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Spectrum of reconstructive surgical procedures in a resource-limited plastic surgery unit: A one-year institutional review from North-central Nigeria

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Abstract
Background: Plastic surgery is essential for treating various conditions that affect patients' functionality and appearance. Understanding patient characteristics, indications for surgery, surgical techniques, is vital for improving Plastic Surgery practice.
Aim: The aim was to examine the sociodemographic data, indications for surgery and surgical techniques, of patients treated over a one-year period at the Plastic Surgery unit of Federal Medical Centre, Keffi, Nassarawa State, Nigeria.
Methods: A retrospective review was conducted on 102 patient records. Data on age, gender, admission type, indications for surgery, anatomical regions, and reconstruction techniques were retrieved and analyzed using SPSS version 27. The results were presented as proportions.
Results: The mean age was 32.53 ± 20.60 years. Most cases were in the 1 - 10 years (18.6%) and 31 - 40 years (17.6%) age groups. There were 56 males (54.9%) and 46 females (45.1%). The majority of cases were elective (87.3%). The most common indications for surgery were trauma (26.5%), followed by burns/post burns and post infective (both 15.7%). Direct closure was the most commonly used reconstructive technique (45.7%), followed by skin grafts (34.8%). Local flaps accounted for 72.2% of flap procedures, and intermediate complexity cases were most common (36.3%).
Conclusion: Trauma was the leading indication for surgery, and direct closure was the most used technique. The findings highlight the importance of addressing trauma care and improving access to reconstructive surgery in similar settings.

Keywords: Burns, flaps, Plastic Surgery, reconstruction technique, trauma

Introduction
Plastic and reconstructive surgery constitutes an essential component of comprehensive surgical care, addressing a substantial proportion of the global surgical disease burden that affects both functionality and quality of life (Meara *et al*., 2015) [12]. Plastic surgery represents a unique intersection between the restoration of form and the preservation of function. While often misconstrued in public discourse as being exclusively cosmetic, the specialty encompasses a vast spectrum of reconstructive procedures essential for managing congenital anomalies, traumatic injuries, oncologic resections, and infective sequelae (GBD, 2019). Globally, the need for reconstructive surgical procedures far outpaces its delivery, particularly in Low- and Middle-Income Countries (LMICs), where it is estimated that over five billion people lack access to safe, timely, and affordable surgical care (Meara *et al*., 2015) [12]. This surgical inequity positions plastic surgery as a critical component of public health and universal health coverage.
Within the African continent, the burden of conditions requiring plastic surgical intervention is disproportionately high. Rapid urbanization and increased motorization have led to a surge in road traffic injuries, while the prevalence of untreated burns and advanced soft tissue infections contributes significantly to the pool of reconstructive need (Nthumba, 2016) [14]. Despite this high demand, there remains a significant scarcity of plastic surgeons and specialized units, with the majority concentrated in a few urban centres, leaving vast populations underserved (Otene, 2016) [26]. Despite its vital role in managing trauma sequelae, burns, congenital anomalies, and post-infective deformities, plastic surgery remains among the least developed surgical specialties across sub-Saharan Africa, with an estimated ratio of only one reconstructive surgeon per 10 million inhabitants in many regions (ReSurge International, 2023) [27]. Consequently, understanding the specific disease patterns and surgical volume in existing units is vital for workforce planning and health systems strengthening.
In Nigeria, road traffic injuries alone account for approximately 68% of trauma admissions, contributing significantly to the regional injury burden that affects over 42 million people annually in sub-Saharan Africa (Thanni, 2011 [28]; Oluwasegun *et al*., 2024). Burns represent another major public health challenge, with studies from Nigerian tertiary centres reporting high morbidity and substantial economic costs (Adeyemo *et al*., 2009) [3]. These conditions frequently result in functional impairment, disfigurement, and psychosocial distress, particularly when timely reconstructive care is unavailable (Olaitan & Ogunleye, 2007) [20].
The evolution of plastic surgery has been marked by efforts to address these diverse challenges, ranging from the management of contractures from burns to the

reconstruction of defects from noma or trauma (Olakulehin & Ademola, 2020) [23]. However, there is wide regional variation in service delivery. While established centres in southern Nigeria have published extensively on their practice patterns, there remains a paucity of published epidemiological data regarding the scope of plastic surgery practice in North-Central Nigeria, particularly in newer training institutions and federal medical centres (Fadeyibi *et al*., 2012) [5]. This lack of baseline data impedes the ability to allocate resources efficiently and develop targeted clinical protocols tailored to the specific demographic and etiological profiles of the region.

It is within this context of a rising regional burden of reconstructive need, and a local gap in epidemiological surveillance that this study was conducted. This review aims to contribute to the body of knowledge by providing a one-year institutional audit of patients managed at the Plastic Surgery Unit of Federal Medical Centre, Keffi, Nassarawa State, Nigeria. By delineating the current spectrum of reconstructive needs, patient demographics, and preferred surgical techniques, this research seeks to establish some information for practice in this specific locale and offer insights applicable to similar emerging centres across Nigeria and sub-Saharan Africa.

Methods

Study site: The study was conducted at Federal Medical Centre (FMC), Keffi Nassarawa State, Nigeria. It is a 214 bedded hospital in Nassarawa State, North-central Nigeria, located about 50 Km, from the Federal Capital Territory (Capital of Nigeria). It provides primary, secondary and tertiary health care to the people of Nassarawa State and adjourning states of Kaduna, Benue, Kogi, Plateau and the Federal Capital Territory.

Study design: This study employed a retrospective design to analyze surgical cases treated at the Plastic Surgery unit of Federal Medical Centre, Keffi, Nassarawa State, Nigeria, over a one-year period, from October 2023 and September 2024 [9]. Data of 102 patients were retrieved from theatre records and patients' records, covering sociodemographic characteristics, indications for surgery, anatomical regions, and reconstruction techniques.

Study population: The study included 102 patients who were operated by the Plastic Surgery unit during the one-year period. The data obtained included demographic details, admission type, clinical indications for surgery, and anatomical region involved. Data was also collected on type of reconstructive technique used. The complexity of the surgery was recorded based on pre-established codes (e.g., major, intermediate, minor).

Data Analysis: The data were entered into SPSS version 27 for analysis. Descriptive statistics, including frequencies and percentages, were used. The results were represented as proportions for clarity. The statistical analysis also included the calculation of mean age and standard deviation for the age of patients.

Inclusion and Exclusion Criteria: Only patients who underwent surgery during the study period were included in the analysis. Patients with incomplete records or missing key data were excluded.

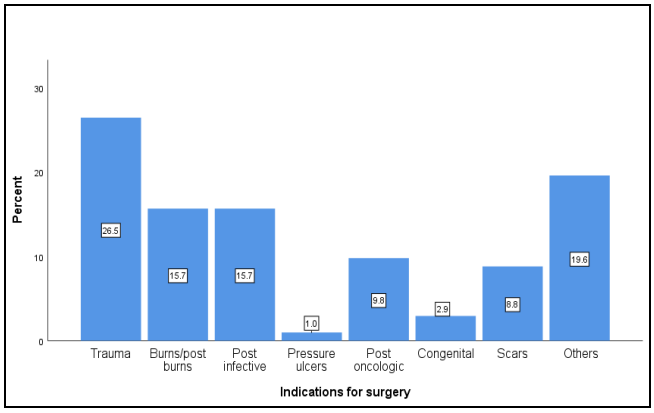
Ethical Considerations: The study was conducted following ethical guidelines, with approval from the hospital's institutional review board. Patient confidentiality was maintained throughout the study by anonymizing personal information.

Results

Table 1: Age, gender and admission type of the patients

Variable	Frequency, n=102	Percent
Age (Mean age= 32.53 ± 20.60 years)		
<1 year	2	2.0
1 - 10 years	19	18.6
11 - 20 years	10	9.8
21 - 30 years	16	15.7
31 - 40 years	18	17.6
41 - 50 years	17	16.7
51 - 60 years	8	7.8
>60 years	12	11.8
Gender		
Male	56	54.9
Female	46	45.1
Admission type		
Elective	89	87.3
Emergency	13	12.7

The mean age was 32.53 ± 20.60 years. The majority of cases were in the 1 - 10 years (18.6%) and 31 - 40 years (17.6%) age groups, followed by 21 - 30 years (15.7%) and 41 - 50 years (16.7%). There were 56 males (54.9%) and 46 females (45.1%). A greater proportion of the cases were elective (87.3%), with 13 emergency cases (12.7%).



*Post infective included, Fourniers' gangrene, necrotizing soft tissue infection

Fig 1: Indication for surgery amongst the patients

The majority of cases presented for surgery were due to trauma (26.5%), followed closely by burns/post burns and post infective cases, each representing 15.7% of the total. A significant portion of cases, 19.6%, fell under the others category, which included lipomas, pyogenic granuloma, ingrown nails and sebaceous cyst etc. Post oncologic cases accounted for 9.8%, while scars contributed 8.8% of the cases. The least common indication for surgery was pressure ulcers, which was observed in just 1.0% of the cases.

Table 2: Anatomic region of the presenting complaints

Anatomic Region	Frequency n=102	Percent
Head and neck	29	28.4
Upper limb	21	20.6
Trunk	5	4.9
Lower limb	35	34.3
Perineum	6	5.9
Buttocks	1	1.0
Multiple sites	5	4.9

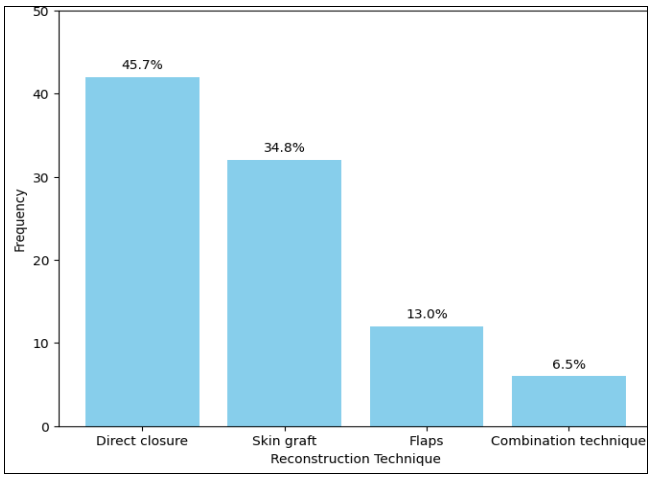


Fig 2: Types of reconstructive technique used

The majority of surgeries were performed using the direct closure technique, accounting for 45.7% of the cases. The second most common technique was skin graft, which was used in 34.8% of the cases. Flaps were used in 13.0% of the cases. Both flaps and grafts were employed in 6.5% of the cases.

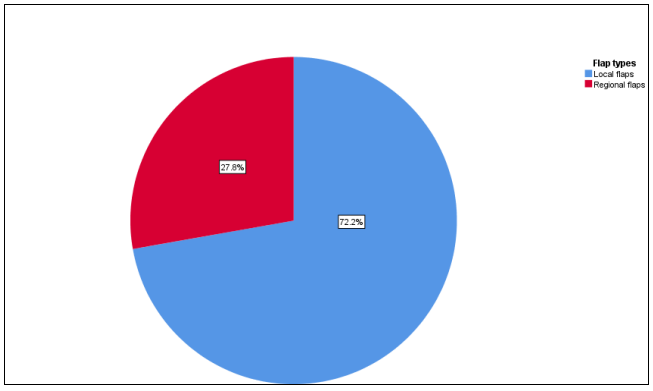


Fig 3: Types of flaps used

The majority of the surgeries involved local flaps, which accounted for 72.2% of the cases. Regional flaps were used in 27.8% of the cases

Table 3: The complexity of the surgeries

Complexity code	Frequency	Percent
Major	36	35.3%
Intermediate	37	36.3%
Minor	29	28.4%

The intermediate complexity code was the most frequently used, accounting for 36.3% of the cases. This was closely followed by major complexity cases, which made up 35.3% of the total. The minor complexity cases represented 28.4% of the cases.

Discussion

This one-year retrospective review of 102 patients managed at the Plastic Surgery unit of FMC, Keffi, provides valuable insights into the epidemiological profile and reconstructive practice patterns within a tertiary healthcare facility in Nigeria's North-central region. The findings reveal a unit predominantly managing traumatic injuries in a young, economically active population, with a reliance on straightforward reconstructive techniques that reflect pragmatic adaptation to resource constraints. These results offer critical evidence for surgical planning, workforce development, and health policy formulation in underserved regions of Nigeria.

The mean age of 32.53 ± 20.60 years aligns with the global understanding that plastic surgical services are most frequently required by young and middle-aged populations (Meara *et al*., 2015) [12]. The distinctive bimodal age distribution with peaks in early childhood (1–10 years; 18.6%) and early adulthood (31–40 years; 17.6%), reflects the dual burden of paediatric thermal injuries and adult trauma characteristic of Nigeria's injury epidemiology. The prominence of the 1–10 years age group likely reflects the nation's high incidence of paediatric scalds occurring in domestic settings where inadequate supervision and unsafe cooking practices expose young children to hot liquids and open flames (Olaitan & Olaitan, 2006) [21]. Studies from southeastern Nigeria report that children under 5 years constitute over 50% of burn admissions, with scalds accounting for 58.5–64.4% of paediatric thermal injuries (Nwachukwu *et al*., 2024; Ocheke *et al*., 2004) [9, 17]. Conversely, the 31–40 years peak corresponds to Nigeria's economically active population disproportionately affected by road traffic injuries (RTIs), the nation's leading cause of trauma morbidity. With RTI rates as high as 41 per 1,000 population and motorcycles constituting a major injury vector in northern Nigeria, working-age adults face elevated risks of complex soft tissue injuries requiring reconstructive intervention (Thanni, 2011 [28]; Oluwasegun *et al*., 2024). These age patterns are consistent with reports from other Nigerian centres. Otene *et al*., (2016) [26] reported a mean age of 28.4 years in Calabar, while Fadeyibi *et al*., (2012) [5] noted similar predominance of the third and fourth decades in their Lagos cohort.

The slight male predominance (54.9%) observed mirrors patterns documented across Nigerian Plastic Surgery units, where males consistently represent 55–65% of reconstructive caseloads (Iyun *et al*., 2018) [10]. This gender disparity likely stems from differential exposure to injury mechanisms: males dominate high-risk occupations (commercial motorcycle riding, construction, artisanal work) prevalent in Nigeria's informal economy and demonstrate higher rates of RTI involvement due to risk-taking behaviours and occupational mobility demands (Oluwasegun *et al*., 2024). In the sub-Saharan African context, Nthumba (2016) [14] similarly documented male predominance in burn and trauma admissions across multiple East African centres. Nevertheless, the relatively balanced gender distribution compared to trauma surgery units (where male predominance often exceeds 70%) suggests that conditions affecting females, particularly paediatric burns and obstetric fistula-related reconstructive needs contribute meaningfully to plastic surgery workload in this setting (Adeyemo *et al*., 2009) [3].

The predominance of elective cases (87.3%) versus emergency presentations (12.7%) requires contextual

interpretation. While trauma constituted the largest indication for surgery, its management was predominantly scheduled rather than acute. This likely reflects the reality of many Nigerian public institutions where emergency operating theatre access remains constrained, necessitating deferment of even time-sensitive reconstructive cases to elective lists (Adeyemo *et al*., 2018) [2]. It may also indicate that many acute trauma patients are initially managed elsewhere and referred secondarily for definitive reconstruction. This pattern contrasts with reports from high-income countries where acute trauma constitutes a larger proportion of emergency plastic surgery workload (Guyuron *et al*., 2020) [8].

Trauma emerged as the leading indication for surgery (26.5%), consistent with regional epidemiological data positioning injury as a leading cause of surgical disease in Africa. Nthumba (2016) [14] identified trauma as the predominant indication for plastic surgical intervention across multiple sub-Saharan African nations, a pattern driven by road traffic crashes, occupational injuries, and domestic accidents. In Nigeria specifically, Olakulehin and Ademola (2020) [23] documented trauma as the leading indication for burn reconstruction, while Olawoye *et al*. (2021) [24] reported similar findings from Ibadan, where trauma constituted 28.4% of their plastic surgical workload.

The equal proportion of burns/post-burns and post-infective cases (15.7% each) highlights the persistent burden of these preventable conditions. The prevalence of post-burn sequelae reflects ongoing challenges in acute burn care accessibility and the tendency for contractures to develop following inadequate primary management (Chalya *et al*., 2018) [4]. The significant proportion of post-infective cases, highlights the intersection of poverty, limited antimicrobial access, and reconstructive need in Nigeria's North-central region where neglected tropical diseases remain endemic (Holmström *et al*., 2024) [9]. Post-oncologic reconstruction constituted 9.8% of the workload, which is a relatively modest proportion compared to Western series where oncologic reconstruction often dominates (Thorne, 2018). This may reflect both the lower incidence of skin malignancies in darker-pigmented populations and significant under-diagnosis of malignancies in the region. Pressure ulcers represented the smallest category (1.0%), likely reflecting limited referral of immobile, chronically ill patients to specialized plastic surgical services in this setting.

Our study found that the lower limbs were the most operated anatomical site which correlates with another study. Okeke, *et al*., (2017) [19], in their review of extremity trauma reconstruction in Enugu, noted that the lower limb was the most frequently involved anatomic region, often requiring complex reconstructive approaches.

The reconstructive technique profile shows that direct closure (45.7%), skin grafts (34.8%), and flaps (13.0%) were used. The pattern of reconstructive techniques reveals a practice prioritizing simplicity and resource efficiency. Direct closure predominance may initially suggest a predominance of simple cases; however, it more likely reflects the significant proportion of secondary intention wounds, debridement procedures, and minor excisions constituting the daily workload of a Plastic Surgery unit. Odili *et al*., (2019) [18], reviewing practice at Lagos University Teaching Hospital, similarly reported direct closure as the most common procedure (38% of interventions). This contrasts sharply with series from high-volume North American or European centres where flap reconstruction predominates (Janis, 2019) [11], highlighting differing case mixes and resource availability.

Skin grafts were employed in 34.8% of cases, consistent with the high burden of burns and post-infective soft tissue loss. The utility of split-thickness skin grafting in resurfacing large defects with limited donor site morbidity makes it an indispensable tool in the sub-Saharan African context where sophisticated microsurgical alternatives may not be readily available (Nangole & Khainga, 2020) [13]. Nigerian studies from Enugu and Port Harcourt report skin grafting rates of 30–40% in burn reconstruction cohorts, with split-thickness grafts preferred due to technical simplicity and relative tolerance of suboptimal wound beds common in resource-limited environments (Olaitan & Ogunleye, 2007; Iyun *et al*., 2018) [10, 20].

Among flap procedures, local flaps (72.2%) were preferred over regional flaps (27.8%). This preference reflects their reliability, single-stage nature, and avoidance of microsurgical expertise and equipment which are advantageous where operating time is precious, intensive care capacity limited, and specialized equipment scarce (Adeyemo & Olaitan, 2020) [1]. This pattern is consistent with that reported by Fadeyibi *et al*. (2012) [5] and aligns with the global trend in low- and middle-income countries (LMICs) where pedicled flaps remain the workhorse of complex reconstruction. The absence of free flaps in this series likely reflects the early developmental stage of the Keffi unit, with gradual microsurgical capacity building anticipated, a trajectory mirroring that described by Otene *et al*. (2016) [26] during the first decade of their Calabar unit's establishment.

The distribution of surgical complexity with intermediate (36.3%) and major (35.3%) cases predominating over minor cases (28.4%), indicates that the unit manages a substantial burden of significant reconstructive problems. This case mix has important implications for resource allocation, operating time scheduling, and postgraduate training. The relatively low proportion of minor cases may reflect appropriate filtering of minor procedures to peripheral centres, allowing secondary facility resources to concentrate on complex reconstructions (Meara *et al*., 2015) [12].

This review demonstrates that trauma, burns, and post-infective conditions constitute the reconstructive surgery burden at FMC Keffi, with technique selection reflecting pragmatic adaptation to resource constraints. The findings suggests three imperatives for policy action: (1) strengthening trauma prevention programs targeting RTIs and domestic burn hazards; (2) expanding Plastic Surgery training slots with emphasis on rural service placement to address Nigeria's severe workforce maldistribution. (3) integrating reconstructive capacity building into Nigeria's National Surgical, Obstetric, and Anaesthesia Plan to ensure equitable access to essential surgical care across geopolitical zones (Federal Ministry of Health Nigeria, 2021) [6]. The case mix suggests that trainees in this centre will develop strong competence in wound management, skin grafting, and local flap design, but may require external rotation to more established centres for microsurgical exposure. Regional collaboration within Nigeria and across West Africa may facilitate this training need (Olawoye *et al*., 2021) [24]. Future multicentre studies spanning Nigeria's six geopolitical zones would enhance understanding of regional

variations in reconstructive need and inform targeted resource allocation.

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