

An Audit of Capacity for Prosthetic Rehabilitation after Orofacial Ablative Surgeries in Nigerian Tertiary Health Facilities

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ABSTRACT

Background: The capacity for prosthodontic rehabilitation after orofacial surgeries in Nigeria has not been adequately reported.

Objectives: To describe the capacity for, and explore avenues for improving prosthodontic rehabilitation after ablative orofacial surgeries in Nigerian tertiary healthcare facilities.

Materials and Methods: This was an electronic questionnaire survey of single representative surgeons at public tertiary facilities. Frequencies and proportions were determined for closed-ended responses. Associations between categorical variables were determined with Fischer's Exact Test, while thematic description characterized open-ended responses. The level of statistical significance was set at $p \leq 0.05$

Results: Thirty-five institutions comprising 22 Federal Teaching Hospitals (FTH)s, 11 Federal Medical Centers (FMC)s and 2 State Specialist Hospitals (SSH)s were assessed. Among the centers evaluated, there were 6 (66.7%) with prosthodontists in the South-West, while the combined South-South/South-East zone has 3 (37.9%) centers. Northern Nigeria only had 2 (11.1%) centers with prosthodontists. There were prosthodontic laboratories in 33 (94.3%) of the centers. However, only 4 (12.2%) of these laboratories had facilities for implant retained prostheses and only 2 (11.1%) had facilities for computer-aided design and manufacture. There were regular pre-surgical prosthodontic consultations in 45% of the FTHs, and 53% level of the FMCs and SSHs combined. Themes from the open-ended questions included increase in workforce numbers and workforce empowerment. They also included improved inter-specialty communication and improved patient access.

Conclusion: There is a good capacity for basic prosthodontic rehabilitation after ablative surgery nationally. However, infrastructure for advanced treatments can be augmented. Capacity may be improved by increasing and empowering the workforce, and by improving interprofessional communication

Keywords: Audit, Facial Ablative Surgery, Prosthetics

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INTRODUCTION

Tumors of the maxillofacial region are important public health concerns globally and constitute a significant part of oncological mortalities in Nigeria annually.¹⁻⁴ The treatments of these neoplasms may include varying combinations of surgery, chemotherapy and radiotherapy.⁵ Surgical treatments however, usually leave large grotesque defects. These defects may become a psychological and functional burden after diseases eradication.⁶⁻⁸

The importance of health-related quality of life (HRQoL) after ablative facial surgeries is so highly regarded, that it is increasingly being viewed as a fundamental human right.⁸⁻¹⁰ The HRQoL of individuals with post-ablative facial defects can be improved with treatments that enhance appearance and oral functions. These improvements can be achieved with either surgical reconstruction or prosthetic rehabilitation or both.¹¹⁻¹³

Surgical reconstruction may range from simple autogenous or allogenic grafts to the employment of microvascular anastomosis of free or pedicled flaps.¹⁴⁻¹⁸ These microvascular surgeries require a high level of skill and specialized infrastructure. However, surgical reconstruction may still require prosthetic rehabilitation to replace the teeth that may have been lost with the tumor.¹¹⁻¹³ Moreover, reconstruction may be superfluous without disease eradication, often requiring adjuvant radiotherapy. Prosthetic rehabilitation is a time-tested option in the rehabilitation of maxillofacial defects.¹⁷ The prostheses are usually removable appliances that are especially useful when there are concerns about recurrence.¹⁷ Prostheses can often produce more predictable results when the right materials and manpower are available, and may be less expensive than microvascular surgical procedures.¹⁸ The fabrication of such prostheses is usually undertaken by a prosthodontist who works in tandem with dental technologists.

The management of the individual who has had facial ablative surgery will not be optimal if their emotions and social function are not addressed.¹⁹⁻²⁰ Their rehabilitation may require the services of a psychologist (psychiatrist) and a speech therapist. Optimal rehabilitation often requires the availability of various specialists such as prosthodontist, speech therapist, psychologist, oral and maxillofacial surgeon, plastic surgeon and otolaryngologists who will be involved in the patient's rehabilitation.

Nigerian investigators have studied the capacity for rehabilitation of individuals with ablative facial defects²¹⁻²⁴ However, these studies have either been from a surgical perspective, or have been localized to only few centers. The capacity for prosthetic rehabilitation of such individuals remains largely unexplored. An initial assessment of public tertiary healthcare facilities where facial ablative surgeries are performed may provide baseline data for a more holistic investigation.

This study aimed to assess the current capacity for prosthetic rehabilitation after orofacial ablative surgeries in public tertiary healthcare facilities in Nigeria. Information derived from this study may aid in the formulation of development plans in this area of healthcare delivery and may serve as a repository for further research.

MATERIALS AND METHODS

Ethical approval (NHREC/28/01/2020 /AKTH/ EC/ 2981) was obtained from the Ethics Review Committee of a Teaching Hospital in one of the Northwestern states of Nigeria. All procedures followed the World Medical Association Declaration of Helsinki as adopted in Fortaleza, Brazil 2013. A structured electronic questionnaire (Google Forms) containing both open and closed-ended questions was piloted on a group of two maxillofacial surgeons and one otolaryngologist from three randomly selected tertiary healthcare centers known to perform facial ablative surgeries. The volunteers in the pilot certified the questionnaires to be easy to fill out and adequate for retrieving the data sought. The questionnaires sought information about institutional demographics, management protocols for cases requiring facial ablative surgeries and the human capital available for managing such cases. The questionnaires also sought information relating to the range and complexity of the rehabilitative procedures at such centers, the availability of infrastructure for radiotherapy and the level of interdisciplinary communication among professionals involved in the prosthetic rehabilitation of individuals who have undergone facial ablative surgeries. The questionnaire concluded by enquiring about suggestions for improvements in the rehabilitation of individuals who require these surgeries with open-ended questions.

The study was a mixed-methods cross-sectional survey of Federal and State Government-owned tertiary health facilities in Nigeria that engage in the

performance of facial ablative surgeries. The study was carried out between May and August 2021. Non-random, purposive sampling was employed. Institutional information was obtained from a consenting maxillofacial surgeon or otolaryngologist in each of these institutions. The responders were individuals who actively participated in the management of orofacial tumors and they were guaranteed anonymity and confidentiality.

The country was divided into three zones for the purpose of statistical analysis. These were the Northern Zone (N Zone) comprising of the Northwest, Northeast and Northcentral Geopolitical zones, the Southwest Zone (SW Zone) made up of the eponymous geopolitical zone; and the combined Southeast and South-south Zone (SE/SS Zone) also comprising eponymous geopolitical zones. This grouping was done based on ethnocultural considerations. Retrieved data was entered into an electronic spreadsheet and analyzed with IBM SPSS Statistics for Windows (version 21). Frequencies and

proportions were determined for closed-ended responses, while responses to open ended questions were characterized by thematic description. Associations were tested with Fischer's Exact test. The level of statistical significance was set at $p \leq 0.05$.

RESULTS

Data was retrieved from 35 hospitals. These included 22 Federal Teaching Hospitals (FTH)s (62.9%), 11 Federal Medical Centers (FMC)s (31.4%); and, 2 State Specialist Hospitals (SSH)s (5.7%). The Northern Zone had 18 (51.4%) of the participating hospitals, the SW Zone 9 (25.7%) and the SE/SS Zone had 8 (22.9%). Most (27 or 77.1%) of the assessed centers were domiciled in urban areas while eight (22.9%) centres were located in semi-urban areas.

Most (74.3%) centers used a combination of surgical reconstruction and prosthetic rehabilitation in postoperative management. Table 1 summarizes the details of the rehabilitative modalities across the centers' demographic.

Table 1. Capacity for facial surgical defect management according to center characteristics

Center characteristics	Management of facial surgical defect		P-value
	One of either surgical or prosthetics	Both surgical and prosthetics	
Center type			0.25
FMC/SSH	2 (15.4)	11 (84.6)	
FTH	7 (31.8)	15 (68.2)	
Region			0.53
N	6 (33.3)	12 (66.7)	
SE/SS	2 (25)	6 (75)	
SW	1 (11.1)	8 (88.9)	
Locations			0.65
Urban	8 (29.6)	19 (70.4)	
Semi-urban/Rural	1 (12.5)	7 (87.5)	

FMC: Federal Medical Center. SSH: State Specialist Hospital.

FTH: Federal Teaching Hospital, N: North, SE: Southeast, SS: South-south, SW: Southwest.

The maxillofacial surgeons were commonly available in most of the centers. All FTHs had at least one maxillofacial surgeon, while only 86% of the FMCs and SSHs combined had at least one maxillofacial surgeon. Dental technologists were however the most common professionals at the centers that participated in the study. All the FMCs and SSHs had dental technologists while 21 (95.5%) of the FTHs had dental technologists. There were no prosthodontists at many of the centers. Prosthodontists were present in 36.4% of the FTHs and 23.1% of the FMCs and SSHs combined. The

speech therapist was the least available professional in all the centers. The FMCs and SSHs combined only had 1 speech therapist, while only 5 (22.7%) of the FTHs had a speech therapist. There was a statistically significant presence of maxillofacial surgeons in FTHs ($X^2=8.77$, $p=0.01$) and in FMCs and SSHs combined ($X^2=5.55$, $p=0.04$). There were no other statistically significant associations between the presence of professionals and the centers assessed. However, while there was an almost equal distribution of professionals between the Northern Zone and the two Southern Zones, the two Southern

Zones had a noticeably higher number (9) of prosthodontists than the Northern Zone (2). Details

of the workforce availability according to center characteristics are summarized in Table 2

Table 2. Distribution of specialists geographically across Nigerian tertiary centers (n=35)

Human resources	Centre demographics, n (%)						
	Center type		Region			Location	
	FMC/Specialist (n = 13)	TH (n = 22)	North (n = 18)	SE/SS (n = 8)	SW (n = 9)	Urban (n = 27)	Rural (n = 8)
Maxillofacial surgeons	10 (76.9) [∞]	22 (100) ^μ	15 (83.3)	8 (100)	9 (100)	26 (96.3)	6 (75.0)
ENT surgeons	9 (62.2)	19 (86.4)	12 (66.7)	8 (100)	8 (88.9)	23 (85.2)	5 (62.5)
Plastic surgeons	7 (53.8)	17 (77.3)	12 (66.7)	5 (62.5)	7 (77.8)	20 (74.1)	4 (50.0)
Prosthodontists	3 (23.1)	8 (36.4)	2 (11.1)	3 (37.5)	6 (66.7)	10 (37)	1 (12.5)
Dental technologists	13 (100)	21 (95.5)	17 (94.4)	8 (100)	9 (100)	26 (96.3)	8 (100)
Speech therapist	1 (7.7)	5 (22.7)	2 (11.1)	1 (12.5)	3 (33.3)	6 (22.2)	0 (0)
Psychologist/Psychiatrist	10 (76.9)	13 (59.1)	10 (55.6)	5 (62.5)	8 (88.9)	19 (70.4)	4 (50)

[∞] ($X^2=5.55$, $p=0.04$), ^μ ($X^2=8.77$, $p=0.01$). FMC: Federal Medical Center. SSH: State Specialist Hospital. FTH: Federal Teaching Hospital., N: North, SE: Southeast, SS: South-south, SW: Southwest.

There were dental laboratories in most of the participating centers [FMC+SSH =12(92.3%), FTH =20(95.2%)]. Majority (95% of the FTHs, 83% of FMC and SSHs combined) of these laboratories had the capacity for acrylic obturator. Only 2 (9.5%) of the FTHs had laboratories with facilities for computer-aided design and manufacture (CAD/CAM) prostheses. There was a statistically significant ($X^2=7.11$, $p=0.04$) preponderance of capacity for metal ceramic work in the SW and SE/SS zones. There was a statistically significant association ($X^2=7.11$, $p=0.04$) between capacity for metal ceramic prostheses and the location of the assessed centers.

The SW zone did not have a single center with CAD/CAM technology, while the N zone and SE/SS zones had one center, respectively with capacity for CAD/CAM technology. The capacity of the dental laboratories for producing prostheses of varying complexity is summarized in Table 3.

There were routine consultations between surgeons and prosthodontists in about half (17 of 35) of the participating centers. There were such consultations in 10 (45%) of the FTHs and 7 (53.8%) of the FMCs and SSHs combined. The speech therapists were consulted where they were available.

Table 3. Capacity of dental laboratories for post-ablative rehabilitation across tertiary healthcare facilities (n =33)

Capacity	Centre demographics, n (%)						
	Center type		Region			Location	
	FMC/Specialist (n = 12)	TH (n = 21)	North (n = 16)	SE/SS (n = 8)	SW (n = 9)	Urban (n = 26)	Rural (n = 7)
Maxillary obturators	10 (83.3)	20 (95.2)	14 (87.5)	7 (87.5)	9 (100)	24 (92.3)	6 (85.7)
Metal-Ceramic restoration	6 (50)	14 (66.7)	6 (37.5)	7 (87.5)	7 (77.8)	7 (65.4)	3 (42.9)
Implant-supported prosthesis	3 (25)	5 (23.8)	4 (25)	1 (12.5)	3 (33.3)	5 (19.2)	3 (42.9)
Extra oral prosthesis	1 (8.3)	3 (14.3)	1 (6.3)	0	3 (33.3)	4 (15.4)	0
CAD/CAM	0	2 (9.5)	1 (6.3)	1 (12.5)	0	1 (3.8)	1 (14.3)

FMC: Federal Medical Center. SSH: State Specialist Hospital. FTH: Federal Teaching Hospital. N: North, SE: Southeast, SS: South-south, SW: Southwest. CAD: Computer-aided design, CAM: Computer-aided manufacture

The responses to the open-ended questions seeking recommendations for improving the quality of prosthetic rehabilitation after facial ablative surgeries were in four broad themes as shown in Table 4. The most common theme was a call for increased personnel recruitment and empowerment of such personnel by institutional capacity building. Recruitment was advised to be holistic, ensuring that personnel are exposed to regular training and re-training. There was an emphasis on increasing the capacity of technologists to fabricate implant retained prostheses. Advocacy for the creation of a separate specialty of maxillofacial prosthodontics

was also discerned from the responses. Similarly, there was a call for infrastructural development especially with regards to CAD/CAM technology. The respondents also suggested the establishment of maxillofacial centers of excellence in each of the geopolitical zones. There were also calls for the formalization of meetings between surgeons and prosthodontists as a standard protocol within institutions. Finally, there was a call for the inclusion of basic maxillofacial rehabilitative procedures in the National Health Insurance scheme to increase patient access.

Table 4. Themes and codes resulting from the qualitative analysis

	Themes	Codes	Quotes
1	Personnel recruitment and capacity development	Personnel Recruitment Specialist training	"Training and engagement of more prosthodontists & dental technologists." "Routine interinstitutional meetings and conferences on case reports and case managements"
2	Infrastructure development	Provision of more facilities More equipped laboratories Creation of regional centers	"More facilities for fabrication of maxillofacial prosthesis" "Establish and equip more Dental Laboratories." "Establish a full maxillofacial center in each geo-political zone"
3	Multidisciplinary management approach	Increased communication between surgeons and prosthodontists	"Multidisciplinary approach to patient management is strongly advised." "Having formal meetings to plan reconstruction"
4	Increased patient access	NHIS coverage of maxillofacial rehabilitation	"Incorporation of basic rehabilitation measures into NHIS-provided treatments"

NHIS: National Health Insurance Scheme

DISCUSSION

Our use of specialist surgeons as sources of data from the surveyed centers was purposive. This was undertaken because they are the most commonly available clinical specialists involved in maxillofacial surgeries, and to avoid the red tape of official bureaucracy likely to occur if information were sought from the chief executives of these institutions. We were also mindful of the risks of social desirability bias among these chief

executives.²⁵ The use of a mixed method design was adopted to allow a reasonable measure of freedom on the part of respondents to provide suggestions that in their opinion, may lead to improved outcomes.

A British audit from 2005 reported that thirty-four centers were involved in head and neck surgery.²⁶ These figures from a first-world country are strikingly similar to the numbers we surveyed in this study. This is however, over twenty years before the

present study was undertaken. This suggests that Nigeria's maxillofacial surgery and rehabilitation infrastructure appears to lag behind Britain's, indicating a need for significant development and improvement.

Our decision to examine public healthcare facilities was informed by documented distribution patterns among health facilities in Nigeria. Makinde et al²⁷ reported a ratio of 67:33% public: private healthcare facilities within Nigeria. They also reported that only 0.25% of health facilities nationally are of a tertiary level. Facial ablative surgeries, along with the rehabilitation of their ensuing defects are a tertiary level service. Our decision to survey public health facilities was to a large extent guided by this report. There are reports that the numbers of teaching hospitals and FMCs are almost equal nationally.^{28,29} the preponderance of teaching hospitals in our survey may be due to the likelihood of specialists to take up academic positions in these teaching hospitals.³⁰ However, the factors that influence the career choices of healthcare specialists is a veritable area of research if informed decisions about tertiary healthcare provision are to be made during policy formulation.

The study observed that prosthodontic rehabilitative services are available nationally. However, access to these specialists is skewed in favor of the southern zones of the country. This may be due to the lopsidedness of medical and dental school locations in the country, as reported by Makinde et al.²⁷ This is especially true of dental schools in Nigeria.²⁷⁻³¹ Adebayo et al³² reported that there is a tendency for healthcare professionals to practice near where they have been trained. There may therefore be a need to strategically incentivize the specialty in the emerging dental schools in the Northern zones of the country. This study observed that prosthetic rehabilitation of post-ablative facial defects is common across the country. However, our results seem to indicate that the level of practice is still basic and limited in scope. Implantology and CAD/CAM technology are at present poorly integrated, and this may limit possibilities for maximal outcomes.^{33,34} The use of CAD/CAM technology would improve efficiency and permit the use of a wider range of materials for rehabilitation. It would also be a useful adjunct to craniofacial implantology.³⁵ However, the use of implantology and CAD/CAM technology are steadily

increasing in the country especially in the field of fixed prosthodontics as reported by Ikusika et al.³⁰

The poor numbers of speech therapists available in the centers surveyed suggests an emphasis on structural rehabilitation to the detriment of functional rehabilitation in many of the surveyed centers. This situation should be remedied if the provision of holistic improvements in HRQoL is to be achieved.³⁶ Speech is a significant indicator of HRQoL after ablative facial surgeries. Limitations in tissue quality and quantity after these surgeries, especially after radiotherapy may make the services of a speech therapist essential.³⁷

The suggestions proffered by our respondents in this study could bring about positive changes in the status quo. There were suggestions for an increased workforce that should be empowered and motivated to perform at optimum capacity. There were requests for improved infrastructure and for staff development to enable optimal use of the new equipment that may be procured. There were also appeals for improved patient access to maximize the effectiveness of the improvements expected to follow the implementation of the earlier suggestions. We concur with these suggestions and would only add that a special fund should be established nationally to provide guaranteed funding for improvements in this important area of healthcare delivery.

There have been repeated calls for interdisciplinary collaboration in rehabilitating orofacial defects.^{38,39} The relatively better levels of communication between surgeons and prosthodontists in FMCs and SSHs may reflect the effect of lower levels of official bureaucracy in these centers. They are usually smaller than, and hence more compact than FTHs. The lack of specialist prosthodontists may also account for suboptimal joint consultations. However, we observed that centers where such consultations occurred were more than the reported number of prosthodontists. This may reflect the benefits of centers retaining specialists on visiting appointment basis.³¹ We however suggest, that consideration should be given by institutions to creating statutory craniofacial rehabilitation teams to eliminate challenges of inter-unit bureaucracy.

CONCLUSION

This study found that institutions that perform facial ablative surgeries are fairly widely distributed nationally. Prosthetic rehabilitation of orofacial

defects is still at a basic level and may benefit from infrastructural and personnel advancement. Interdisciplinary communication can be improved upon especially in Federal Teaching Hospitals. The numbers and distribution of specialist prosthodontists is suboptimal and inequitable with an urgent need for increased numbers in Northern Nigeria. Speech therapists are inadequate.

Source of support

Nil

Conflicts of Interest:

None Declared

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