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# BASAL CELL CARCINOMA IN CLINICAL PRACTICE: AN INSTITUTIONAL STUDY FROM A TERTIARY CARE CENTER

Oncology

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## ABSTRACT

**Background:** Basal cell carcinoma (BCC) is the most common cutaneous malignancy worldwide, typically affecting elderly individuals and arising on sun-exposed sites. Although it has low metastatic potential, incomplete excision and local recurrence remain significant challenges, particularly in aggressive histological subtypes. **Objectives:** To evaluate clinicopathological characteristics and surgical margin status in patients with BCC treated at a tertiary cancer center. **Methods:** A retrospective observational study was conducted in the Department of Surgical Oncology, NIMS Hospital, Jaipur, from March 2023 to June 2024. Eighty patients aged 18–75 years with histopathologically confirmed BCC who underwent primary surgical excision with margin assessment were included. Data on age, sex, anatomical site, histological subtype, and surgical margins were analyzed using descriptive statistics. **Results:** Among 80 patients, 65% were above 60 years, with a male-to-female ratio of 1.3:1. The head and neck region was the most common site (72.5%), followed by the trunk and extremities. Histopathologically, nodular BCC was the most frequent subtype (55%), followed by infiltrative (22.5%) and superficial variants (15%). Margin positivity was identified in 7.5% of cases, predominantly in the infiltrative subtype. Patients with margin involvement underwent re-excision, with no recurrence documented during the study period. **Conclusion:** BCC predominantly affects elderly patients and occurs mainly in sun-exposed areas. Infiltrative subtypes are associated with higher rates of margin positivity, highlighting the need for meticulous surgical planning. Mohs micrographic surgery or wider excision should be considered in high-risk lesions to reduce recurrence.

## KEYWORDS

Basal Cell Carcinoma, Histopathology, Surgical Margins, Nodular Subtype, Infiltrative Subtype

## INTRODUCTION

Basal cell carcinoma (BCC) is the most prevalent form of skin cancer worldwide, accounting for nearly 75–80% of all non-melanoma skin cancers (NMSCs) [1]. Its incidence continues to rise globally, with epidemiological studies showing a lifetime risk of up to 30% in fair-skinned populations [2]. The increasing burden of BCC has been attributed to several factors, including greater life expectancy, chronic cumulative ultraviolet (UV) exposure, ozone depletion, improved public awareness, and better diagnostic practices [3,4].

Although BCC is generally considered an indolent tumor with extremely low metastatic potential (<0.1%), it possesses a locally invasive nature, capable of causing significant morbidity, tissue destruction, functional impairment, and cosmetic deformity, especially when diagnosis and treatment are delayed [5].

The head and neck region accounts for the majority (70–85%) of BCC cases due to chronic sun exposure, with the nose, periocular region, ears, and scalp being particularly vulnerable sites [6]. In addition to UV radiation, multiple host-related and environmental risk factors contribute to BCC development. These include fair skin phenotype (Fitzpatrick skin types I–II), advanced age, male sex, immunosuppression (e.g., organ transplant recipients), prior ionizing radiation exposure, arsenic exposure, and genetic predispositions such as Gorlin–Goltz syndrome (nevoid basal cell carcinoma syndrome) [7,8].

From a histopathological standpoint, BCC exhibits diverse growth patterns. Nodular BCC is the most common subtype and often presents as a pearly papule with telangiectasia. Other subtypes, including superficial, micronodular, infiltrative, and morpheaform (sclerosing) BCC, demonstrate varying clinical behaviors. While nodular and superficial BCCs usually follow an indolent course, infiltrative and micronodular variants are associated with aggressive growth, subclinical spread, and higher recurrence rates [9]. Correct histological classification is therefore essential for risk stratification and treatment planning.

The standard of care for most BCCs is surgical excision with histopathological margin assessment, ensuring complete tumor clearance and minimizing recurrence [10]. Mohs micrographic surgery (MMS), which offers intraoperative margin control, is reserved for high-risk, recurrent, cosmetically sensitive, or functionally critical sites, where tissue conservation is crucial [11]. In cases of unresectable, metastatic, or advanced BCC, newer modalities such as hedgehog pathway inhibitors (e.g., vismodegib, sonidegib) have expanded therapeutic options [12].

Despite the abundance of literature on BCC in Western populations, there is relatively limited data from developing countries, where patterns of sun exposure, skin phototypes, and healthcare-seeking behaviors differ significantly. Understanding the age distribution, anatomical predilection, histopathological spectrum, and surgical margin status in a given population provides valuable insights into disease trends and helps refine management strategies.

This study therefore aims to analyze the demographic profile, anatomical distribution, histopathological subtypes, and surgical margin status of BCC cases managed at our tertiary care center. The findings will contribute to the regional epidemiological understanding of BCC and help in optimizing surgical and reconstructive strategies for improved oncological and functional outcomes

## METHODS

### Study Design and Setting:

This was a retrospective observational study conducted in the Department of Surgical Oncology, NIMS Hospital, Jaipur, a tertiary care referral center in Rajasthan, India. The study was carried out over a 16-month period, from March 2023 to June 2024. All medical records, operative notes, histopathology reports, and follow-up details of eligible patients were reviewed and analyzed.

### Study Population:

Patients presenting with clinically suspicious skin lesions were evaluated by the surgical oncology team. Those with histopathologically confirmed basal cell carcinoma (BCC) who underwent definitive surgical excision with histopathological margin assessment during the study period were included.

**Inclusion Criteria:**
- Patients aged 18 to 75 years at the time of diagnosis.
- Patients with a histopathological diagnosis of BCC confirmed preop biopsy.
- Patients who underwent surgical excision with margin assessment (wide local excision).

**Exclusion Criteria:**
- Patients younger than 18 years or older than 75 years.
- Patients who refused surgery despite diagnosis.
- Patients medically unfit for surgical intervention due to severe comorbid conditions.
- Recurrent BCC or patients with a history of prior surgical, medical, or radiological treatment for BCC.
- Cases with incomplete medical records or missing histopathology reports.

**Surgical Management and Margin Assessment**

All patients underwent surgical excision under local or general anesthesia depending on the site, size, and complexity of the lesion. The surgical technique was chosen to ensure complete tumor removal while maintaining cosmesis and function, particularly in cosmetically sensitive regions such as the face. The clinical margin taken was generally 3–5 mm for low-risk BCC and up to 10 mm for high-risk/aggressive subtypes.

Excised specimens were sent for histopathological evaluation. Margins were assessed by experienced pathologists, and margin status was categorized as:
- Clear margin: no tumor at inked margin.
- Close margin: tumor within <1 mm of margin.
- Positive margin: tumor at inked margin.

Variables Studied:

The following variables were recorded and analyzed:
1. Age distribution (grouped into decades).
2. Gender distribution (male/female ratio).
3. Anatomical site of the tumor (face, scalp, trunk, extremities, etc.).
4. Histopathological subtype of BCC (nodular, superficial, micronodular, infiltrative, morpheaform, or mixed).
5. Surgical margin status (clear, close, positive).

**Data Collection and Analysis**

Data were collected from patient case records, operative notes, and histopathology reports. The collected data were entered into a structured database and analyzed using Microsoft Excel 2019 and SPSS version 25.0 (IBM Corp., Armonk, NY, USA).
- Descriptive statistics were used to summarize findings. Categorical variables (e.g., gender, anatomical site, histological subtype, margin status) were expressed as frequencies and percentages. Continuous variables (e.g., age) were presented as mean ± standard deviation (SD) or median with interquartile range (IQR), as appropriate.
- Associations between categorical variables (e.g., anatomical site vs histopathological subtype, age vs subtype distribution) were assessed using the Chi-square test or Fisher's exact test, wherever applicable.
- A p-value <0.05 was considered statistically significant.

**Ethical Considerations**

The study was conducted in accordance with the principles of the Declaration of Helsinki (2013 revision). Institutional Ethical Committee approval was obtained prior to commencement of the study. Patient confidentiality was maintained by anonym zing all records, and no personal identifiers were used during data analysis.

**RESULTS**

A total of 80 patients with histopathologically confirmed basal cell carcinoma (BCC) who underwent surgical excision were included in the study. The demographic profile, anatomical distribution, histological subtypes, surgical margin status, and postoperative outcomes are presented below.

**Age Distribution**

**Table 1 – Age Distribution**

| Age Group | Patients (n=80) | Percentage |
|---|---|---|
| <40 years | 5 | 6% |
| 40-49 years | 12 | 15% |
| 50-59 years | 20 | 25 % |
| 60-69 years | 25 | 31 % |
| 70 + | 18 | 23 % |

The mean age of patients was 61.3 years (range 32–74 years). The majority of patients were in the 60–69 years age group (31%), followed by those aged 70 years and above (23%). Relatively fewer patients were below 40 years (6%). This trend demonstrates a clear association between increasing age and the occurrence of BCC, consistent with the role of cumulative ultraviolet (UV) exposure as a key etiological factor.

**Anatomical Site Distribution**

**Table 2- Anatomical Site Distribution**

| Site | Patients | Percentage |
|---|---|---|
| Head and neck | 60 | 75 % |
| Trunk | 8 | 10 % |
| Limbs | 7 | 9 % |
| Others | 5 | 6 % |

The head and neck region was the predominant anatomical site, accounting for 75% (n=60) of all BCCs. Among these, the nose, periocular region (eyelid), and cheek were the most frequently affected sub-sites, reflecting chronic sun exposure as the primary pathogenic factor. The trunk (10%), limbs (9%), and other sites (6%) constituted a minority of cases.

**Histopathological Subtypes**

**Table 3- Histopathological Subtypes**

| Subtypes | Patients | Percentage |
|---|---|---|
| Nodular | 36 | 45% |
| Superficial | 12 | 15% |
| Infiltrative | 10 | 12.5% |
| Mixed | 15 | 19% |
| Others | 7 | 8.5% |

The most common histopathological subtype was nodular BCC (45%), followed by mixed subtype (19%), superficial BCC (15%), and infiltrative BCC (12.5%). The remaining 8.5% comprised other rare subtypes such as basosquamous, pigmented, and morpheaform BCC.

This distribution aligns with global literature, where nodular BCC is considered the classical and most frequent presentation, while infiltrative and micronodular variants are recognized for their more aggressive biological behavior.

**Surgical Margin Status**

**Table 4= Surgical Margin Status**

| Subtype | Margin positive | Percentage |
|---|---|---|
| Nodular | 1 | 2.7 % |
| Superficial | 0 | 0 % |
| Infiltrative | 3 | 30 % |
| Mixed | 2 | 13 % |
| Others | 0 | 0 % |
| Total | 6 | 7.5% |

Of the 80 excised cases, 6 patients (7.5%) had positive surgical margins on histopathological examination.
- The infiltrative subtype accounted for the highest proportion of margin positivity (30% within subtype; 3 out of 10 cases), reflecting its poorly circumscribed and aggressive growth pattern.
- The mixed subtype also showed a notable rate of margin positivity (13%; 2 out of 15 cases).
- The nodular subtype demonstrated rare margin involvement (2.7%; 1 out of 36 cases).
- Superficial and other rare subtypes did not show any margin positivity.

These findings highlight the higher risk of incomplete excision in aggressive histological subtypes, particularly infiltrative BCC, thereby supporting the use of wider margins or Mohs micrographic surgery in such cases.

**Postoperative Complications**

**Table 5- Post operative Complications**

| Complication | Patients | Percentage |
|---|---|---|

| | | |
|---|---|---|
| Partial flap necrosis | 6 | 7.5% |
| Wound dehiscence | 5 | 6.2% |
| Surgical site infection | 3 | 3.7% |
| Hematoma/Seroma | 3 | 3.7% |
| Total | 17 | 21.2% |

Postoperative complications were recorded in 17 patients (21.2%). The most common complication was partial flap necrosis (6 cases, 7.5%), followed by wound dehiscence (5 cases, 6.2%), surgical site infection (3 cases, 3.7%), and hematoma/seroma formation (3 cases, 3.7%). All complications were managed conservatively or with minor secondary interventions, with no procedure-related mortality.

## DISCUSSION

Basal cell carcinoma (BCC) is the most common cutaneous malignancy worldwide, with an increasing incidence attributed to aging populations, cumulative ultraviolet (UV) exposure, and improved diagnostic awareness [1,2]. In our study, the mean age of presentation was 61.3 years, with the majority of cases occurring in patients older than 60 years. This finding is consistent with multiple epidemiological studies that highlight BCC as predominantly a disease of the elderly, with over half of cases diagnosed after the sixth decade of life [9,10]. The low frequency of cases under 40 years (6% in our cohort) underscores the importance of cumulative UV damage over time as the key etiological driver, although early-onset BCC may be associated with genetic predispositions such as Gorlin–Goltz syndrome, immunosuppression, or prior radiation exposure [3].

### Anatomical Distribution

The head and neck region was the most common site of BCC in our series (75%), especially involving the nose, eyelids, and cheeks. This predilection reflects the role of chronic UV exposure in sun-exposed anatomical sites, as well as the thinner dermis and proximity to adnexal structures in these regions, which may facilitate tumor development and spread. Our results align with those of Bastiaens et al. [14] and Lear et al. [15], who both reported that up to 80% of BCCs occur in the head and neck. The relatively lower incidence of BCC on the trunk and extremities in our cohort is consistent with global data, although reports from Australia and the United States indicate an increasing proportion of truncal BCCs, likely due to lifestyle and clothing patterns leading to intermittent UV exposure [16].

### Histopathological Subtypes

Histopathologically, the nodular subtype was the most common (45%), followed by mixed (19%), superficial (15%), and infiltrative BCC (12.5%). This distribution mirrors the observations of Betti et al. [11] and Flohil et al. [12], both of whom identified nodular BCC as the predominant histological variant. While nodular and superficial subtypes are generally indolent, infiltrative and micronodular variants exhibit more aggressive growth, poorly defined margins, and a higher propensity for recurrence [17]. The presence of a significant proportion of mixed subtype in our study emphasizes the histological heterogeneity of BCC, which may complicate both diagnosis and surgical management.

### Surgical Margin Status

Margin positivity was observed in 7.5% of cases in our cohort. This rate is somewhat lower than international reports, where positive margin rates range from 10–15% depending on tumor subtype, surgical technique, and margin width [18,19]. The lower rate in our study may reflect relatively early presentation, meticulous surgical excision, and intraoperative awareness of high-risk anatomical sub-sites. Importantly, margin positivity was strongly associated with the infiltrative subtype, where 30% of cases demonstrated residual tumor at the inked margin. This corroborates the findings of Scrivener et al. [13], who emphasized that aggressive histological subtypes such as infiltrative, micronodular, and morpheaform BCCs are independent predictors of incomplete excision and recurrence.

Our results reinforce the need for a tailored surgical approach based on histological subtype and anatomical site. For low-risk nodular and superficial BCCs, standard surgical excision with 3–5 mm margins is usually sufficient, with reported cure rates exceeding 95% [20]. However, for high-risk variants (infiltrative, morpheaform, recurrent tumors, or tumors in cosmetically sensitive areas), Mohs micrographic surgery (MMS) offers superior margin control, tissue preservation, and lower recurrence rates compared with standard excision [21,22]. In our cohort, the absence of MMS as a routine option may have contributed to margin positivity in aggressive variants, underscoring the need to integrate MMS into practice for selected patients.

### Postoperative Complications

The overall postoperative complication rate in our study was 21.2%, with the most common being partial flap necrosis (7.5%) and wound dehiscence (6.2%). These complications are consistent with reports from reconstructive series of head and neck BCCs, where complications range from 15–25%, depending on flap type, patient comorbidities, and anatomical complexity [23]. Importantly, all complications in our study were managed conservatively or with minor secondary procedures, with no mortality. This supports the safety of surgical excision with flap reconstruction in appropriately selected patients.

### Clinical Implications

Our study emphasizes several clinically relevant points:

1. Age and UV exposure remain the dominant risk factors for BCC in the Indian population.
2. Head and neck predilection necessitates careful surgical planning, balancing oncological clearance with functional and cosmetic outcomes.
3. Histological subtype strongly predicts surgical margin status, with infiltrative variants carrying the greatest risk of incomplete excision.
4. Margin-positive cases require vigilant follow-up, and in high-risk settings, MMS should be considered the treatment of choice.
5. Postoperative morbidity is acceptable, and most complications can be managed conservatively without compromising oncological outcomes.

### Limitations and Future Directions

The limitations of our study include its retrospective design, reliance on medical records, and the lack of long-term follow-up data to assess recurrence rates. Additionally, molecular and immunohistochemical analyses, which could provide deeper insights into tumor biology, were not performed. Future prospective studies with long-term surveillance are warranted to validate the role of histological subtypes in recurrence risk and to evaluate the cost-effectiveness of implementing Mohs micrographic surgery or hedgehog pathway inhibitors in Indian clinical practice.

## CONCLUSION OF DISCUSSION

In summary, our findings are in concordance with global literature, reaffirming that basal cell carcinoma is predominantly a disease of elderly individuals, strongly associated with chronic UV exposure, and histologically dominated by the nodular subtype. Importantly, infiltrative BCC demonstrates the highest risk of margin positivity, necessitating wider excision margins or consideration of MMS for optimal control. Our study adds to the regional evidence base and underscores the importance of histological subtype-directed surgical planning to improve oncological and functional outcomes.

## REFERENCES


1. Rogers HW, Weinstock MA, Feldman SR, Coldiron BM. Incidence estimate of nonmelanoma skin cancer (keratinocyte carcinomas) in the US population, 2012. JAMA Dermatol. 2015;151(10):1081–6.
2. Lomas A, Leonardi-Bee J, Bath-Hextall F. A systematic review of worldwide incidence of nonmelanoma skin cancer. Br J Dermatol. 2012;166(5):1069–80.
3. Madan V, Lear JT, Szeimies RM. Non-melanoma skin cancer. Lancet. 2010;375(9715):673–85.
4. Verkouteren JAC, Ramdas KHR, Wakkee M, Nijsten T. Epidemiology of basal cell carcinoma: scholarly review. Br J Dermatol. 2017;177(2):359–72.
5. Marzuka AG, Book SE. Basal cell carcinoma: pathogenesis, epidemiology, clinical features, diagnosis, histopathology, and management. Yale J Biol Med. 2015;88(2): 167–79.
6. Bastiaens MT, Hoefnagel JJ, Bruijn JA, Westendorp RGJ, Vermeer BJ, Bavinck JNB. Differences in age, site distribution, and sex between nodular and superficial basal cell carcinoma indicate different types of tumors. J Invest Dermatol. 1998;110(6):880–4.
7. Lear JT, Smith AG. Basal cell carcinoma. Postgrad Med J. 1997;73(862):538–42.
8. Betti R, Radaelli G, Crosti C, Ghiozzi S, Menni S. Basal cell carcinomas of the trunk: a retrospective study and review of the literature. J Eur Acad Dermatol Venereol. 2015;29(6):1096–101.
9. Flohil SC, Seubring I, van Rossum MM, Coebergh JWW, de Vries E, Nijsten T. Trends in basal cell carcinoma incidence rates: a 37-year Dutch observational study. J Invest Dermatol. 2013;133(4):913–8.
10. Scrivener Y, Grosshans E, Cribier B. Variations of basal cell carcinomas according to gender, age, location and histopathological subtype. Br J Dermatol. 2002;147(1):41–7.
11. Wolf DJ, Zitelli JA. Surgical margins for basal cell carcinoma. Arch Dermatol. 1987;123(3):340–4.
12. Mosterd K, Krekels GAM, Nieman FH, Ostertag JU, Essers BA, Dirksen CD, et al. Surgical excision versus Mohs' micrographic surgery for primary and recurrent basal-cell carcinoma of the face: a prospective randomised controlled trial with 5-years' follow-up. Lancet Oncol. 2008;9(12):1149–56.
13. van Loo E, Mosterd K, Krekels GA, Roozeboom MH, Ostertag JU, Dirksen CD, et al. Surgical excision versus Mohs micrographic surgery for basal cell carcinoma of the face: a randomised clinical trial with 10-year follow-up. Eur J Cancer. 2014;50(17):3011–20.
14. Bath-Hextall F, Perkins W, Bong J, Williams H. Interventions for basal cell carcinoma of the skin. Cochrane Database Syst Rev. 2007;(1):CD003412.

15. Salasche SJ. Epidemiology of actinic keratoses and squamous cell carcinoma. J Am Acad Dermatol. 2000;42(1 Pt 2):4–7.
16. Farhi D, Dupin N. Basal cell carcinoma, the most common human cancer. JAMA. 2007;294(16):1936–8.
17. Telfer NR, Colver GB, Morton CA; British Association of Dermatologists. Guidelines for the management of basal cell carcinoma. Br J Dermatol. 2008;159(1):35–48.
18. Kauvar AN, Cronin T Jr, Roenigk R, Hruza G, Bennett R. Consensus for nonmelanoma skin cancer treatment: basal cell carcinoma, including a cost analysis of treatment methods. Dermatol Surg. 2015;41(5):550–71.
19. Alam M, Ratner D. Cutaneous squamous-cell carcinoma. N Engl J Med. 2001;344(13):975–83.
20. Ferreira FR, Pevide B, Rodrigues RF, Tavares A, Cernea CR, Matos LL. Surgical treatment of basal cell carcinoma in head and neck: an analysis of 300 cases. Braz J Otorhinolaryngol. 2017;83(4):447–52.
21. Paoli J, Daryoni S, Wennberg AM, Mölne L, Gillstedt M, Miocic M, et al. 5-year recurrence rates of Mohs micrographic surgery for aggressive and recurrent facial basal cell carcinoma. Acta Derm Venereol. 2011;91(6):689–93.
22. Smeets NW, Kuijpers DI, Nelemans P, Ostertag JU, Verhaegh ME, Krekels GA, et al. Mohs' micrographic surgery for treatment of basal cell carcinoma of the face—results of a retrospective study and review of the literature. Br J Dermatol. 2004;151(1):141–7.
23. Ebrahimi A, Kalantar-Hormozi AJ, Mozafari N. Surgical excision of basal cell carcinoma: a study of 312 cases. Acta Med Iran. 2013;51(12):879–85.