**Journal of Current Research in Oral Surgery**
2026, Volume 6, Issue 1, Page No: 123-127

Available online at: www.tsdp.net

**ISSN: 3062-3480**

**Original Article**

# Impact of Maxillofacial Prosthetic Rehabilitation on Quality of Life in Head and Neck Cancer Patients: A Prospective Clinical Study

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**Received:** 11 January 2026; **Revised:** 21 March 2026; **Accepted:** 27 March 2026

## ABSTRACT

Management of head-and-neck malignancies can diminish patient quality of life (QoL) by disrupting the structural and functional integrity of the oral and nasopharyngeal regions. Maxillofacial prosthetic intervention is warranted when head and neck anatomy cannot be reconstructed with viable tissue, when recurrence probability is elevated, when radiotherapy is delivered, or when bone segments are markedly displaced. This investigation aimed to determine whether maxillofacial prosthetic restoration influences patient QoL, using the University of Washington (UW) QoL instrument. This investigation employed a prospective interventional pre-post design with convenience sampling. Appliances were custom-fabricated based on the clinical presentation, employing heat-cured polymethyl methacrylate, maxillofacial silicone, or a combination of the two. The overall mean composite QoL score stood at 68.05 ± 16.98 before rehabilitation and rose to 73.22 ± 11.28 afterward. Chewing and saliva (oral dryness) registered the poorest scores (55 ± 9.2, 62 ± 8.6, respectively) across all domains, whereas pain and anxiety yielded the best scores (93 ± 3.7, 95 ± 1.5, respectively). Statistically significant improvements following prosthetic rehabilitation were observed in appearance, speech, swallowing, chewing, saliva, and overall QoL. Within the confines of this study and its chosen population, subjective assessment via the UW-QOL demonstrated that despite postsurgical and postreconstructive anatomical alterations and compromised physiology secondary to chemoradiation, oral cancer patients successfully adapted and regained near-normal oral status through prosthetic rehabilitation. Their enhanced QoL substantiated this adaptation at the one-month post-rehabilitation interval.

**Keywords:** Auricular prosthesis, Mandibular guide flange prosthesis, Maxillofacial rehabilitation, Obturator prosthesis, Orbital prosthesis

**How to Cite This Article:** Torres A, Fernandez M. Impact of Maxillofacial Prosthetic Rehabilitation on Quality of Life in Head and Neck Cancer Patients: A Prospective Clinical Study. J Curr Res Oral Surg. 2026;6(1):123-7. https://doi.org/10.51847/61c35wUaMA

## Introduction

Head-and-neck cancer and its therapeutic management remain a source of profound suffering for affected individuals. Treatment protocols can erode quality of life (QoL) as a consequence of lost structural and functional integrity within the oro- and nasopharyngeal territories. Vital capabilities, including mastication, deglutition, phonation, and aesthetics, can be compromised by surgical resection, irradiation, or chemotherapy, yielding detrimental effects on patients' physical, psychological, and social functioning [1]. The magnitude of impairment depends upon the defect's site and extent. Anatomic deficits and functional disruption of the oral cavity or face may be addressed either by microvascular reconstructive flaps or, when surgery is not feasible, by prosthetic approaches. Maxillofacial prostheses function as an adjunct to, or a substitute for, reconstructive surgical procedures [2, 3].

Maxillofacial prosthetic management is not merely a replacement for plastic and reconstructive surgery; in select scenarios, it may represent a viable alternative. A maxillofacial prosthesis delivers a nonsurgical remedy for individuals who are unsuitable candidates

for plastic surgical intervention due to advanced age, compromised health status, extensive deformity, or poor tissue vascularity resulting from radiation exposure. Moreover, prosthetic intervention is indicated when cephalic and cervical anatomical structures cannot be restored with living tissue, when recurrence is anticipated, when radiotherapy is employed, or when fracture fragments are severely displaced. To the author's knowledge, investigations examining alterations in QoL following maxillofacial rehabilitation remain scarce. Nagy *et al*. [1] were the first to publish data contrasting posttreatment and postrehabilitation states in head-and-neck cancer patients undergoing both intraoral and extraoral rehabilitation. Their findings indicated that posttreatment maxillofacial rehabilitation in head-and-neck cancer not only reinstates lost physical functions but also triggers substantial transformations in patients' overall QoL [1]. Within the Indian context, Mohan [3] appraised the effect of definitive obturator prostheses on oral health-related QoL (OHRQoL) for maxillary defects using the oral health impact profile (OHIP-Edent) and the obturator functioning scale, concluding that a robust positive correlation exists between definitive obturator prostheses and OHRQoL. Dholam *et al*. [4] gauged the impact of oral rehabilitation on patients' OHRQoL following oral cavity cancer treatment using the Liverpool Oral Rehabilitation Questionnaire (LORQ) version 3 (LORQv3) and the OHIP-14 questionnaire, documenting enhanced QoL following 1 year of dental rehabilitation. Nonetheless, investigators have used diverse instruments to quantify changes in QoL. Furthermore, extraoral defects, health-related QoL, and overall QoL remain unexplored within the Indian population.

Health-related QoL (HRQoL) constitutes a pivotal outcome parameter following head-and-neck cancer therapy. The repercussions of head-and-neck cancer and its associated therapeutic modalities profoundly influence patients' physical, functional, and psychological wellness; consequently, examining the patient perspective in such circumstances furnishes essential information. The selection of an HRQoL questionnaire depends on the investigation's objective, design, and available resources. Certain instruments may prove more suitable for routine clinical application, while others are better suited to research environments. The University of Washington QoL questionnaire (UW-QoL) has surfaced as a straightforward yet clinically meaningful measure apt for routine clinical deployment [5]. The UW-QoL confers the following merits: (1) it is concise and self-administered, (2) it is multidimensional, permitting discernment of subtle changes, (3) it supplies questions tailored specifically to head-and-neck cancer, and (4) it necessitates no input from the healthcare provider, thereby mirroring the QoL as reported by the patient [5, 6]. The Hindi and Marathi versions of the UW-QoL were developed and validated as reliable tools for QoL assessment in the Indian population [2]. The study objective was to scrutinize whether prosthetic rehabilitation of maxillofacial defects alters patients' QoL, employing the UW-QoL. The hypothesis posited that diverse prosthetic interventions for restoring maxillofacial defects influence patients' QoL.

## Materials and Methods

Approval from the institutional ethics committee was secured for this prospective interventional investigation. Patients referred to the maxillofacial rehabilitation center at the author's institution for prosthetic restoration of maxillofacial defects (after surgical tumor resection) spanning January 2016 to December 2019 were enrolled. A convenience sampling strategy was adopted owing to the constrained patient population and the author's institution's straightforward accessibility. Sample size was derived in accordance with a preceding study by Dholam *et al*. [4]. **Table 1** delineates the demographic attributes of the enrolled participants. Informed written consent was obtained from all patients after a thorough explanation of all procedural details. The prostheses were custom-manufactured to meet clinical requirements, using heat-cured polymethyl methacrylate, maxillofacial silicone, or a blend of both.



**Table 1.** Details of the studied population

| Characteristic | Number of patients/Value |
|---|---|
| Mean age (years) | 56 ± 4.6 |
| **Gender** | |
| Male participants | 24 |
| Female participants | 15 |
| **Educational level** | |
| School-level education | 21 |
| College-level education | 18 |
| **Habits (tobacco, alcohol)** | |

| | |
|---|---|
| Tobacco chewing | 19 |
| Alcohol consumption | 8 |
| **Treatment modality** | |
| Surgery only | 14 |
| Surgery combined with radiotherapy | 25 |

The present iteration, designated version 4 of the UW-QOL instrument, comprises 12 single-question domains, each with 3 to 6 response alternatives, uniformly graduated from 0 (most unfavorable) to 100 (most favorable), following the ordering of the options [5, 6]. The assessed domains include pain, appearance, activity, recreation, swallowing, chewing, speech, shoulder, taste, saliva, mood, and anxiety [5, 6]. A further query asked patients to identify up to three of these domains that carried the greatest weight for them personally. Three overarching questions also feature: one probing how the patient feels compared with their condition before cancer emergence, one addressing their HRQoL, and one concerning their overall QOL. With respect to their overall QOL, individuals were asked to reflect on aspects beyond physical and mental health, including family, friends, spirituality, and personal recreational activities that are important to their life satisfaction. The full questionnaire focused on the patient's current health and QoL over the preceding 7 days. The UW-QOL is built on domains with discrete ordinal response formats. A rating of 0 corresponds to the least desirable result, whereas a rating of 100 equates to the most desirable one. Scores are allocated in uniform steps from 0 to 100, corresponding to the count of possible replies. For example, the pain domain contains 5 possible replies, each assigned a score of 0, 25, 50, 75, or 100. The UW-QOL includes three global questions, querying how the patient feels compared with the period before their cancer arose, their health-related QoL, and their overall QoL. These three have likewise been converted to a 0–100 scaling to permit straightforward presentation of all principal outcomes on a shared 0–100 metric. The instruments are intended for independent completion, but depending on the individual's needs, a healthcare provider may offer minimal support. Data were collected from subjects who provided consent to participate in the study, including sociodemographic parameters such as age at treatment, sex, treatment category, and type of rehabilitation. QoL measurements were captured at two time points using the UW-QoL version 4 in its Hindi and Marathi translations [2] before rehabilitation and again 1 month afterward.

The statistical computations were executed by an independent statistician unaffiliated with the clinical care team. Going beyond descriptive summaries, pre- and post-rehabilitation scores for the distinct domains were compared. Data normality was tested, and two-tailed analyses were conducted using the Mann–Whitney U test and the Kruskal–Wallis test to determine the significance of average QoL score differences within each domain across separate groupings. Statistical significance was set at $P < 0.05$. The Type I error threshold was maintained at 5%, the Type II error at 20%, and the study's power stood at 80%.

## Results and Discussion

Before rehabilitation, the overall mean composite QoL score was 68.05 ± 16.98, and after rehabilitation, it increased to 73.22 ± 11.28. Across all domains, chewing and saliva (oral dryness) received the lowest scores (55 ± 9.2, 62 ± 8.6, respectively), whereas pain and anxiety received the highest scores (93 ± 3.7, 95 ± 1.5, respectively) **(Table 2)**. **Table 2** presents the scores broken down by domain before and after rehabilitation, and **Table 3** consolidates the range of prosthetic devices provided to the cohort under study. Meaningful statistical improvement was evident in the domains of swallowing, chewing, speech, and saliva. Health-related QoL measured over the preceding 7 days and overall QoL assessed over the preceding 7 days likewise showed statistically meaningful gains. Ratings for pain, activity, recreation, taste, mood, anxiety, intimacy, and fear of cancer recurrence stayed mostly static, with the observed alterations lacking statistical significance. When ranked by priority before rehabilitation, the three leading domains of worry were chewing, swallowing, and appearance; following rehabilitation, these shifted to fear of cancer recurrence, recreation, and anxiety.



**Table 2.** Domain-wise scores using the University of Washington Questionnaire (version 4.1)

| Domain | P-value | After prosthetic rehabilitation (Mean ± SD) | Before prosthetic rehabilitation (Mean ± SD) |
|---|---|---|---|
| Pain | > 0.05 | 94 ± 2.8 | 93 ± 3.7 |
| Appearance | < 0.05* | 75 ± 7.2 | 68 ± 7.4 |

| | | | |
|---|---|---|---|
| Activity | > 0.05 | 70 ± 2.1 | 69 ± 2.7 |
| Recreation | > 0.05 | 71 ± 1.8 | 70 ± 2.1 |
| Swallowing | < 0.05* | 75 ± 15.8 | 67 ± 12.5 |
| Chewing | < 0.05* | 66 ± 17.5 | 55 ± 19.2 |
| Speech | < 0.05* | 74 ± 14.4 | 68 ± 15.4 |
| Shoulder function | > 0.05 | 96 ± 1.2 | 95 ± 1.5 |
| Taste | > 0.05 | 93 ± 1.8 | 92 ± 2.1 |
| Salivary function | < 0.05* | 79 ± 17.8 | 62 ± 18.6 |
| Mood | > 0.05 | 71 ± 2.1 | 69 ± 2.3 |
| Anxiety | > 0.05 | 73 ± 4.4 | 72 ± 4.5 |
| Intimacy | > 0.05 | 84 ± 3.8 | 84 ± 1.5 |
| Fear of cancer recurrence | > 0.05 | 63 ± 2.1 | 62 ± 2.5 |
| Health-related QoL compared to the month before cancer onset | < 0.05* | 81 ± 7.6 | 72 ± 8.5 |
| Health-related QoL over the past 7 days | < 0.05* | 76 ± 12.1 | 63 ± 12.7 |
| Overall QoL over the past 7 days | < 0.05* | 77 ± 11.5 | 64 ± 12.6 |
| **Key domains of concern (Rank order)** | | **Before rehabilitation** | **After rehabilitation** |
| 1 | | Chewing | Fear of cancer recurrence |
| 2 | | Swallowing | Recreation |
| 3 | | Appearance | Anxiety |

(P < 0.05) was considered to be significant. SD=Standard deviation, QOL= Quality of life

**Table 3.** Type of prosthetic rehabilitation in the present study population

| Type of prosthetic rehabilitation | Number of cases |
|---|---|
| Obturator prosthesis for maxillectomy defects | 20 |
| Prosthetic reconstruction following hemimandibulectomy using a guide flange prosthesis and removable partial dentures | 14 |
| Combined prosthesis involving both extraoral and intraoral components | 1 |
| Other prostheses (auricular, orbital, ocular) | 4 |
| **Total** | **39** |



The broad pattern of results was consistent with earlier reports [1, 3, 4, 6-10] that have described enhanced QoL scores following prosthetic restoration, despite the multiplicity of QoL instruments used by various research groups. Uplifts were registered across both the physical symptom spectrum and psychosocial dimensions of well-being. The greatest magnitude of benefit was concentrated in exactly those domains that had caused patients the most distress during the prerehabilitation period. The current work adopted the Hindi and Marathi versions of the UW-QoL questionnaire, version 4, which were originally designed and psychometrically validated for head-and-neck cancer cohorts in the Indian setting [2].

When ordered hierarchically by salience before rehabilitation, the top three spheres of concern comprised chewing, swallowing, and appearance; after rehabilitation, this triad was supplanted by fear of tumor. Pronounced standard deviations alongside inter-domain variability were evident, reflecting the disparate defect categories and the wide-ranging therapeutic modalities encompassed within the investigation. With respect to appearance, patients with extraoral defects returned markedly lower scores than those with intraoral involvement; the reverse pattern held for chewing and saliva, where intraoral defect patients scored substantially lower than their extraoral defect counterparts. Shoulder mobility represented yet another parameter in which ratings remained virtually identical at both time points, implying that none of the procedures—surgical or otherwise—impinged upon the accessory nerve and, correspondingly, shoulder dysfunction did not register as a meaningful QoL concern.

Certain study limitations deserve explicit acknowledgment. The central thrust of this investigation was to gauge whether the deployed rehabilitative approaches might confer a beneficial effect on QoL relative to the posttreatment state. Consequently, however striking the results and however robust the statistical power of the comparisons, they are most prudently viewed as hypothesis-generating rather than confirmatory. This interpretive restraint arises because only bivariate analyses were undertaken, without any statistical adjustment for potential confounders such as chronological age, biological sex, defect magnitude, tumor histology, radiotherapy administration, or pre-

existing oral health status. By extension, the data presented here call for circumspect reading and do not furnish a basis for strict causal attribution. That said, our accumulated clinical experience with these individuals, coupled with their subjective appraisals, strongly suggested that the integrated surgical and prosthetic rehabilitative framework was instrumental in improving their QoL.

## Conclusion

In the face of postsurgical and postreconstructive anatomical derangement, together with chemoradiation-induced physiological compromise, oral cancer patients registered notable QoL improvement at the one-month mark, a gain directly traceable to maxillofacial prosthetic rehabilitation. The cohort demonstrated effective coping and a return to near-normal oral function after completion of prosthetic rehabilitation.

**Acknowledgments:** None

**Conflict of Interest:** None

**Financial Support:** None

**Ethics Statement:** None

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