adverse effect of systemic health on perceived OHRQoL. Biological OH parameters also emerged as strong independent predictors. Each one-unit increase in CAF index was associated with a 0.303-point increase in OHIP-14 score (95% CI: 0.213–0.393, $p < 0.001$), whereas increasing periodontal disease severity (CPITN) corresponded to a 1.069-point increase in OHIP-14 score *per* category (95% CI: 0.214–1.923, $p = 0.014$). Age, PI, and GI were not independently associated with total OHIP-14 scores after adjustment. Collectively, these findings indicate that the overall OHIP-14 score reflects both psychosocial and biological components of OH. Prosthetic status captures a global psychosocial and functional burden perceived by patients, while the CAF and CPITN indices represent objective indicators of clinical oral disease severity, all of which independently contribute to the overall deterioration of QoL.

A separate multivariable regression model was constructed with FLs domain as the dependent variable (Table 2). The model was statistically significant ($F = 20.30$,

Table 1

Multivariable regression analysis – dependent variable OHIP-14 total score

Predictor	B	SE	β	95% CI for B	*p*-value
Oral status, ordinal	0.996	0.499	0.050	0.017–1.974	0.046
Chronic disease, yes	1.671	0.808	0.051	0.085–3.256	0.039
CAF	0.303	0.046	0.171	0.213–0.393	< 0.001
CPITN	1.069	0.436	0.089	0.214–1.923	0.014
PI	0.741	0.576	0.040	- 0.388–1.871	0.198
GI	0.623	0.691	0.033	- 0.733–1.978	0.368
Age, years	0.041	0.027	0.046	- 0.011–0.093	0.121

OHIP-14 – Oral Health Impact Profile-14; SE – standard error; CI – confidence interval; CAF – Caries Activity Factor; CPITN – Community Periodontal Index of Treatment Needs; PI – plaque index; GI – gingival index.
***Note*: Model fit: $R^2 = 0.098$; adjusted $R^2 = 0.094$; F (7,1626) = 25.22.**

Table 2

Multivariable regression analysis – dependent variable functional limitation domain OHIP-14 score

Predictor	B	SE	β	95% CI	*p*-value
Oral status, ordinal	0.135	0.070	0.049	-0.00–0.272	0.054
Chronic disease, yes	0.355	0.113	0.078	0.133–0.577	0.002
CAF	0.027	0.006	0.111	0.015–0.040	< 0.001
CPITN	0.228	0.061	0.138	0.109–0.348	< 0.001
PI	0.093	0.081	0.036	-0.065–0.251	0.249
GI	-0.079	0.097	-0.030	-0.268–0.111	0.416
Age, years	0.007	0.004	0.059	0.000–0.015	0.047

OHIP-14 – Oral Health Impact Profile-14; SE – standard error; CI – confidence interval; CAF – Caries Activity Factor; CPITN – Community Periodontal Index of Treatment Needs; PI – plaque index; GI – gingival index.
***Note*: Model fit: $R^2 = 0.080$; adjusted $R^2 = 0.076$; F (7,1626) = 20.30.**

$p < 0.001$; adjusted $R^2 = 0.076$). Unlike the total OHIP-14 score, oral status was no longer a statistically significant independent predictor of FLs after adjustment for age and clinical OH indicators (B = 0.135, $p = 0.054$). This suggests that the intergroup differences in FLs observed in the Kruskal–Wallis and Dunn's *post hoc* tests were largely attributable to underlying clinical oral disease severity rather than prosthetic status *per se*. Biological factors emerged as the dominant predictors of functional impairment. Each one-unit increase in the CAF index was associated with a 0.027-point increase in FLs score (95% CI: 0.015–0.040, $p < 0.001$), whereas each increment in CPITN corresponded to a 0.228-point increase in FLs score (95% CI: 0.109–0.348, $p < 0.001$). Increasing age was independently associated with worsening FLs (B = 0.007 *per* year, $p = 0.047$), and the presence of CSD further contributed to higher FLs scores (B = 0.355, $p = 0.002$). These findings indicate that FL is predominantly determined by objective biological disease severity and aging, rather than by prosthetic category, explaining why oral status loses independent significance in this domain despite showing big group-level differences in nonparametric analyses.

Discussion

The study evaluated patient-reported outcomes regarding the functional, esthetic, and psychosocial impacts of prosthodontic treatment on OHRQoL using the OHIP-14 questionnaire. In addition, biological OH parameters, including CAF, CPITN, PI, and GI indices, were assessed to evaluate the overall burden of oral disease. The sample was drawn exclusively from SAF personnel, which may limit generalizability to the broader population due to unique occupational and lifestyle factors, differential access to care, and psychosocial influences that differ from civilians. Nevertheless, the study addresses a significant gap in the literature by examining the impact of prosthodontic treatment on OHRQoL in a Serbian military population, a setting where such data are scarce. By focusing on military personnel, a relatively underexplored population, these results contribute novel insights to the scientific literature and help bridge the knowledge gap regarding the comparative effects of different prosthetic restorations on patients' OHRQoL, highlighting the importance of individualized treatment planning in prosthodontic practice [23]. Patient-reported outcomes were assessed using the OHIP-14 questionnaire, providing a comprehensive evaluation of functional, esthetic, and psychosocial impacts of prosthodontic interventions. While self-reported data are inherently subject to recall and social desirability biases, which may influence OHIP-14 responses, the instrument is validated and widely recognized as a rigorous measure of OHRQoL [24, 25].

The study findings suggest that, although prosthetic rehabilitation is associated with restoration of structural integrity, it may not fully mitigate the psychosocial burden associated with tooth loss. Participants with both FPs and RPs reported significantly higher OHIP-14 scores compared with individuals with ND, indicating a persistent negative effect on perceived QoL. Although patient satisfaction and OHRQoL overlap in some areas, patients generally expect that prostheses will primarily improve their overall QoL [26]. These results align with previous research in civilian populations, suggesting that prosthetic treatment may be associated with better functional outcomes, although it cannot entirely replicate the comfort and confidence associated with ND [27, 28]. Interestingly, no significant difference was observed between FPs and RPs in overall OHIP-14 scores, except within FLs domain. This domain displayed a clear gradient, with FPs being associated with a measurable functional advantage over RPs. These findings emphasize the importance of considering functional outcomes separately from psychosocial dimensions when evaluating prosthetic success. Therefore, the influence of prosthodontic treatment on QoL extends beyond mere restoration of oral function [29]. While FPs may enhance mastication and speech, they do not appear to provide additional psychological or social benefits compared with RPs. Similar findings were reported in another study, where patient satisfaction was more closely associated with the psychological than the physical domain of OHIP [30].

Multivariable regression analysis further demonstrated that oral status remained an independent predictor of overall OHRQoL even after adjustment for age and clinical indicators, confirming its role as a global determinant of patient-perceived burden. Similarly, a study using hierarchical multiple regression analysis reported that OH status remained significantly associated with OHRQoL after controlling for demographic and clinical variables, reinforcing its importance as an independent predictor [31]. However, within the FLs domain, oral status lost statistical significance once biological variables were included in the model, suggesting that functional impairment is primarily driven by objective disease severity rather than prosthetic category. This finding highlights the complex interplay between structural rehabilitation and underlying OH conditions.

Biological indicators, specifically CAF and CPITN indices, emerged as strong independent predictors of both overall OHIP-14 and FLs scores. Each incremental increase in these indices was associated with a significant deterioration in QoL, reinforcing the notion that untreated caries and periodontal disease exert a substantial impact beyond clinical symptoms, affecting daily functioning and psychosocial well-being. Although reported in a military population, our findings are consistent with previous reports demonstrating a clear correlation between increasing periodontitis severity and higher OHIP-14 scores, particularly in Stage III and IV disease, indicating marked impairment in QoL [32]. Furthermore, greater caries experience was associated with worse OHIP-14 scores, confirming the detrimental effect of untreated caries on daily functioning and psychosocial well-being [33].

CSD also contributed negatively to OHRQoL, reflecting the multidimensional nature of OH and its interaction with general health. Consistent with these

findings, previous studies have shown that patients with chronic systemic conditions, such as diabetes mellitus, cardiovascular disease, and hypertension, exhibit significantly poorer OH parameters, including a higher prevalence of periodontitis and tooth loss, underscoring the need for integrated and interdisciplinary care approaches [34].

Contrary to expectations, PI, GI, and age were not significant predictors of overall OHIP-14 scores after multivariable adjustment, although both age and the presence of CSD significantly influenced the FLs domain. These findings are consistent with previous studies reporting no direct association between mild-to-moderate plaque accumulation or gingival inflammation and overall OHRQoL [13, 35]. This suggests that while plaque accumulation and gingival inflammation are important targets for clinical management, their direct impact on patient-perceived QoL may be outweighed by more severe conditions, such as active caries lesions and advanced periodontal pockets. Nevertheless, contradictory evidence exists, as some studies have demonstrated that self-reported gingival bleeding is associated with poorer OHRQoL, indicating that patient-perceived symptoms may influence QoL outcomes independently of clinical indices [36].

Collectively, these findings emphasize the necessity for comprehensive treatment strategies that simultaneously address prosthetic rehabilitation and underlying biological disease. Merely replacing missing teeth does not guarantee improvements in psychosocial well-being; effective control of caries activity and periodontal disease is equally essential. Furthermore, FLs should be considered a key outcome measure in prosthetic planning, as it reflects meaningful improvements in patients' functional capacity and daily performance.

A major strength of this study lies in the combined use of nonparametric group comparisons and multivariable regression modeling, which enabled the differentiation of overall group effects from independent biological determinants of OHRQoL. This analytical approach enhances the robustness of the findings by accounting for potential confounding factors while preserving sensitivity to group-level differences.

Limitation of the study

Nevertheless, several limitations should be acknowledged. The cross-sectional study design precludes causal inference; therefore, the observed associations between biological indicators (CAF and CPITN) and OHIP-14 scores cannot be interpreted as causal relationships. It is plausible that pain, discomfort, or functional impairment may lead to poorer oral hygiene practices and reduced dental attendance, rather than biological disease severity alone driving diminished QoL. Furthermore, reliance on the CPITN, based on the worst finding *per* sextant, and the potential use of partial-mouth recording protocols, commonly employed in epidemiological studies, may underestimate the true distribution and severity of periodontal disease compared with full-mouth assessments. This methodological constraint may influence the relative sensitivity of the regression models to GI and PI vs. CPITN. Although the OHIP-14 instrument is widely validated and frequently used in population-based research, its domain-level granularity and responsiveness to clinical change may vary across populations and clinical conditions. In addition, the present study focused exclusively on FPs and RPs, excluding other prevalent treatment modalities such as implant-supported restorations and complete dentures, which may limit the generalizability of the findings. Finally, the cross-sectional nature of the data and reliance on self-reported outcomes introduce the potential for subjective bias and further restrict causal interpretation. Longitudinal studies are therefore warranted to evaluate whether improvements in biological indicators translate into sustained enhancements in OHRQoL following prosthodontic rehabilitation. Complementary qualitative research could also provide deeper insight into patient expectations, perceptions, and satisfaction beyond quantitative QoL scores.

Conclusion

This study suggests that prosthodontic rehabilitation in military personnel, although essential for restoring oral function, may not fully alleviate the psychosocial burden associated with tooth loss. While both fixed and removable prostheses were associated with improved functional outcomes, Serbian Armed Forces participants continued to report lower oral health-related quality of life compared with individuals with natural dentition. Oral health indicators, particularly caries activity and periodontal status, emerged as strong independent predictors of oral health–related quality of life, underscoring the necessity for comprehensive treatment strategies that address underlying biological disease in conjunction with prosthetic rehabilitation. These findings suggest the importance of individualized treatment planning that integrates functional, esthetic, and psychosocial dimensions of care, while prioritizing effective disease control to achieve meaningful and sustained improvements in patient-perceived quality of life.

Conflict of interest

The authors declare no conflict of interest.

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R E F E R E N C E S

1. *World Health Organization*. Global oral health status report: towards universal health coverage for oral health by 2030 [Internet]. Geneva: WHO; 2022 [cited on 2026 Apr 23]. Available from: https://www.who.int/publications/i/item/9789240061484
2. *World Health Organization*. Oral health data portal [Internet]. Geneva: WHO; 2023 [accessed 2026 Apr 15; cited on 2026 Apr 23]. Available from: https://www.who.int/data/gho/data/themes/oral-health-data-portal
3. *Lekić M, Lazić Z, Pandjaitan Donfrid P, Bokonjić D, Lemić T, Daković D*. Assessment of oral health of the Serbian Armed Forces members. Vojnosanit Pregl 2020; 77(6): 575–81. DOI: 10.2298/VSP180414111L.
4. *Milić Lemić A, Rajković K, Radović K, Živković R, Miličić B, Perić M*. The use of digital texture image analysis in determining the masticatory efficiency outcome. PLoS One 2021; 16(5): e0250936. DOI: 10.1371/journal.pone.0250936.
5. *Hong CL, Thomson WM, Broadbent JM*. Oral health-related quality of life from young adulthood to mid-life. Healthcare (Basel) 2023; 11(4): 515. DOI: 10.3390/healthcare11040515.
6. *Abolfotouh MA, Alhayf MD, Al-Shaer AS, Almutairi FK, Alotaibi DF, Alhawas NA,* et al. Prevalence and predictors of poor oral health-related quality of life among the Saudi elderly. BMC Public Health 2025; 25(1): 2622. DOI: 10.1186/s12889-025-23996-3.
7. *Helmi M*. Impacts of oral health on life quality metrics: correlations with job function, psychological well-being, self-perception, and dietary behavior. Front Oral Health 2025; 6: 1586868. DOI: 10.3389/froh.2025.1586868.
8. *Lekić M, Daković D, Kovačević V, Čutović T, Ilić I, Ilić M*. Testing of the Serbian version of the Oral Health Impact Profile-14 (OHIP-14) questionnaire among professional members of the Serbian Armed Forces. Vojnosanit Pregl 2021; 78(12): 1257–62. DOI: 10.2298/VSP200121049L.
9. *World Medical Association*. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. JAMA 2013; 310(20): 2191–4. DOI: 10.1001/jama.2013.281053.
10. *Daković D, Lekić M, Bokonjić D, Lazić Z, Čutović T, Mladenović R*. Evaluation of periodontal status and treatment needs of the Serbian military forces population. Vojnosanit Pregl 2021; 78(9): 911–8. DOI: 10.2298/VSP191125010D.
11. *Kovačević V, Milosavljević M, Rančić N, Daković D*. Assessment of the periodontal health and community periodontal index in the Army of Serbia. Vojnosanit Pregl 2015; 72(11): 953–60. DOI: 10.2298/VSP140812105K.
12. *Nyvad B, Baelum V*. Nyvad criteria for caries lesion activity and severity assessment: a validated approach for clinical management and research. Caries Res 2018; 52(5): 397–405. DOI: 10.1159/000480522.
13. *Ayan G, Dayı B*. Evaluation of plaque index, gingival index and oral health-related quality of life in obese patients. Odovtos Int J Dent Sci 2023; 25(1): 166–78. DOI: 10.15517/ijds.2022.52533.
14. *Popovac A, Kuzmanović Pfićer J, Stančić I, Milić Lemić A, Petričević N, Peršić Kiršić S,* et al. Psychometric properties of the five-item ultrashort Oral Health Impact Profile (OHIP-5) in the Serbian cultural environment: a cross-sectional study. J Clin Med 2025; 14(22): 7909. DOI: 10.3390/jcm14227909.
15. *Von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP; STROBE Initiative*. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. J Clin Epidemiol 2008; 61(4): 344–9. DOI: 10.1016/j.jclinepi.2007.11.008.
16. *Nyvad B, Machiulskiene V, Baelum V*. Reliability of a new caries diagnostic system differentiating between active and inactive caries lesions. Caries Res 1999; 33(4): 252–60. DOI: 10.1159/000016526.
17. *World Health Organization*. Oral health surveys: basic methods - 5th edition [Internet]. Geneva: WHO; 2013 [accessed 2026 Apr 15; cited 2026 Apr 24]. Available from: https://www.who.int/publications/i/item/9789241548649
18. *Silness J, Löe H*. Periodontal disease in pregnancy II. Correlation between oral hygiene and periodontal condition. Acta Odontol Scand 1964; 22(1): 121–35. DOI: 10.3109/00016356408993968.
19. *Löe H, Silness J*. Periodontal disease in pregnancy I. Prevalence and severity. Acta Odontol Scand 1963; 21(6): 533–51. DOI: 10.3109/00016356309011240.
20. *Slade GD, Spencer AJ*. Development and evaluation of the oral health impact profile. Community Dent Health 1994; 11(1): 3–11.
21. *Stančić I, Sojić LT, Jelenković A*. Adaptation of Oral Health Impact Profile (OHIP-14) index for measuring impact of oral health on quality of life in the elderly to the Serbian language. Vojnosanit Pregl 2009; 66(7): 511–5. DOI: 10.2298/VSP0907511S.
22. *Couto P, Pereira PA, Nunes M, Mendes RA*. Validation of a Portuguese version of the Oral Health Impact Profile adapted to people with mild intellectual disabilities (OHIP-14-MID-PT). PLoS One 2018; 13(6): e0198840. DOI: 10.1371/journal.pone.0198840.
23. *Kovačević I, Barac I, Major Poljak K, Čandrlić S, Čandrlić M*. Assessing the oral-health-related quality of life in patients with dental prosthetics: a cross-sectional study from Eastern Croatia. Oral 2025; 5(1): 10. DOI: 10.3390/oral5010010.
24. *Reissmann DR*. Methodological considerations when measuring oral health-related quality of life. J Oral Rehabil 2021; 48(3): 233–45. DOI: 10.1111/joor.12983.
25. *Riva F, Seoane M, Reichenheim ME, Tsakos G, Celeste RK*. Adult oral health-related quality of life instruments: a systematic review. Community Dent Oral Epidemiol 2022; 50(5): 333–8. DOI: 10.1111/cdoe.12689.
26. *Techapiroontong S, Chuenjitwongsa S, Limpuangthip N*. Determinants of removable partial denture success in patients' perspectives. J Dent 2025; 163: 106145. DOI: 10.1016/j.jdent.2025.106145.
27. *Tanasić IV, Tihaček Šojić LJĐ, Milić Lemić AM*. Prevalence and clinical effects of certain therapy concepts among partially edentulous Serbian elderly. J Prosthodont 2015; 24(8): 610–4. DOI: 10.1111/jopr.12261.
28. *Dula LJ, Kelmendi TZ, Shala K, Staka G, Pustina-Krasniqi T, Kosumi S*. Attachment-retained versus clasp-retained removable partial dentures: effects of retention on patient satisfaction. Eur J Dent 2025; 19(3): 823–34. DOI: 10.1055/s-0044-1795122.
29. *Rodriguez K*. The role of prosthodontics in enhancing quality of life. Periodon Prosthodon 2024; 10: 24.
30. *Teng CJ, Lin SC, Chen JH, Chen Y, Kuo HC, Ho PS*. The association between denture self-satisfaction rates and OHRQoL: a follow-up study. BMC Oral Health 2020; 20(1): 140. DOI: 10.1186/s12903-020-01119-1.
31. *Ayala-Luis J, Johansson V, Sampogna F, Axtelius B, Söderfeldt B*. A multivariable analysis of patient dental satisfaction and oral health-related quality-of-life. A cross-sectional study based on DVSS and OHIP-14. Acta Odontol Scand 2014; 72(3): 187–93. DOI: 10.3109/00016357.2012.762987.
32. *Efeoğlu NH, Başer Ü*. Evaluation of the impact of different stages of periodontitis on quality of life with Oral Health Impact Profile – 14 (OHIP-14): a systematic review. J Clin Pract Res 2025; 47(3): 227–34. DOI: 10.14744/cpr.2025.99232.

33. *Klarić Puđa I, Goršeta K, Jurić H, Soldo M, Marks LAM, Majstorović M.* A Cohort Study on the Impact of Oral Health on the Quality of Life of Adolescents and Young Adults. Clin Pract 2025; 15(4): 76. DOI: 10.3390/clinpract15040076.
34. *Öçbe M, Çelebi E, Öçbe ÇB.* An overlooked connection: oral health status in patients with chronic diseases. BMC Oral Health 2025; 25(1): 314. DOI: 10.1186/s12903-025-05673-4.
35. *Ceylan Şen S, Saraç Atagün Ö, Ustaoğlu G, Yildiz ZH.* Assessment of oral health-related quality of life and its association with periodontal status in geriatric patients. BMC Oral Health 2025; 26(1): 15. DOI: 10.1186/s12903-025-07432-x.
36. *Collins JR, Rivas-Tumanyan S, Santosh ABR, Boneta AE.* Periodontal Health Knowledge and Oral Health-Related Quality of Life in Caribbean Adults. Oral Health Prev Dent 2024; 22: 9–22. DOI: 10.3290/j.ohpd.b4836035.

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