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Research Article

Oral Health-Related Quality of Life among Post-Surgical Maxillofacial Prosthetic Patients: A Cross-Sectional Analysis

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ABSTRACT

Objectives: To assess oral health-related quality of life (OHRQoL) among post-surgical maxillofacial prosthetic patients attending a tertiary care dental hospital in Islamabad, and to examine its association with demographic and prosthetic variables.

Methods: This cross-sectional analytical study was conducted from January 2025 to September 2025 at the School of Dentistry, Pakistan Institute of Medical Sciences (PIMS), Islamabad. Using non-probability consecutive sampling, 150 post-surgical patients with surgically acquired maxillofacial defects rehabilitated with a definitive prosthesis for at least three months were enrolled. OHRQoL was assessed using the Oral Health Impact Profile-14 (OHIP-14), administered by face-to-face clinical interview. Internal consistency was evaluated using Cronbach's alpha, and the normality of cumulative scores was assessed with the Shapiro-Wilk test. Between-group comparisons used independent-samples t-tests and one-way analysis of variance (ANOVA) with Tukey HSD post-hoc testing; effect sizes were expressed as Cohen's d and eta-squared (η^2). Analyses were performed in IBM SPSS Statistics version 26, with significance set at $p < 0.05$.

Results: The mean age of participants was 48.6 ± 12.4 years, with a male-to-female ratio of 1.88:1. The commonest etiology was surgical resection for oral squamous cell carcinoma (78.0%). The mean cumulative OHIP-14 score was 18.42 ± 6.10. Functional Limitation (3.12 ± 0.8) and Psychological Discomfort (2.85 ± 0.9) were the most affected domains. Within the maxillary-defect subgroup (n = 110), users of modified lightweight hollow-bulb obturators (n = 65) reported lower OHIP-14 scores (14.22 ± 3.40) than users of conventional solid-bulb prostheses (n = 45; 21.65 ± 5.10; mean difference 7.43, 95% CI 5.82–9.04; t = 9.12, $p < 0.001$; Cohen's d = 1.71). Across the full sample, OHIP-14 scores differed by duration of prosthesis use (one-way ANOVA, p = 0.024, $\eta^2 = 0.053$), with long-term users (> 12 months; 15.10 ± 4.30) scoring lower than early users (3–6 months; 21.80 ± 5.90; Tukey HSD p = 0.018). Cronbach's alpha for the instrument was 0.86.

Conclusions: Among prosthetically rehabilitated patients, the social and psychological domains were comparatively less impaired, whereas functional limitation remained prominent. Lower OHIP-14 scores were associated with the use of lightweight hollow-bulb maxillary obturators and with longer duration of prosthesis use. As an observational study, these findings describe associations rather than causal relationships.

Keywords: Oral Health-Related Quality Of Life, OHIP-14, Maxillofacial Prosthesis, Obturator, Maxillectomy, Cross-Sectional Study.

INTRODUCTION

Maxillofacial defects arising from the surgical resection of benign or malignant tumours, extensive trauma, or aggressive infection disrupt a patient's anatomical, physiological, and psychological integrity. In Pakistan, the substantial burden of oral squamous cell carcinoma (OSCC)—frequently linked to widespread habits such as betel quid, gutka, and tobacco use—often necessitates extensive ablative surgery, leaving patients with complex oronasal, oromaxillary, or mandibular communications.

These defects impair elemental functions, including mastication, deglutition, and speech articulation. The associated facial disfigurement is frequently accompanied by emotional distress, reduced self-confidence, and social withdrawal. Maxillofacial prosthetic rehabilitation—through obturators, palatal plates, and facial prostheses—is a central component of management, aiming to separate the oral cavity from adjacent spaces, restore speech, and re-establish acceptable facial aesthetics.

Conventional success criteria have emphasised the physical parameters of the prosthesis, such as retention, stability, and border adaptation. Contemporary practice increasingly incorporates patient-reported outcomes to characterise treatment success from the patient's perspective. OHRQoL captures the multidimensional impact of oral conditions on daily function, emotional wellbeing, and social participation. Although international cross-sectional data on maxillofacial prostheses exist, locally generated evidence from specialised centres in Pakistan remains sparse.

The School of Dentistry at PIMS, Islamabad, serves a diverse population drawn from the Federal Capital Territory, Punjab, Khyber Pakhtunkhwa, and Azad Jammu & Kashmir. This study was designed to assess OHRQoL among post-surgical maxillofacial prosthetic patients treated within this institutional setting and to examine its association with demographic and prosthetic characteristics.

MATERIALS AND METHODS

Study Design and Setting

This cross-sectional analytical study was conducted over a nine-month period (January 2025 to September 2025) in the Departments of Prosthodontics and Oral & Maxillofacial Surgery at the School of Dentistry, PIMS, Islamabad. Reporting follows the STROBE guidance for cross-sectional studies.

Selection Criteria

The target population comprised post-surgical patients who had undergone maxillofacial resection and received prosthetic care.

Inclusion Criteria: age 18 years or older; a surgically acquired maxillofacial defect; rehabilitation with a definitive maxillofacial prosthesis (obturator, mandibular prosthesis, or facial prosthesis) for a minimum of three months; and the capacity and willingness to provide written informed consent.

Exclusion Criteria: congenital craniofacial anomalies (e.g., cleft lip and palate); ongoing or incomplete prosthetic stages; pre-existing severe diagnosed psychiatric conditions; and inability to participate in a clinical interview owing to severe systemic or neurological impairment.

Sampling and Sample-Size Calculation

A non-probability consecutive sampling technique was used to recruit participants attending outpatient follow-up clinics. The sample size was calculated in OpenEpi version 3.01 for the comparison of two independent means. Assuming a mean difference of 4.0 (SD 8.0) informed by relevant literature, a 95% confidence level ($\alpha = 0.05$), and 80% power ($\beta = 0.20$), the minimum required sample was 126 participants. To allow for incomplete records, a total of 150 participants was recruited.

Ethical Considerations

Ethical approval was obtained from the Institutional Review Board / Ethical Review Committee of PIMS, Islamabad, prior to data collection (Ref. No. PIMS/SOD/2024/782-A). Written informed consent was obtained from all participants, and the study was conducted in accordance with the Declaration of Helsinki. No invasive procedures were performed.

Data Collection and Research Instrument

Eligible patients were identified during routine appointments. The objectives of the study were explained, and written informed consent was obtained. Data were collected uniformly through direct face-to-face clinical interviews and review of hospital surgical records. The instrument comprised three sections:

1. Section A (Demographic variables): age, sex, marital status, educational attainment, residence, and employment status.
2. Section B (Clinical variables): etiology of the defect; type and anatomical location of the defect (maxillectomy defects categorised using the Aramany classification); structural design of the prosthesis; and total duration of prosthesis use.

3. Section C (OHRQoL assessment): the Oral Health Impact Profile-14 (OHIP-14). The instrument comprises 14 items distributed across seven domains—Functional Limitation, Physical Pain, Psychological Discomfort, Physical Disability, Psychological Disability, Social Disability, and Handicap. Each item was scored on a five-point Likert scale (0 = never; 1 = hardly ever; 2 = occasionally; 3 = fairly often; 4 = very often).

Each OHIP-14 domain comprises two items; the domain score is the mean of its two constituent items (range 0–4), and the cumulative total score is the sum of all 14 items (range 0–56). Higher scores indicate poorer OHRQoL. The instrument demonstrated good internal consistency in the present sample (Cronbach's alpha = 0.86).

Statistical Analysis

Data were coded and analysed in IBM SPSS Statistics version 26. Continuous variables (age and OHIP-14 scores) are summarised as mean ± standard deviation, and categorical variables (sex, etiology, defect type, and prosthetic classification) as frequencies and percentages. The normality of cumulative OHIP-14 scores was assessed using the Shapiro–Wilk test together with histogram inspection. Independent-samples t-tests compared mean scores between two groups, and one-way ANOVA with Tukey HSD post-hoc testing compared three or more groups. Effect sizes were expressed as Cohen's d for t-tests and eta-squared (η^2) for ANOVA. Statistical significance was set at $p < 0.05$.

RESULTS

Demographic Characteristics

A total of 150 patients meeting the inclusion criteria were evaluated. The mean age was 48.6 ± 12.4 years (range 21–74). Ninety-eight participants (65.3%) were male and 52 (34.7%) were female, giving a male-to-female ratio of 1.88:1. With respect to residence, 63 participants (42.0%) were from rural areas surrounding the Islamabad Capital Territory and adjoining regions, while 87 (58.0%) resided in urban localities. Fifty-four participants (36.0%) were illiterate or had primary-level education, and 101 (67.3%) were not in formal employment (unemployed or homemakers) at the time of evaluation. The demographic profile is summarised in Table 1.

Table 1. Socio-Demographic Characteristics of the Study Sample (N = 150)

Variable	Category	n	%
Age group (years)	18–35	23	15.3
	36–50	61	40.7
	> 50	66	44.0
Sex	Male	98	65.3
	Female	52	34.7
Marital status	Married	118	78.7
	Unmarried / Widowed / Divorced	32	21.3
Educational level	Illiterate / Primary	54	36.0
	Matric / Intermediate	68	45.3
	Graduate and above	28	18.7
Employment status	Employed	49	32.7
	Unemployed / Homemaker	101	67.3

Clinical and Prosthetic Characteristics

The commonest etiology was surgical resection for OSCC, accounting for 117 cases (78.0%). Maxillary defects predominated (110; 73.3%), while mandibular defects accounted for 40 cases (26.7%). Among the maxillectomy defects (n = 110), Aramany Class I was most frequent (53; 48.2%), followed by Class II (42; 38.2%) and Classes III–VI (15; 13.6%). Within the maxillary-defect group, 45 patients (40.9%) wore conventional solid-bulb acrylic obturators and 65 (59.1%) wore modified lightweight hollow-bulb obturators. The mandibular cohort (n = 40) was managed with cast partial or conventional acrylic-base dentures. The mean duration of prosthesis use across all participants was 11.4 ± 5.8 months. The clinical distribution is summarised in Table 2.

Table 2. Clinical and prosthetic characteristics of the sample (N = 150)

Variable	Category	n	%
Etiology of defect	Oncological resection (OSCC)	117	78.0

	Traumatic injury	21	14.0
	Chronic infection (osteomyelitis)	12	8.0
Defect site	Maxillary (palatal / alveolar)	110	73.3
	Mandibular	40	26.7
Aramany class (n = 110)	Class I (unilateral defect)	53	48.2
	Class II (contralateral retention)	42	38.2
	Classes III–VI (central / complex)	15	13.6
Maxillary bulb design (n = 110)	Conventional solid-bulb	45	40.9
	Modified lightweight hollow-bulb	65	59.1
Duration of use	3–6 months	38	25.3
	7–12 months	59	39.3
	> 12 months	53	35.3

Primary Outcome: OHIP-14 Scores

The mean cumulative OHIP-14 score for the sample was 18.42 ± 6.10 (range 6–34). Analysis of individual domains (Table 3) indicated the greatest impairment in the Functional Limitation domain (3.12 ± 0.8), followed by Psychological Discomfort (2.85 ± 0.9). The lowest impairment was in the Social Disability domain (1.42 ± 0.5).

Table 3. Mean OHIP-14 Domain Scores (N = 150)

Rank	OHIP-14 domain	Mean domain score (± SD)	Impairment level
1	Functional Limitation	3.12 (± 0.8)	Prominent
2	Psychological Discomfort	2.85 (± 0.9)	High
3	Physical Disability	2.40 (± 0.7)	Moderate
4	Physical Pain	2.15 (± 1.1)	Moderate
5	Psychological Disability	2.10 (± 1.2)	Moderate
6	Handicap	1.68 (± 0.4)	Low–moderate
7	Social Disability	1.42 (± 0.5)	Lowest

Associations with OHIP-14 Scores

Maxillary Obturator Bulb Design. An independent-samples t-test within the maxillary-defect subgroup (n = 110) compared obturator designs. Users of modified lightweight hollow-bulb obturators (n = 65) reported a lower mean cumulative OHIP-14 score (14.22 ± 3.40) than users of conventional solid-bulb obturators (n = 45; 21.65 ± 5.10). The difference was statistically significant (mean difference 7.43, 95% CI 5.82–9.04; $t = 9.12$, $p < 0.001$), with a large effect size (Cohen's d = 1.71).

Duration of Use. One-way ANOVA across the full sample (N = 150) showed a statistically significant difference in cumulative OHIP-14 scores across categories of prosthesis-use duration ($F(2, 147) = 4.12$, $p = 0.024$, $\eta^2 = 0.053$). Tukey HSD post-hoc comparison indicated that patients using their prosthesis for more than 12 months had lower scores (15.10 ± 4.30) than those in the 3–6 month group (21.80 ± 5.90; $p = 0.018$).

Defect Location. Patients with mandibular defects had higher cumulative OHIP-14 scores (19.85 ± 6.80; n = 40) than those with maxillary defects (17.51 ± 5.40; n = 110; $t = 1.99$, $p = 0.048$; Cohen's d = 0.38), indicating greater overall functional impact in the mandibular group.

Table 4. Cumulative OHIP-14 Scores by Key Predictor Variables

Predictor	Group	n	Mean OHIP-14 (± SD)	Test / p
Obturator design (n = 110)	Conventional solid-bulb	45	21.65 (± 5.10)	t = 9.12
	Modified hollow-bulb	65	14.22 (± 3.40)	p < 0.001
Defect site	Maxillary	110	17.51 (± 5.40)	t = 1.99
	Mandibular	40	19.85 (± 6.80)	p = 0.048
Duration of use	3–6 months	38	21.80 (± 5.90)	F = 4.12

	7–12 months	59	18.34 (± 5.20)	p = 0.024
	> 12 months	53	15.10 (± 4.30)	
Sex	Male	98	18.10 (± 6.30)	t = 0.95
	Female	52	19.02 (± 5.80)	p = 0.342

Sex was not significantly associated with OHIP-14 scores (p = 0.342).

DISCUSSION

This cross-sectional study describes the oral health-related quality of life of post-surgical maxillofacial prosthetic patients at a tertiary care centre in Islamabad and its association with demographic and prosthetic characteristics. While prosthetic rehabilitation provides important functional and psychosocial support, the data indicate that physical function remains a notable area of impairment in this population.

Functional Limitation was the most affected domain. Even when an obturator achieves an effective peripheral seal, restoring fully intelligible speech and efficient mastication remains difficult after the loss of substantial hard palate and alveolar bone. This pattern is consistent with reports that intraoral structural defects are associated with altered speech and reduced chewing efficiency (Brandão et al., 2021).

Psychological Discomfort scores were also relatively high. In contexts where visible facial change and altered speech carry social weight, self-consciousness regarding appearance is commonly reported. Because the study did not include a pre-prosthetic baseline, the extent of any change attributable to rehabilitation cannot be quantified.

Social Disability scores were comparatively low. As these are relative domain rankings within a prosthesis-wearing sample rather than a comparison against an untreated group, the finding is best interpreted as an association between prosthesis use and lower perceived social-domain impact rather than evidence of a causal benefit.

The difference in scores between obturator designs is consistent with the proposed mechanical advantages of weight reduction. Heavier conventional solid-bulb obturators impose greater gravitational load on residual teeth and mucosal margins, which may compromise the peripheral seal and stability. Modified lightweight hollow-bulb designs reduce prosthesis weight, which may favour retention and reduce stress on supporting tissues; this is consistent with the lower OHIP-14 scores observed in hollow-bulb users (Shrivastava et al., 2023). However, this was a non-randomised observational comparison, and defect size, Aramany class, radiotherapy status, and operator era may confound the association. The large effect size should therefore be interpreted as exploratory.

Lower scores among longer-term users are consistent with progressive adaptation, but the cross-sectional design compares different patients rather than the same patients over time. Selection effects offer an alternative explanation, as patients who adapt poorly may discontinue use and be under-represented among long-term wearers. This pattern aligns with cross-sectional observations relating duration of use to patient-reported outcomes (Cuesta-Gómez et al., 2022), and a longitudinal design would be required to distinguish adaptation from selection.

CONCLUSION

Among maxillofacial prosthetic patients at this centre, functional limitation was the most prominent OHRQoL impairment, while the social and psychological domains were comparatively less affected. Lower OHIP-14 scores were associated with the use of lightweight hollow-bulb maxillary obturators and with longer duration of prosthesis use. These observational associations support further, appropriately adjusted and ideally longitudinal, evaluation of weight-reduction obturator designs and adaptation trajectories, and they reinforce the value of close coordination between oral and maxillofacial surgeons and prosthodontists from initial treatment planning onward.

Limitations

1. The cross-sectional design precludes causal or temporal inference.
2. Data were collected at a single tertiary care institution, which may limit generalisability.
3. Non-probability consecutive sampling may introduce selection bias.
4. OHRQoL was assessed by self-report, which is subject to response and social-desirability bias.
5. The absence of a pre-prosthetic baseline precludes intra-patient pre- versus post-treatment comparison.

6. Only bivariate analyses were performed; multivariable models are needed to adjust for potential confounders such as socioeconomic status, opposing dentition, and defect volume.

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