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Prevalence of Post-Surgical Maxillary Defects and Causes of Maxillary Resections in Patients Presenting at Tertiary Care Hospitals of Multan, Pakistan
Running Title: Prevalence and Causes of Maxillary Resections

Rida Anjum[1], Maria Komil Ghumman[1], Malik Adeel Anwar[2], Waleed Ishaq[3], Sana Urooj[4], Umar Farooq[4]

[1]Department of Prosthodontics, Nishtar Institute of Dentistry, Multan, [2]Department of Oral Pathology, University College of Medicine and Dentistry, The University of Lahore, [3]Department of Prosthodontics, Islamic International Dental College, Riphah International University, Islamabad,[4] Department of Prosthodontics, Bakhtawar Amin Medical and Dental College, Multan, Pakistan.

ABSTRACT

Background: Maxillectomy, often necessitated by late-stage malignancies, results in significant anatomical and functional impairments profoundly affecting the quality of life of the affected patients. This study aimed to assess the prevalence of maxillary post-surgical defects and primary causes of maxillectomy among patients in South Punjab, Pakistan.

Methods: A descriptive cross-sectional study was conducted with a sample size of 32 patients at two tertiary care hospitals in Multan from September 2023 to August 2024 using nonprobability convenience sampling. The target population for this study was patients who developed post-surgical maxillary defects following maxillectomy and presented at the hospitals. Data was collected using a proforma including patient demographics, side of defect, timing from diagnosis to surgery, surgery to prosthesis placement, and underlying causes of maxillectomy. SPSS 23 was used for descriptive analysis. For inferential analysis, the Chi-square test was used. A p-value of < 0.005 was considered statistically significant.

Results: Males were more affected (71.9%, n=23) than females (28.1%, n=9), with the highest prevalence among those aged 41-60 years. Surgeries were delayed for more than a year in 56.3% of the cases. Defects were more common on the right side (56.3%), and pathological causes were responsible for 71.9% of maxillectomies, with benign lesions (82.6%) being more frequent than malignant ones.

Conclusion: Maxillary defects were more prevalent in males and aged 41 to 60, with a right-sided predominance. The majority of the maxillectomies were due to benign pathological causes, with fungal infection being the most common pathological reason.

Keywords: Oral Surgical Procedures, Prosthodontics, Jaw Neoplasms, Fungal Infections, Mycoses.

Corresponding Author:
Dr .Malik Adeel Anwar,
Department of Oral Pathology,
University College of Medicine and Dentistry,
The University of Lahore, Pakistan.
Email: dr_adeel_anwar@yahoo.com
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INTRODUCTION

The principal facial bone, known as the maxilla, provides essential support to the cheeks, orbits, teeth, nose, and facial muscles, as referenced by scholarly sources[1,2]. The experience of losing a physical component is undeniably distressing, particularly when it affects both our external appearance and our capacity to engage in typical daily activities. The reasons behind the potential loss of a portion or the entirety of the maxilla are indeed multifarious, encompassing a myriad of factors including trauma, pathology, and congenital conditions[2, 3].

A comprehensive investigation meticulously assessed various factors, ultimately concluding that the erroneous diagnosis and delayed referral of malignant oral cancers by family dentists significantly contribute to the progression of the disease[4]. Shedding light on this matter also revealed that the majority of maxillectomy lesions persist in a quiescent state for prolonged durations, leading to diagnoses at an advanced stage, typically after substantial involvement of the surrounding bone and tissue. This, in turn, invariably underscores the imperative need for maxillectomy procedures[5].

This surgical intervention introduces a notable anatomical alteration, fostering an interconnectedness between the oral and nasal cavities that precipitates a range of challenges in patients' lives. Foremost among these challenges are issues such as halitosis, psychological distress, mastication difficulties, cosmetic concerns, oro-nasal fluid leaks, diminished comfort in social contexts, and a myriad of others[6]. The presence of these significant impediments significantly impacts the post-maxillectomy quality of life experienced by patients[7]. Road traffic accidents are a leading cause of skull fractures resulting in injuries and serious complication[8,9].

The management of maxillectomy cases invariably entails a comprehensive approach with subsequent rehabilitation utilizing prostheses. These prostheses play a pivotal role in restoring the compromised tissue, elevating aesthetic appeal, optimizing functionality, and enhancing overall quality of life.

The incidence of complications following maxillectomy procedures has received limited attention in the realm of research. This study aimed to address this gap by evaluating the demographic patterns, affected side, and etiological factors associated with maxillary resections. Additionally, it examines the influence of socioeconomic status on surgical and prosthesis timings.

METHODS

The research was structured as a descriptive cross-sectional study. This study was conducted in the prosthodontics departments of two dental institutes (Nishtar Institute of Dentistry and Bakhtawar Amin Medical and Dental College) located in Multan. The study obtained ethical clearance from the institutional ethical review committee of Nishtar Institute of Dentistry, Multan (Ref no: 9705/NID). Before the commencement of data collection via the proforma, each participant, or their caregiver in cases of dependency, provided informed consent, as per ethical protocols.

The sample size was calculated using the Raosoft online sample size calculator based on 95% confidence level, a 7.25% margin of error, and an assumed prevalence of maxillectomies among individuals aged ≤20 to be 4.5%[1]. Individuals exclusively afflicted by maxillary defects, displaying a willingness to partake in the study, regardless of the underlying etiology. Patients with any other or additional oral cavity deformities, along with those declining participation, were excluded from the study.

A nonprobability convenience sampling was used to collect patients afflicted with maxillary deformities who sought medical care at our facilities. The study spanned from September 2023 to August 2024. Data collection was executed through the utilization of a standardized proforma. The design of the proforma was informed by insights gleaned from previous investigations[1, 2]. Gender, age, defect side, causes of maxillectomy, and the period between diagnosis and surgery were all influential variables examined in the study.

The collected data were categorized into distinct segments, delineated by gender, who identified themselves as male and female, and age groups: ≤ 20, 21-40, 41-60, and 61-80 years. Additionally, the categorization involved specifying the affected side (left, right, or both) and causes of maxillectomy,

encompassing congenital, traumatic, pathologic, and cases with an unknown origin. The ensuing analysis adopted a descriptive approach, facilitated by SPSS software version 23 (IBM Corp, Armonk, N.Y, USA). The evaluation centered on ascertaining the frequencies and corresponding percentages of the amassed data.

RESULTS

Table 1: Patient Demographics

Gender	Male	23 (71.9%)
	Female	9 (28.1%)
Age (Years)	≤20	2 (6.3%)
	21-40	12 (37.5%)
	41-60	16 (50%)
	61-80	2 (6.3%)
Socioeconomic Status	Fully Affording	5 (15.6%)
	Partially Affording	18 (56.3%)
	Non Affording	9 (28.1%)

The analysis of the dataset revealed an overall age of 41.48 ± 13.95 old, indicating a diverse age distribution among the participants. When examined by gender, the mean age for males was 43.59±14.71 and for females 37.27±12.60 years. Males showed a slightly higher age range compared to females.

The findings indicated a notable trend, with a larger proportion of males exhibiting maxillectomy defects in comparison to their female counterparts. The outcomes of the analysis revealed that a higher prevalence of defects was found within the age group of 41 to 60 years, constituting 50% of the cases. In terms of socioeconomic status, the majority were partially affording, **Table 1**.

Table 2: Clinical and Surgical Variables

Causes of resection	Congenital	4 (12.5%)
	Trauma	5 (15.6%)
	Pathological	23 (71.9%)
Pathological	Benign	19 (82.61%)
	Malignant	4 (17.4%)
Time duration from Diagnosis to Surgery	3-6 months	9 (28.1%)
	7-12months	5 (15.6%)
	> 12 months	18 (56.3%)
Time from Surgery to prosthesis placement	3-6months	6 (18.8%)
	7-12months	4 (12.5%)
	> 12 months	22 (68.8%)

For the side of the defect, the data analysis revealed a higher prevalence of defects on the right side of the maxilla when compared to the left. Defects solely located at the center of the palate were relatively infrequent. Upon scrutinizing the data concerning causes of maxillectomy, categorized primarily as congenital, traumatic, or pathological, distinct patterns emerged. Within our population, the most prevalent causative factor contributing to maxillary defects was found to be pathological, accounting for a significant proportion. Within the subset of pathological factors, further breakdown was conducted to differentiate between benign and malignant occurrences. Benign pathologies held a more substantial presence in contrast to malignant pathologies.

Analysis of the time interval between diagnosis and surgical intervention revealed a prevailing trend, with the most surgeries being performed more than a year after diagnosis. A similar pattern was observed in the time from Surgery to prosthesis placement for their maxillary defects, **Table 2.**

Among the benign category, fungal infections emerged as the most prevalent subcategory, constituting 45% of cases (**Figure 1**). Conversely, within the malignant category, only squamous cell carcinoma cases were identified as the cause for all the maxillary resections.

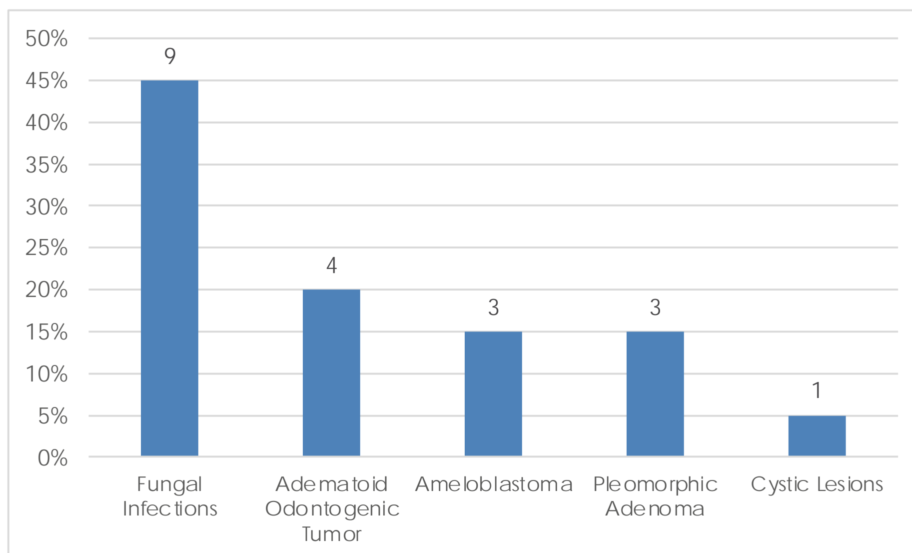

Figure 1: Frequencies of Causes of Benign Resection

Table 3: Socioeconomic Status and Surgical/Prosthetic Delays

Socioeconomic status	Subcategories	Partially Affording	Fully Affording	Non Affording	Total	P-value
Time for Surgery and Diagnosis	3-6 months	6	0	0	6	0.027*
	7-12 months	0	1	3	4	
	> 12 months	12	4	6	22	
Time from Surgery to getting the prosthesis	3-6months	6	2	1	9	0.723
	7-12months	2	1	2	5	
	> 12 months	10	2	6	18	

***Significant p-value*

A statistically significant association (p=0.027) was observed between socioeconomic status and time from diagnosis to surgery, indicating that non-affording patients experienced longer delays in receiving surgical intervention. However, there was no significant association between socioeconomic status and time from surgery to prosthesis placement (p=0.723), **Table 3**.

DISCUSSION

Tertiary care hospitals in Multan city were the focus of this research. Only 32 patients who presented with maxillary abnormalities during the study's 12-month period (September 2023–August 2024) were included due to the rarity of these cases. Thirty patients were included in Singh et al.'s study over two years, but only 22 had complete data included in their analysis[1].

The study data showed that males were significantly more affected (71.9%) than females (28.10%). This aligns with findings from several studies[1,10,11,12]. However, a few reported a higher prevalence among females[2,7]. No evidence for a gender-based bias in data collecting was discovered, and no studies were cited that addressed the topic. Women in this country tend to stay at home and raise their children, so they often don't seek medical attention

for themselves until it's too late. Second, they can be afraid of going to the dentist. The results showed that among all age categories, maxillectomies were most prevalent among those aged 41–60 (50%), with the youngest and oldest age groups having the lowest prevalence (6.3% and 6.3%, respectively). These findings were consistent with previous studies reporting similar age distribution [2,13]. Other studies presented age data through mean values, which were slightly higher than this study, 42 and 45 years respectively[11,13]. In contrast, one study found that 45.4% of defects were common in people aged 21 to 40[1].

The majority of surgeries (56.3%) in this study occurred after 1 year from the time of diagnosis, while in a study, 44.8% of patients had their operations performed between 0 and 2 years from the time of diagnosis[2]. Maxillary lesions are notorious for being misdiagnosed because their symptoms don't present themselves until much later[1]. Only 25-35% of individuals experience symptoms such as pain in the upper teeth, lock jaw, palatal fullness, or erosions[11,14]. Defects were more prevalent on the right side of patients (56.3%) due to the prevalence of cancerous lesions on the right side of patients in our culture. Singh et al. found that left maxillary defects were more prevalent[1]. Most patients prefer to eat on their right side, which may explain why the right side is more dominant[15].

This data revealed that pathological maxillofacial involvement accounted for the vast majority of resections (71.90 percent). Trauma and congenital factors were on the second and third, respectively. Singh et al. found similar outcomes, with the author explaining that the pathological etiological factor was the primary cause[1]. The majority of the patients had a benign lesion (82.61%), whereas just 17.40% had a malignant one. The most common benign lesion reported was mucormycosis, while the most common malignant lesion was squamous cell carcinoma. Some research has found that benign lesions are more common than malignant ones, while other research has found the opposite to be true. Similar findings were reported in a study that found that 63% of lesions were benign tumors and 37% were malignant[16]. Malignant lesions were reported as more common in investigations in previous studies[1,11,7].

According to the American Cancer Society, the most recent estimation is that 54,540 new cases of oral cancer alone have been reported in 2023 in the United States[17]. Prevalence of maxillofacial cancer, whether benign or malignant, basically depends on various factors that include age, gender, type of lesion, geographical location, lifestyle of population, and risk factors, including some viruses like Human papillomavirus common in one population[3]. Tobacco and alcohol are significant risk factors in developing oral cancers, and consumption of these is higher in developing countries[3,16,18]. In this study, the most common benign lesion was fungal infections, followed by adenomatoid odontogenic tumor. For malignant tumors, only squamous cell carcinoma was found in all four patients. A study reported that the most common benign lesion was odontogenic cysts (55%), and then odontogenic tumors (25%)[19]. Another study found that squamous cell carcinoma accounted for 90-95% of malignant lesions in the oral cavity[20].

Most of the patients in this study presented for interim obturators; a few patients wanted definitive obturators. The typical insertion time for an interim obturator is between 5 and 10 days post-op. Definitive obturators are inserted 2 to 6 months after surgery when the defect is completely healed and stable, which usually depends on the extent of surgery[21]. These prostheses not only improve speech by reducing hypernasality, deglutition, and mastication but also improve esthetics and quality of life[1,21,22]. Males need to be more vigilant about their oral health than females do because defects are more common in males. These defects primarily affected the right side of the population, and they peaked around middle age. Patients must be very careful about their oral health and conditions. If they discover anything out of the ordinary in their mouths, they should see a doctor or dentist right away. There could be dire consequences if you put off getting a thorough checkup and examination. Further research is needed to identify the factors for more male predominance, defects being common on the right side, and the root causes of developing maxillary cancers.

CONCLUSION

It is concluded from this study that defects were more prevalent among males and those aged 41 to 60, with a right-sided predominance. The majority of maxillectomies (56.3%) occurred more than a year after diagnosis. The most prevalent causative factor was pathological, with benign lesions being more prevalent than malignant lesions.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

ETHICAL APPROVAL

The ethical approval was obtained from the Institutional Review Board of Nishtar Institute of

Dentistry, Multan, under reference number: 9705/NID.

AUTHORS' CONTRIBUTION

RA, MKG, MAA: Substantial contributions to study design, acquisition of data, Manuscript writing, has given final approval of the version to be published, and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.**WI, SU, UM:** Substantial contributions to analysis and interpretation of data, Critical review, Has given final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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