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Socio-demographic and clinical variables affecting quality of life in maxillectomy patients rehabilitated with obturator prostheses

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Abstract:

Despite the continued use of obturator prostheses for maxillectomy rehabilitation, evidence on how socio-demographic and clinical factors influence early quality of life and prosthesis function, particularly in the North-East Indian population, remains limited. Therefore, it is of interest to evaluate the influence of socio-demographic and clinical factors on early quality of life and obturator function among 45 maxillectomy patients rehabilitated with interim obturator prostheses. Urban residence, Aramany defect class, remaining maxillary teeth, radiotherapy status and defect etiology showed significant associations with quality of life ($p < 0.05$). Interim obturator rehabilitation significantly improved prosthesis function, with better outcomes observed in patients with favorable defect characteristics and preserved dentition. Thus, data show the clinical factors, particularly defect type and remaining dentition, were the strongest determinants of early rehabilitation outcomes and should guide prosthetic treatment planning.

Keywords: Maxillectomy, obturator prosthesis, oral health-related quality of life (OHQOL), obturator functioning scale, aramany classification

Background:

Oral health is an integral part of the general health and wellbeing, an indicator of one's Health Related Quality Of Life (HRQOL) [1]. Oral functions such as speaking, chewing, swallowing, play a fundamental role in communication, nutrition and social integration. Any interference in these functions may lead to physical discomfort, emotional distress, reduced self-esteem and social withdrawal. Consequently, oral health is closely linked to general well-being and overall quality of life. In patients with head and neck conditions, where fundamental oral functions are involved, the impact on quality of life is immense [2]. Apart from the course of the disease, the surgical mode of treatment in patients with head and neck cancers can also lead to speech impairment; difficulties in mastication and swallowing and facial disfigurement can lead to psychological dysfunction. Maxillectomy is one such surgical procedure that involves removal of a part or all of the maxilla resulting in pronounced discontinuity defect that significantly affects function and esthetics [3]. Therefore, the prosthetic rehabilitation of the maxillectomy defect is important to restore oral functions and facial contours as well as health related quality of life. Various methods of reconstruction in such cases include prostheses, non-vascularized grafts, regional flaps and free vascularized tissue transfer and the recent, computer assisted techniques, artificial intelligence aids are being used for 3D reconstruction of maxillectomy defects [4, 5]. One of the most popularly used prosthesis for reconstruction remains the

obturator prosthesis. This may be attributed to less morbidity, low cost, which can be modified according to patient's needs and also allows for prosthetic reconstruction of lost structures, *e.g.*, missing teeth and soft tissues. Obturator aid in healing during the recovery period and provide possibility of immediate rehabilitation [6]. In spite of the advancements in the reconstructive options, obturator prosthesis remains a viable treatment option after maxillectomy particularly the surgical and interim obturator that help in healing surgical wound and maintaining tissue till the reconstructive surgery is done. It may be the only reconstructive option for the resource challenged clinical settings [7]. Till date, several studies have been carried out on the QOL of maxillectomy patients after rehabilitation with obturator prosthesis [8, 9], but no study is found to be reported in the North-East region of India where prevalence of oral cancer patients is comparatively high. Optimization of the prosthesis also leads to the predictability of the prosthetic treatment goal may be determined by the location, extension, etiology of the defect and other medical variable and socio-demographic factors. Previously conducted studies [10, 11] lack insight into socio-demographic variables and clinical variables which might influence the choice of reconstruction and important determinants to modify the treatment outcome of obturator prosthesis. Therefore, it is of interest to assess the effect of socio-demographic factors and clinical variables on quality of life of patients with maxillectomy defects rehabilitated with obturator prosthesis.

Methodology:**Ethical approval:**

Ethical clearance for the study was obtained from the Institutional Ethics Committee, Regional Dental College, Guwahati prior to the commencement of the study (No.RDC/29/2011/1035). The study was conducted in accordance with the principles of the Declaration of Helsinki. Written informed consent was obtained from all participants before enrolment. Confidentiality and anonymity of the participants were strictly maintained throughout the study.

Study design:

The present study was designed as an analytical cross-sectional investigation to assess the effect of socio-demographic and clinical variables on oral health-related quality of life in patients with maxillectomy defects rehabilitated using obturator prostheses.

Study setting and eligibility criteria:

This institutional based study was conducted in the Department of Prosthodontics and Crown & Bridge of Regional Dental College affiliated to Srimanta Sankaradeva University of Health Sciences, Assam, India. Patients with maxillectomy defects without orbital or nasal involvement who are otherwise healthy or medically stable, ambulatory and willing to undergo rehabilitation with obturator prosthesis were included, while those without oro-antral communication, with cognitive impairment, local recurrence, inability to attend additional visits, or physical/mental disabilities interfering with the study were excluded.

Sample size:

The sample size was calculated using the formula $n = [2 (Z_{\alpha/2} + Z_{\beta})^2 \times \sigma^2] / \Delta^2$, where n is the required sample size per group, $Z_{\alpha/2}$ is the standard normal deviate corresponding to a 95% confidence level (1.96), Z_{β} corresponds to 80% power (0.84), σ represents the estimated standard deviation of the quality of life (QOL) scores (assumed to be 15 based on previous literature) [12] and Δ is the clinically significant difference, considered as 9. Substituting the values, $n = [2 \times (1.96 + 0.84)^2 \times (15)^2] / (9)^2 = 43.55$. The calculated sample size was approximately 44, which was rounded up to 45 participants to ensure adequacy.

Outcome variables:

Socio-demographic variables included age groups (≤ 20 , 21–40, 41–60, > 60 years), gender, geographic distribution, education, occupation and socio-economic status per modified BG Prasad classification 2020 [13]. Clinical variables included etiology of maxillectomy defect, remaining number of maxillary teeth, neck dissection, post-operative radiotherapy and Aramany defect classification (Classes I–VI). Obturator Functioning Scale (OFS) and Quality of Life measuring tool were also assessed.

Study tools:**Obturator functioning scale [14]:**

A pre validated 15 item questionnaire where responses were recorded using a 5-point Likert scale ranging from “not at all” to

“extremely difficult.” For analysis, responses were coded from 1 (not at all) to 5 (extremely difficult), with higher scores indicating greater difficulty in obturator functioning.

University of Washington quality of life (UWQOL) questionnaire version 4.1 [15]:

The version 4.1 of the UW-QOL questionnaire includes 14 domains: appearance, swallowing, chewing, speech, taste, saliva, shoulder function, pain, activity, recreation, mood, anxiety, intimacy and fear of cancer recurrence. These domains are further categorized into two subscales: the physical subscale (appearance, swallowing, chewing, speech, taste, saliva and shoulder function) and the socio-emotional subscale (pain, activity, recreation, mood, anxiety, intimacy and fear of cancer recurrence). Each domain is assessed using a single question with 3 to 6 response options. The responses are arranged hierarchically and converted into scores ranging from 0 to 100, with a numerical value assigned to each response. A score of 0 indicates maximum impairment or dissatisfaction, whereas a score of 100 indicates that the patient is asymptomatic or extremely satisfied in the respective domain.

Study procedure:

Baseline data were obtained from all 45 participants prior to the initiation of treatment using the UW-QOL questionnaire to assess quality of life following maxillectomy. Information on socio-demographic characteristics, medical history and treatment-related variables was collected during case history recording and clinical examination at each participant's first visit to the department. Follow-up assessments were conducted two weeks after insertion of the interim obturator prosthesis to evaluate both obturator functions and quality of life using the Obturator Functioning Scale (OFS) and the UW-QOL questionnaire. Due to loss to follow-up, 40 patients were available for this assessment. All collected data were systematically entered into Microsoft Excel for subsequent statistical analysis.

Statistical analysis:

Data was entered into Microsoft Excel (Microsoft Excel, Microsoft Corporation, Redmond, WA, USA) and analysed using SPSS version 23 (IBM SPSS Statistics, IBM Corporation, Armonk, NY, USA). Shapiro Wilk test was used to assess the normality of the data. Descriptive statistics were done. Independent t-test and one-way ANOVA were used to compare mean OFS and UWQOL scores across socio-demographic and clinical variables.

Results:

A total of 45 patients rehabilitated with obturator prosthesis following maxillectomy were included in the study. However, there was a loss of follow up of 5 patients. The majority of participants were aged 41–60 years (48.9%), followed by above 60 years (26.7%) and 21–40 years (20%), while 4.4% were ≤ 20 years. Females constituted 60% of the study population. Most participants belonged to rural areas (66.7%), while 33.3% were

from urban areas. The mean quality of life (UWQOL) scores varied across socio-demographic categories (**Table 1**). The highest mean score was observed among participants aged ≤ 20 years (1032.5 ± 208.6); however, the association between age and quality of life was not statistically significant ($p=0.346$). Similarly, no significant association was observed between quality of life and gender ($p=0.262$), education level ($p=0.083$), occupation ($p=0.657$), or socioeconomic status ($p=0.335$). A statistically significant difference in quality of life scores was observed based on geographic location, with urban participants showing significantly higher mean quality of life scores (840.0 ± 250.7) compared to rural participants (684.0 ± 211.2) ($p=0.034$). **Table 2** shows the association between clinical variables and quality of life among patients rehabilitated with obturator prosthesis following maxillectomy. A significant association was observed between Ataman defect classification and quality of life ($p=0.025$). Patients with Class III defects demonstrated the highest mean UWQOL score (928.3 ± 297.5), whereas Class IV defects had the lowest mean score (551.7 ± 98.8). The number of remaining maxillary teeth showed a highly significant association with quality of life ($p=0.001$). Participants with 10–15 remaining teeth reported the highest mean QOL score (978.1 ± 257.0) compared to those with 5–9 teeth (705.5 ± 200.4) and less than 5 teeth (544.0 ± 81.5). Postoperative radiotherapy was also significantly associated with quality of life ($p=0.017$), with patients who did not receive radiotherapy demonstrating higher mean UWQOL scores (832.4 ± 267.4) compared to those who underwent radiotherapy (665.6 ± 181.6). Similarly, a significant association was observed between the etiology of the maxillectomy defect and quality of life ($p=0.012$). Participants with defects due to other causes reported the

highest mean QOL score (1091.7 ± 179.6), followed by benign tumors (768.3 ± 217.8) and malignant tumors (687.5 ± 217.2). However, no statistically significant association was found between neck dissection and quality of life ($p=0.065$), although patients who had not undergone neck dissection showed comparatively higher mean QOL scores (788.5 ± 247.8) than those who had undergone the procedure (657.2 ± 193.2). The association between Obturator Functioning Scale (OFS) scores and socio-demographic variables at different stages of prosthetic rehabilitation is presented in **Table 3**. A significant association was observed between geographic location and OFS scores after delayed surgical obturator placement ($p=0.001$), with rural participants demonstrating higher difficulty scores compared to urban participants. Education level was also significantly associated with OFS scores after delayed surgical obturator ($p=0.008$). However, age, gender, occupation and socioeconomic status did not show any significant association with OFS scores at any stage of rehabilitation ($p>0.05$). **Table 4** shows the association between clinical variables and OFS scores. Aramany defect classification was significantly associated with OFS scores after delayed surgical obturator ($p=0.017$) and interim obturator ($p=0.021$). Similarly, the number of remaining maxillary teeth showed a significant association with OFS scores after delayed surgical obturator ($p=0.001$) and interim obturator ($p=0.017$). However, no significant association was observed between OFS scores after definitive obturator placement and the clinical variables studied ($p>0.05$). Additionally, neck dissection, radiotherapy and etiology of the defect did not show statistically significant associations with OFS scores at any stage of rehabilitation ($p>0.05$).

Table 1: Association of quality of life (UWQOL tool) with socio demographic factors post maxillectomy among the study participants

Socio demographic factors		N(%)	Mean QOL score	p value
Age	≤ 20 years	2(5.0)	1032.5 $\pm$ 208.6	0.346
	21 to 40 years	9(22.5)	715.6 $\pm$ 264.0	
	41 to 60 years	20(50.0)	728.0 $\pm$ 241.7	
	above 60 years	9(22.5)	716.7 $\pm$ 191.5	
Gender	Male	15(37.5)	687.5 $\pm$ 158.6	0.262
	Female	25(62.5)	768.3 $\pm$ 271.7	
Location	Rural	27(67.5)	684.0 $\pm$ 211.2	0.034*
	Urban	13(32.5)	840.0 $\pm$ 250.7	
Education	Illiterate	9(22.5)	608.6 $\pm$ 191.0	0.083
	Primary school	9(22.5)	590.0 $\pm$ 104.7	
	Middle school certificate	1(2.5)	580 $\pm$ 0	
	High school certificate	16(40.0)	896.9 $\pm$ 223.9	
Occupation	Post high school diploma	2(5.0)	832.5 $\pm$ 270.4	0.657
	Graduate or post graduate	3(7.5)	755.0 $\pm$ 238.5	
	Unemployed	25(62.5)	756.6 $\pm$ 254.4	
	Semi-skilled worker	4(10.0)	752.5 $\pm$ 222.0	
	Skilled worker	2(5.0)	726.7 $\pm$ 217.3	
	Clerical, shop owner, farmer	6(15.0)	620.8 $\pm$ 175.8	
	Semi professional	1(2.5)	1005 $\pm$ 0	
Socio economic status	Professional	2(5.0)	630.0 $\pm$ 141.4	0.335
	Class I	5(12.5)	820.0 $\pm$ 192.1	
	Class II	8(20)	851.0 $\pm$ 268.5	
	Class III	11(27.5)	690.4 $\pm$ 163.4	
	Class IV	13(32.5)	685.4 $\pm$ 252.3	
	Class V	3(7.5)	645.0 $\pm$ 356.8	

Table 2: Association of quality of life (UWQOL tool) with clinical variables post maxillectomy among the study participants

Socio demographic factors		N (%)	Mean QOL score	p value
Maxillectomy defect	Class I	9(22.5)	609.2 $\pm$ 195.5	0.025*

Number of remaining maxillary teeth	Class II	26(65.0)	791.5±224.6	0.001*
	Class III	3(7.5)	928.3±297.5	
	Class IV	2(5.0)	551.7±98.8	
	Less than 5 teeth	4(10.0)	544.0±81.5	
	5 to 9 teeth	28(70.0)	705.5±200.4	
	10 to 15 teeth	8(20.0)	978.1±257.0	
Neck dissection	Yes	14(35.0)	657.2±193.2	0.065
	No	26(65.0)	788.5±247.8	
Radiotherapy	Yes	22(55.0)	665.6±181.6	0.017*
	No	18(45.0)	832.4±267.4	
Etiology	Malignant Tumor	11(27.5)	687.5±217.2	0.012*
	Benign Tumor	26(65.0)	768.3±217.8	
	Others	3(7.5)	1091.7±179.6	

Table 3: Association of Obturator Functioning Scale scores with socio demographic factors post maxillectomy among the study participants

Socio demographic factors		OFS after obturator	Delayed surgical	p value	OFS after obturator	interim	p value	OFS after obturator	definitive	p value
Age	≤20 years	30.0 ± 12.7		0.825	21.0 ± 2.8		0.663	17.0 ± 4.2		0.349
	21 to 40 years	33.0 ± 7.6			22.9 ± 4.1			24.3 ± 7.3		
	41 to 60 years	30.5 ± 7.2			24.5 ± 5.7			17.3 ± 0.6		
	above 60 years	32.5 ± 4.3			23.6 ± 3.6			15.7 ± 2.4		
Gender	Male	30.6 ± 5.2		0.440	23.9 ± 4.8		0.855	16.2 ± 2.7		0.258
	Female	32.1 ± 7.5			23.6 ± 4.9			19.6 ± 6.0		
Location	Rural	33.7 ± 6.2		0.001*	24.3 ± 5.3		0.308	17.0 ± 3.3		0.269
	Urban	27.2 ± 5.5			22.6 ± 3.4			20.1 ± 6.9		
Education	Illiterate	32.9 ± 4.6		0.008	25.8 ± 4.2		0.382	18 ± 4.1		0.203
	Primary school	37.4 ± 6.4			25.4 ± 6.2			16.5 ± 4.2		
	Middle school	29.0 ± 0			21.1 ± 0			Data not available		
	High school certificate	29.1 ± 6.4			22.0 ± 4.4			18.0 ± 2.3		
Occupation	Post high school diploma	26.3 ± 3.6		0.131	22.0 ± 4.2		0.919	14.0± 0		0.143
	Graduate or post graduate	27.3 ± 7.2			24.0 ± 2.6			26.5 ± 12.0		
	Unemployed	32.5±7.2			24.1±5.1			17.3±3.5		
	Semi-skilled worker	27.0±4.1			24.3±6.5			17.0 ± 5.4		
	Skilled worker	27.0±5.3			22.0±2.8			NA		
	Clerical, shop owner, farmer	34.0±2.9			22.3±4.6			17.0±1.7		
	Semi professional	19 ± 0			21.0±0			Data not available		
	Professional	31.5±0.7			25.5±0.7			26.5±12.0		
	Class I	29.0±5.6			23.8±2.2		0.283	23.7±9.8		0.260
	Class II	29.2±6.7			22.5±3.1			17.3±3.8		
Socio economic status	Class III	32.2±6.2		0.415	24.2±4.9			15.3±2.9		
	Class IV	32.3±7.9			22.8±6.1			18.2±2.6		
	Class V	36.7±2.5			29.3±3.1			Data not available		

Table 4: Association of Obturator Functioning Scale scores with clinical variables post maxillectomy among the study participants

Socio demographic factors		OFS after obturator	Delayed surgical	p value	OFS after obturator	interim	p value	OFS after obturator	definitive	p value
Maxillectomy defect	Class I	34.08±5.76		0.017*	27.89±5.16		0.021*	20.50 ± 0.71		0.447
	Class II	30.1±5.5			22.8±4.4			18.8 ± 5.9		
	Class III	26.0±10.4			21.0±2.0			13.0 ± 1.4		
	Class IV	39.7±9.1			21.0± 0			22.0± 0		
Number of remaining maxillary teeth	Less than 5 teeth	37.4±8.0		0.001*	26.3 ± 6.1		0.017*	22.00		0.704
	5 to 9 teeth	32.3±5.6			24.6 ± 4.6			18.6 ± 6.0		
	10 to 15 teeth	24.9±5.4			19.6 ± 2.2			16.7 ± 2.5		
Neck dissection	Yes	31.7 ± 5.1		0.885	25.4 ± 4.7		0.123	15.7 ± 2.1		0.326
	No	31.4 ± 7.7			22.9 ± 4.7			19.2 ± 5.7		
Radiotherapy	Yes	32.5 ± 5.9		0.239	25.1 ± 5.4		0.051	16.3 ± 2.1		0.229
	No	30.1 ± 7.6			22.1 ± 3.4			19.3 ± 6.0		
Etiology	Malignant Tumor	32.2 ± 5.3		0.346	24.2±4.7		0.308	16.5±2.8		0.127
	Benign Tumor	31.1 ± 8.6			23.7±5.4			23.0 ±8.3		
	Others	26.3 ± 11			19.7±3.1			17.7±3.2		

Discussion:

The present study investigated the quality of life of patients with maxillary defects after prosthodontic rehabilitation with obturator prosthesis at different stages and how it is affected by

various socio-demographic factors like age, gender, location, education, occupation, SES and medical variables like etiology and type of maxillectomy defect, number of remaining maxillary teeth, neck dissection and radiotherapy. Tumors involving the

maxillary arch are relatively uncommon but are associated with considerable morbidity and mortality; consequently, studies involving maxillectomy patients often report small sample sizes [16, 17]. Similarly, the present study included a total of 45 participants. In the present study, most participants belonged to the 41–60 years age group, which is consistent with the age distribution commonly reported for head and neck cancers in the Indian population [18]. However, age did not show a statistically significant association with quality of life, suggesting that adaptation to prosthetic rehabilitation may not be strongly influenced by age alone. Similarly, gender was not significantly associated with QOL, indicating that both male and female patients experience comparable functional and psychosocial outcomes following obturator rehabilitation. A noteworthy finding of the study was the significant association between geographic location and quality of life, with urban patients showing higher UWQOL scores than rural participants. This difference may be attributed to disparities in access to healthcare facilities, follow-up services, prosthetic maintenance and awareness regarding rehabilitation options [19]. Urban patients may also benefit from better social support systems and improved access to nutritional and rehabilitative resources, which could contribute to improved quality of life. Education level, occupation and socio-economic status did not show statistically significant associations with quality of life in the present study, although patients with higher educational attainment tended to report relatively better QOL scores [20]. This observation may reflect better health literacy and greater awareness regarding prosthesis care and oral health practices. However, the lack of statistical significance suggests that prosthetic rehabilitation may provide comparable functional benefits across different socio-economic strata. Clinical variables showed a stronger association with quality of life than socio-demographic factors. Aramany defect classification showed a significant association with QOL, indicating that the extent and location of the maxillary defect play a critical role in determining functional outcomes. Patients with Class III defects exhibited higher QOL scores, whereas Class IV defects showed poorer scores, likely due to greater anatomical disruption affecting speech, mastication and prosthesis stability. Another important finding was the significant association between the remaining maxillary teeth and quality of life. Patients with 10–15 remaining teeth reported significantly higher QOL scores compared with those with fewer teeth [21]. Remaining teeth contribute to better retention, stability and support of the obturator prosthesis, thereby improving masticatory efficiency and speech function. This finding highlights the importance of preserving natural teeth whenever possible during surgical management and prosthetic planning [22]. Post-operative radiotherapy was also found to significantly influence quality of life, with patients who had not undergone radiotherapy showing higher UWQOL scores. Radiotherapy is known to produce several adverse effects such as xerostomia, mucosal irritation, fibrosis, altered taste sensation and reduced salivary flow, all of which can negatively affect oral function and prosthesis tolerance [23]. These factors may contribute to the comparatively lower quality of life

observed among patients who received radiotherapy. The etiology of the maxillectomy defect also showed a significant association with QOL, with patients having benign lesions or other etiologies reporting higher QOL scores compared to those with malignant tumors. This may be explained by the fact that malignant conditions often require more extensive surgical resection, adjunctive radiotherapy and prolonged treatment, which can negatively influence functional outcomes and psychological well-being [24]. Among the clinical variables, Aramany defect classification showed significant associations with OFS scores during the early stages of rehabilitation (delayed surgical and interim obturator phases). Larger or more complex defects may compromise prosthesis retention and stability during the early healing period, leading to greater functional difficulty [25]. Interestingly, no significant association was observed between clinical variables and OFS scores after definitive obturator placement. This finding suggests that definitive prosthetic rehabilitation may effectively compensate for anatomical variations, allowing patients to achieve comparable functional outcomes irrespective of defect characteristics or treatment history. However, certain limitations should be considered while interpreting the results. The loss to follow-up encountered during the study reduced the number of participants assessed after definitive obturator placement, which may have limited the statistical power for comparisons at later stages of rehabilitation. Future studies with larger sample sizes, metacentric participation and longer follow-up periods may provide a more comprehensive understanding of the factors influencing prosthetic rehabilitation outcomes. Despite these limitations, the present study provides valuable insight into the influence of socio-demographic and clinical variables on quality of life and obturator functioning among maxillectomy patients, particularly in the North-East region of India, where data in this area remain limited.

Conclusion:

Both socio-demographic and clinical factors significantly influence the quality of life and functional outcomes of maxillectomy patients rehabilitated with obturator prostheses. Obturator rehabilitation significantly enhances quality of life, with more favorable outcomes observed in patients with less extensive defects and greater preservation of maxillary dentition. Careful consideration of patient- and defect-related factors is essential for individualized prosthetic planning and improved rehabilitation outcomes.

Advancement to knowledge:

This study provides region-specific evidence that clinical characteristics, particularly Aramany defect classification, remaining maxillary dentition and radiotherapy status, have a greater influence on early quality of life after obturator rehabilitation than most socio-demographic factors. It further shows that while socio-demographic factors such as geographic location affect early functional adaptation, prosthetic rehabilitation outcomes are primarily driven by defect

characteristics, enabling more individualized treatment planning and patient counselling.

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