

Impact of Plastic Surgery on Reducing Surgical Disease Burden in Rural India

Mrutyunjay Das¹, Rojalin Mishra², Chandan Mahapatra³

¹Associate Professor, Department of Plastic & Reconstructive Surgery, Institute of Medical Sciences & SUM Hospital -II, Odisha, India

²Assistant Professor, Department of Plastic & Reconstructive Surgery, Institute of Medical Sciences & SUM Hospital -II, Odisha, India

³Assistant Professor, Department of Plastic Surgery, Institute of Medical Sciences & SUM Hospital -II, Odisha, India

Received: 07-07-2025 / Revised: 16-07-2025 / Accepted: 27-07-2025

Corresponding Author: Chandan Mahapatra

Conflict of interest: Nil

Abstract:

Background: Surgical disease burden in rural India remains high due to limited access to specialized care. Plastic surgery, primarily reconstructive, plays a crucial role in addressing deformities and disabilities resulting from trauma, burns, congenital anomalies, and chronic wounds in these underserved populations.

Aim: To evaluate the role of plastic surgery in reducing the surgical disease burden in rural India by assessing patient demographics, clinical indications, surgical outcomes, complications, and functional recovery.

Methods: A prospective observational study was conducted from April 2024 to June 2025 at IMS & SUM Hospital (Campus-2), involving 200 rural patients undergoing plastic surgical interventions. Data on demographics, clinical diagnosis, surgical procedures, complications, and functional outcomes were collected and analyzed using SPSS version 23.

Results: Of 200 patients, 59% were male, predominantly aged 21–40 years. The main indications were post-traumatic defects (38%), burn contractures (20%), chronic ulcers (15%), congenital deformities (14%), and post-tumor defects (13%). Skin grafting (30%) and local flaps (25%) were the most common procedures. Complications occurred in 19% of patients, primarily wound infections (10%). Functional recovery was good in 84% of cases, with 92% patient satisfaction. Statistical analysis showed significant associations between condition type and outcome ($p=0.018$) and complication rates ($p=0.04$).

Conclusion: Plastic surgery significantly reduces surgical disease burden in rural populations by restoring function and improving quality of life. It addresses prevalent reconstructive needs arising from trauma, burns, and congenital conditions with a favorable safety profile.

Recommendations: Expansion of plastic surgical services and training in rural healthcare settings is recommended to bridge the surgical care gap and reduce preventable disabilities. Integrating outreach programs and telemedicine may enhance accessibility.

Keywords: Plastic Surgery, Rural Healthcare, Surgical Disease Burden, Reconstructive Surgery, India.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Plastic and reconstructive surgery plays a vital role in the comprehensive management of surgical conditions that impact form, function, and quality of life. While often perceived as a discipline focused on aesthetic enhancement, plastic surgery in resource-limited settings like rural India is predominantly reconstructive in nature. It addresses a broad spectrum of conditions, including post-traumatic defects, congenital anomalies, burn contractures, chronic ulcers, and tumor excision defects. These morbidities are not only functionally debilitating but also socially and economically distressing, especially for populations with limited access to specialized care [1].

Rural India, home to nearly 65% of the population, continues to suffer from significant disparities in access to surgical services due to a shortage of trained specialists, inadequate infrastructure, and socioeconomic barriers [2]. The burden of untreated surgical conditions remains high, leading to preventable disability and poor health outcomes. Plastic surgeons, through interventions such as skin grafting, flap coverage, contracture release, and reconstructive microsurgery, are uniquely positioned to restore function and reduce long-term disability in rural populations [3].

Recent studies have emphasized the growing need for decentralizing surgical services and strengthening reconstructive capacities in rural areas. A 2019 systematic review highlighted that the unmet need for surgical care, especially reconstructive procedures, is one of the leading contributors to global disability-adjusted life years (DALYs) [4]. Similarly, the Lancet Commission on Global Surgery emphasized the need for increasing surgical workforce density and reconstructive care in low-resource settings [5]. In India, several initiatives such as rural outreach camps, telemedicine consultations, and mobile reconstructive units have been explored to bridge this gap [6].

Despite these efforts, the evidence base assessing the direct impact of plastic surgery in reducing surgical disease burden in rural Indian populations remains limited. Most available data are institutional or program-based, lacking prospective evaluation of patient outcomes, complications, and satisfaction rates. Hence, there is a pressing need for systematically collected data that can inform healthcare policies and resource allocation.

This study was conducted to prospectively evaluate the role of plastic surgical interventions in reducing surgical disease burden among patients residing in rural areas. It aims to identify the most common indications for surgery, assess the outcomes and complication rates, and highlight the functional and social benefits conferred by timely plastic surgical care in a tertiary rural care setting.

Methodology

Study Design: This was a prospective observational study.

Study Setting: The study was carried out at IMS & SUM Hospital (Campus-2), a tertiary care center with a dedicated plastic and reconstructive surgery department. The hospital serves a significant population from surrounding rural areas, making it an ideal setting for analyzing surgical disease burden and outcomes in a rural context.

Study Duration: The study was conducted over a 15-month period, starting from April 2024 to June 2025. This duration was chosen to ensure adequate patient enrollment, follow-up, and comprehensive evaluation of surgical outcomes.

Participants: A total of 200 patients were included in the study. All participants were residents of rural areas and presented with conditions requiring plastic surgical intervention. Patients were selected consecutively based on eligibility criteria until the desired sample size was reached.

Inclusion Criteria

- Patients of all genders aged 5 years and above.

- Patients belonging to rural areas, as defined by census classification.
- Patients requiring plastic or reconstructive surgery for congenital deformities, trauma, burns, chronic wounds, or post-surgical defects.
- Patients who gave written informed consent to participate in the study.

Exclusion Criteria

- Patients residing in urban or semi-urban areas.
- Patients requiring aesthetic surgery without functional impairment.
- Patients with incomplete follow-up or who were lost during the course of the study.
- Patients with terminal illnesses or those deemed medically unfit for surgery.

Bias Control: To minimize selection bias, patients were enrolled consecutively based on the defined criteria. Information bias was reduced by using standardized data collection forms and pre-defined surgical outcome parameters. Additionally, all procedures and follow-up assessments were carried out by the same surgical team to maintain consistency.

Data Collection: Data was collected using a structured case record form, which included demographic details, clinical presentation, type of plastic surgery performed, intraoperative findings, post-operative complications, duration of hospital stay, and functional outcome at follow-up intervals. Patient satisfaction and quality of life metrics were also documented using validated questionnaires.

Procedure: Patients underwent standard preoperative assessment and surgical planning. The surgical interventions included procedures such as flap reconstructions, skin grafting, tendon repairs, cleft lip/palate repair, contracture release, and chronic wound management. Postoperative follow-up was conducted at regular intervals (2 weeks, 1 month, and 3 months) to assess wound healing, complications, functional recovery, and satisfaction.

Statistical Analysis: The collected data were entered into SPSS version 23.0 for analysis. Descriptive statistics were used to summarize demographic data and clinical profiles. Chi-square tests were used for categorical variables, while t-tests or ANOVA were employed for continuous variables. A p-value <0.05 was considered statistically significant. Functional and satisfaction outcomes were also analyzed with appropriate comparative tools depending on the nature of variables.

Results

Out of the 200 participants enrolled in the study, 118 (59%) were male and 82 (41%) were female, with a mean age of 34.6 ± 13.8 years (range 5–72 years).

The majority of patients belonged to the 21–40 year age group (45%), followed by 41–60 years (28%), under 20 years (17%), and above 60 years (10%).

Table 1: Age and Gender Distribution of Patients (n = 200)

Age Group (years)	Male (n)	Female (n)	Total (%)
<20	15	19	34 (17%)
21–40	60	30	90 (45%)
41–60	30	26	56 (28%)
>60	13	7	20 (10%)
Total	118	82	200

The data indicate a higher number of cases in the productive age group (21–60 years), reflecting the occupational exposure and trauma burden in rural settings.

Types of Surgical Conditions Treated: The most common indication for plastic surgery was post-traumatic soft tissue defects (38%), followed by burn contractures (20%), chronic non-healing ulcers (15%), congenital deformities (14%), and post-tumor excision defects (13%).

Table 2: Clinical Indications for Plastic Surgery

Surgical Condition	Frequency (n)	Percentage (%)
Post-traumatic defects	76	38%
Burn contractures	40	20%
Chronic ulcers/wounds	30	15%
Congenital deformities	28	14%
Post-tumor excision recon.	26	13%
Total	200	100%

Explanation: Trauma-related conditions remain the leading burden treated by plastic surgeons in rural India, indicating a need for reconstructive expertise.

Surgical Procedures Performed: A total of 208 surgical procedures were performed (some patients had more than one), including skin grafting (30%), local flaps (25%), contracture release (20%), cleft repair (10%), and others (15%).

Table 3: Types of Surgical Procedures

Procedure Type	Number (n)	Percentage (%)
Skin grafting	62	30%
Local flaps	52	25%
Contracture release	42	20%
Cleft lip/palate repair	20	10%
Others (e.g., tendon repairs, pedicled flaps)	32	15%
Total Procedures	208	100%

The predominance of skin grafting and local flaps highlights the reconstructive nature of rural plastic surgery interventions.

Postoperative Complications: Out of 200 patients, 38 (19%) experienced minor complications. The most common complications were wound infection (10%), partial graft/flap loss (6%), and seroma/hematoma (3%). No mortality was reported.

Table 4: Postoperative Complications

Complication	Frequency (n)	Percentage (%)
Wound infection	20	10%
Partial graft/flap loss	12	6%
Seroma/hematoma	6	3%
No complications	162	81%

The overall complication rate was low, demonstrating effective surgical care delivery in rural settings.

Functional Outcome and Patient Satisfaction: Functional improvement was measured at 3 months using standardized criteria. A total of 168 patients (84%) showed good functional recovery, while 32

(16%) had moderate recovery (mostly in complex burn contractures or ulcers). Patient satisfaction was

high, with 92% rating their experience as satisfactory or very satisfactory.

Table 5: Functional Outcome and Satisfaction

Outcome Category	Number (n)	Percentage (%)
Good functional recovery	168	84%
Moderate improvement	32	16%
High patient satisfaction	184	92%
Dissatisfaction	16	8%

Most patients regained functionality and were satisfied with the surgical care, underlining the value of plastic surgery in improving quality of life in rural populations.

Statistical Analysis Summary

- A significant association was observed between type of surgical condition and functional outcome (Chi-square = 12.56, $p = 0.018$).
- Postoperative complications were significantly higher in burn contracture and chronic ulcer cases ($p = 0.04$).
- No significant difference was found in outcomes based on gender ($p = 0.26$) or age group ($p = 0.33$).

Discussion

The present study evaluated the impact of plastic surgical interventions in reducing surgical disease burden in rural India. The findings revealed that the majority of patients (59%) were male, and most cases belonged to the productive age group of 21–40 years, highlighting the burden of surgical diseases among the working population in rural areas. This demographic trend reflects a high occupational exposure to trauma and related injuries in rural environments.

The most common indication for plastic surgical intervention was post-traumatic soft tissue defects (38%), followed by burn contractures (20%), chronic ulcers (15%), congenital deformities (14%), and post-tumor excision defects (13%). These results emphasize the predominance of reconstructive needs over cosmetic concerns in rural healthcare settings. Trauma and burn-related issues remain the major contributors to long-term disability in these regions, warranting timely and effective surgical management.

Among the 208 surgical procedures performed, skin grafting (30%) and local flap coverage (25%) were the most frequently used techniques, indicating the practical utility and adaptability of these procedures in resource-constrained settings. Contracture release (20%) and cleft repairs (10%) were also significant, showing the wide spectrum of reconstructive surgeries contributing to functional restoration.

Postoperative complications were observed in 19% of the patients, with wound infection being the most

common (10%). However, the majority (81%) had uneventful recoveries, indicating a favorable safety profile of plastic surgical interventions even in rural tertiary care centers. Importantly, there was no procedure-related mortality.

Functional outcome assessment at 3 months follow-up showed that 84% of patients achieved good recovery, while 92% expressed satisfaction with their treatment. This reinforces the positive role of reconstructive plastic surgery in improving the quality of life and physical functionality of rural patients.

Statistical analysis revealed significant associations between the type of surgical condition and functional outcome ($p = 0.018$), as well as between complication rates and the nature of the condition, particularly among burn and ulcer cases ($p = 0.04$). These findings suggest that certain conditions carry a higher risk for complications and may require more targeted perioperative care.

Plastic surgery initiatives have been shown to substantially reduce the surgical disease burden in rural India. A notable example is the Give Me 5 Foundation, which carried out short-term plastic surgery missions at Shirdi Hospital, Maharashtra. In just four days, the team treated 88 patients suffering from deformities including post-burn contractures, brachial plexus injuries, lymphoedema, and syndactyly. The mission reported zero complications at six-month follow-up, highlighting the effectiveness of targeted, short-term surgical interventions in resource-limited rural environments [7].

Similarly, a retrospective review of 60 plastic surgery camps across Central India over 16 years demonstrated that these mobile units are critical in managing common rural surgical conditions like cleft lip/palate and burn contractures. Over 4300 patients were treated with high satisfaction and minimal complications, reinforcing the value of outreach-based surgical care in bridging urban-rural healthcare disparities [8].

Another effective intervention involved community-based surgical camps for neglected clubfoot in Odisha. A total of 993 clubfeet were surgically corrected in children from backward rural areas. The study demonstrated that such camp-based models could efficiently address significant disability

caused by congenital deformities in underprivileged regions [9].

The workforce study of plastic surgeons in low-income countries, including India, revealed that plastic surgeons often treat burns, trauma, and cleft conditions, which form a major part of the rural surgical burden. Despite their critical role, 91% of surveyed surgeons reported a severe shortage of qualified personnel and resources in rural areas. This gap further emphasizes the need for workforce expansion and infrastructure investment in these regions [10].

A separate initiative in Punjab utilized Accredited Social Health Activists (ASHAs) to improve early detection and referral for surgical conditions. Training ASHAs in wound care, surgical site infection recognition, and basic cancer detection significantly enhanced access to surgical care in remote villages. The study underscored the importance of community-based human resource development in scaling surgical outreach [11].

Lastly, global reviews have emphasized that plastic surgery is vital to addressing the large unmet surgical disease burden in low- and middle-income countries. Around 66% of surgical DALYs are related to conditions manageable through plastic and reconstructive procedures. These services are not only cost-effective but yield substantial returns in terms of productivity and community health improvement [12].

Conclusion

The results demonstrate that plastic surgery plays a critical and effective role in addressing the unmet surgical needs of rural populations. It contributes significantly to restoring function, preventing disability, and enhancing the overall well-being of patients affected by trauma, burns, congenital anomalies, and chronic wounds. These findings advocate for increased investment in rural reconstructive surgical services and training to bridge the rural-urban healthcare divide.

References

1. Verma A, Lodhi M, Bajaj M. Reconstructive plastic surgery in rural India: Bridging the gap. *Indian J Plast Surg.* 2020;53(2):175–80.
2. Singh S, Tiwari A, Rao S. Access to surgical care in rural India: A public health crisis. *J Family Med Prim Care.* 2021;10(3):1227–31.
3. Mishra B, Sinha R. Role of plastic surgery in post-traumatic reconstruction: An Indian perspective. *Ann Plast Surg.* 2019;83(4):439–44.
4. Shrimpe MG, Bickler SW, Alkire BC, Mock C. Global burden of surgical disease: An estimation from the provider perspective. *Lancet Glob Health.* 2019;7(9):e1211–e1218.
5. Meara JG, Leather AJM, Hagander L, Alkire BC, Alonso N, Ameh EA, et al. Global surgery 2030: Evidence and solutions for achieving health, welfare, and economic development. *Lancet.* 2018;386(9993):569–624.
6. Kumar P, Jain M, Patel A. Innovative models for rural plastic surgical outreach in India. *Int J Health Allied Sci.* 2022;11(1):30–4.
7. Wood BC, Chilgar RM, Chen HC, Nicoli F. ‘Give Me 5 Foundation’: A Plastic Surgery Charity Mission Helping to Enhance the Surgical Management of Limb Deformities in Rural India. *Int J Orthop Plast Surg.* 2018;1:94–100.
8. Agarwal P, Yadav P, Sharma D, Agrawal V, Mishra A. Plastic Surgery in Camps in Rural India. *Indian J Surg.* 2021;83(6):1285–91.
9. Sahoo P, Sahu M. Neglected Clubfoot - A Community Health Challenge in Rural Odisha, India. *Indian J Orthop.* 2023;57(9):1757–64.
10. Truché P, Moeller E, Wurdeman T, Zimmerman K, Cruz N, Nakarmi K, et al. The Plastic Surgery Workforce and Its Role in Low-Income Countries. *Plast Reconstr Surg Glob Open.* 2021;9:e3428.
11. Suroy A, Jain D, Gulrez A, Kaur A, Shukla P, Mathai S, et al. Transforming Health Advocate Initiatives in Punjab and Beyond Through Surgical Community Engagement. *Impact Surg.* 2024;72:1–4.
12. Borrelli M. What Is the Role of Plastic Surgery in Global Health? A Review. *World J Plast Surg.* 2018;7(3):275–82.