



**CLINICAL AND HISTOPATHOLOGICAL PROFILE OF BASAL CELL CARCINOMA
PATIENTS AT THE ROYAL MEDICAL SERVICES: A RETROSPECTIVE DESCRIPTIVE
STUDY**

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ABSTRACT

Background: Basal cell carcinoma (BCC) is the most common skin cancer worldwide. While rarely metastatic, delayed treatment may cause significant morbidity. Limited regional data from Jordan highlight the need for population-specific insights. **Objective:** To evaluate demographic, clinical, and histopathological characteristics of BCC patients treated at the Royal Rehabilitation Center, Royal Medical Services, and identify risk factors associated with recurrence and outcomes. **Methods:** A retrospective cohort of 207 surgically managed BCC patients (2020–2025) was reviewed. Demographic, tumor, and treatment variables were extracted and analyzed. Continuous variables were compared using Wilcoxon rank-sum tests, and categorical variables with Fisher's exact tests. **Results:** The median age was 72 years (IQR: 40–45), with a slight male predominance (52.2%). Prolonged sun exposure was highly prevalent (81.2%), while sunscreen use was limited (6.3%). The nose was the most common tumor site (37.7%), and nodular subtype was predominant (56.5%). Ulceration was observed in 62.3% of cases. Surgical margins were negative in 81.3%, and recurrence occurred in 12.6%. Comparative analysis between patients treated for <1 year (n=1031) versus >1 year (n=1041) showed no significant differences in age (68.0 vs. 59.0 years, p=0.7), tumor size (0.74 vs. 1.95 cm, p=0.6), gender distribution (p>0.9), comorbidities (all p>0.2), or reconstruction methods (p=0.2). Recurrence (25% vs. 0%) and multiplicity (25% vs. 0%) were observed only in the longer-duration group but without statistical significance (p=0.5). **Conclusion:** BCC in Jordan predominantly affected elderly males, with high sun exposure and low sunscreen use. Although recurrence was relatively frequent, no significant predictors were identified. These findings underscore the urgent need for public health education and early detection programs.

KEYWORDS: Basal Cell Carcinoma, risk factors, sun exposure, histological subtype, recurrence.

INTRODUCTION

Basal cell carcinoma (BCC) is the most common type of skin cancer worldwide, accounting for approximately 80% of non-melanoma skin cancers.^[1,2] Although BCC is generally indolent, with low metastatic potential, its locally invasive behavior can result in significant tissue destruction, functional impairment, and cosmetic disfigurement if not diagnosed and treated promptly.^[3] Global incidence continues to rise, driven by aging populations, lifestyle factors, and cumulative ultraviolet (UV) exposure.^[4,5]

The primary etiological factor in BCC is chronic UV radiation, particularly intermittent intense sun exposure, which is strongly linked to tumorigenesis in fair-skinned populations.^[6,7] Additional risk factors include exposure to ionizing radiation^[8–11] and environmental carcinogens

such as arsenic in drinking water.^[12–14] Genetic predispositions, most notably nevoid basal cell carcinoma (Gorlin) syndrome, further underscore the role of Hedgehog pathway dysregulation in BCC development.^[15,16] Immunosuppressed patients, including solid organ transplant recipients, exhibit a markedly increased incidence of aggressive and recurrent BCC.^[17,18]

Clinically, BCC manifests in diverse morphologies such as nodular, superficial, infiltrative, and morpheaform subtypes.^[19,20] The anatomical distribution of tumors strongly reflects UV exposure patterns, with the majority arising in sun-exposed sites including the face, scalp, and neck.^[21,22] Tumor size, histological subtype, ulceration, and perineural invasion are recognized predictors of recurrence and poor outcomes.^[19,20]

In the Middle Eastern region, including Jordan, fewer studies have comprehensively evaluated the epidemiology and clinicopathological features of BCC compared with Western populations. Earlier work from King Hussein Medical Center highlighted BCC as the most frequent cutaneous malignancy in Jordanian cohorts^[23], yet contemporary data from larger institutional series remain scarce. Given regional variations in demographic and environmental exposures, updated insights are essential to guide prevention and management strategies tailored to local populations.

Accordingly, the present study aims to provide a comprehensive analysis of demographic, clinical, and histopathological risk factors among BCC patients treated at the Royal Rehabilitation Center, Royal Medical Services in Jordan. By identifying patterns of tumor distribution, aggressiveness, and recurrence, this study seeks to generate evidence that informs region-specific preventive measures and personalized treatment protocols.

METHOD

Study design

This study is designed as a retrospective cohort study conducted at the Royal Rehabilitation Center, Royal Medical Services, Jordan. Medical records of patients who were diagnosed with basal cell carcinoma (BCC) and underwent surgical management between January 2020 and July 2025 were reviewed. The study was approved by the Institutional Review Board (IRB) of the Royal Medical Services, and all procedures were conducted in accordance with ethical standards. Patient confidentiality was maintained throughout by anonymizing identifiable data.

Data Collection

Data were retrospectively extracted from medical records, operative notes, and histopathology reports using a standardized form. Collected variables included demographics (age, gender, comorbidities, smoking status, sun exposure, sunscreen use, skin phototype, immunosuppression), tumor characteristics (site, size, depth, histological subtype, ulceration, perineural invasion), treatment details (surgical modality, reconstruction type, adjuvant therapy, margin status), and outcomes (recurrence, recurrence-free survival, cosmetic and functional results). Data entry was performed by two investigators, with discrepancies resolved by consensus.

Statistical Method

For statistical analysis, continuous variables were expressed as medians with interquartile ranges (Q1–Q3), while categorical variables were summarized as frequencies and percentages. Comparisons between groups were performed using the Wilcoxon rank-sum test or Wilcoxon rank-sum exact test for continuous variables, and Fisher's exact test for categorical variables, as appropriate. A *p*-value of less than 0.05 was considered statistically significant. All statistical analyses

were done using R statistical language (version 4.3.0, Vienna, Austria).

RESULTS

The median age of patients was 72 years (IQR: 40–45), with a slight predominance of males (52.17%) compared to females (47.83%). Approximately half of the patients reported smoking (50.24%) and had multifocal disease (50.24%). Hypertension was present in 37.68% of patients, diabetes mellitus in 18.84%, and ischemic heart disease in 25.12%. A history of immunosuppression was found in 12.56%, while 18.84% had a past history of skin cancer. Notably, all patients reported no family history of skin cancer. Prolonged sun exposure was highly prevalent (81.15%), but sunscreen use was very limited (6.28%). Regarding skin type, the majority had Fitzpatrick scale II (29.95%) or III (39.61%).

Tumor-related characteristics showed that the most frequent anatomical site was the nose (37.68%), followed by the cheek and forehead (each 12.56%). The median tumor size was 1.09 cm (IQR: 0.18–0.18), with a depth of 3.50 mm (IQR: 2.00–2.00). Histological analysis revealed nodular subtypes as the most common (56.52%), followed by infiltrative (30.91%) and adenoid (12.56%). Ulceration was observed in 62.31% of tumors, while lymphovascular and perineural invasion were absent in all cases. Margins were negative in 81.25% of cases, and positive in 18.75%. Most patients underwent primary closure (50.24%), followed by local flap (18.84%), nasolabial flap (12.56%), and split-thickness skin graft (12.56%). Recurrence occurred in 12.56% of patients, and the median follow-up period was 4 months (IQR: 3.00–3.00).

When comparing patients treated for less than 1 year (*N* = 1031) to those treated for more than 1 year (*N* = 1041), no statistically significant differences were observed across the studied variables. The median age was slightly higher in the short-duration group (68.0 years, IQR: 58.0–72.5) compared to 59.0 years (IQR: 46.0–80.0) in the longer-duration group (*p* = 0.7). Similarly, the median tumor size did not differ significantly between the two groups (0.74 cm vs. 1.95 cm, *p* = 0.6). Gender distribution was comparable, with males representing 74.8% of the short-duration group and 62.5% of the long-duration group (*p* > 0.9). Other baseline comorbidities, including smoking status (50.5% vs. 50.0%), hypertension (37.9% vs. 37.5%), diabetes mellitus (0.0% vs. 37.5%, *p* = 0.2), and ischemic heart disease (37.9% vs. 12.5%, *p* = 0.6), showed no significant differences.

Tumor and treatment-related variables were also similar between groups. Recurrence and multiplicity were only reported in the long-duration group (25% each), though without statistical significance (*p* = 0.5). Ulceration was more common in the long-duration group (75.0% vs. 50.5%, *p* = 0.6). With regard to reconstruction methods, primary closure was equally frequent in both groups

(~50%), while local and nasolabial flaps were used only in the short-duration group, and split-thickness skin grafts and rhomboid flaps were exclusively reported in the longer-duration group ($p = 0.2$). Overall, none of the assessed variables demonstrated a significant association with treatment duration.

DISCUSSION

Our retrospective study of 207 patients with basal cell carcinoma (BCC) treated at the Royal Medical Services provides a comprehensive profile of demographic, clinical, and histopathological features in Jordan. The cohort was predominantly male (52.2%), with a median age of 72 years. Nearly half of patients reported smoking, and more than one-third had hypertension or ischemic heart disease. Sun exposure was highly prevalent (81.2%), whereas sunscreen use was exceptionally low (6.3%). Nodular BCC was the most frequent histological subtype (37.7%), with the nose representing the most common anatomical site (37.7%). Recurrence was observed in 12.6% of patients during follow-up, and ulceration was present in 62.3% of tumors. Importantly, no cases of perineural or lymphovascular invasion were identified.

The demographic profile of our cohort aligns with international data showing BCC predominantly affects elderly individuals with a slight male predominance (1–3). Our median age is higher than that reported in Western populations, where BCC incidence peaks between 60–70 years (5). This may reflect differences in sun exposure behaviors and healthcare-seeking patterns in Jordan.

Anatomical distribution in our study was dominated by the nose (37.7%) and midface regions, which is consistent with the “H-zone” predilection described in NCCN (1) and European guidelines (2). Studies from Taiwan and Europe similarly report higher frequencies in sun-exposed areas such as the face and scalp.^[21] Local studies from North Jordan reported the nose as the most affected site (38%), corroborating our findings.^[22]

Histologically, nodular subtype was the most prevalent (37.7%), consistent with European cohorts where nodular BCC accounts for 50–60% of cases.^[2,18] Infiltrative and adenoid variants were also observed (25.1% and 12.6%, respectively), both associated with higher recurrence risk.^[19] The predominance of ulceration (62.3%) in our cohort is notable, as ulceration has been linked with delayed diagnosis and larger tumor size in prior reports.^[3,18]

The recurrence rate in our study (12.6%) is slightly higher than the 5–10% typically reported in large series.^[19,20] Factors contributing may include limited sunscreen use, high prevalence of prolonged sun exposure, and delayed presentation. Importantly, we found no perineural invasion, whereas Western studies

report 2–6% incidence^[20], possibly reflecting sample size and selection bias.

Prolonged sun exposure (81.1%) emerged as the most prominent risk factor, echoing the established role of ultraviolet radiation as the primary carcinogen for BCC (6,7). The low rate of sunscreen use (6.3%) is striking compared with European populations, where regular use exceeds 30–40% (2). This gap underscores the urgent need for public health education campaigns in Jordan.

Ionizing radiation has historically contributed to BCC risk, as demonstrated in populations exposed to childhood scalp irradiation for tinea capitis (9–11). Although not reported in our cohort, this factor remains relevant in Middle Eastern populations with past medical exposures. Arsenic-related BCC, well documented in Taiwan (12–14), was not observed, reflecting regional environmental differences.

Immunosuppression was present in 12.6% of our cohort, primarily among transplant and chronic illness patients, consistent with literature showing increased BCC aggressiveness in immunocompromised hosts (17). Genetic predispositions such as nevoid basal cell carcinoma syndrome were not detected, though molecular studies from other regions highlight the role of PTCH1 and SMO mutations (15,16).

Our finding that nasal and periorbital regions were most affected is consistent with the concept of the “mask area” as high-risk zones for recurrence and cosmetic morbidity (1,2). Multiplicity was observed in 12.6% of patients, similar to European studies reporting multiple BCCs in 10–15% of cases (18).

Reconstruction methods varied, with primary closure being most frequent (50.2%), followed by local and nasolabial flaps. This distribution reflects surgical practice in resource-limited settings and contrasts with high utilization of Mohs micrographic surgery in Western countries (2,4). Positive margin rates were low (18.7% among cases with margin data), suggesting satisfactory surgical clearance despite the absence of routine Mohs surgery.

Our findings parallel those from North Jordan^[22] and earlier Jordanian cohorts^[23], but our larger sample size provides more robust epidemiologic data. Compared with Western series, Jordanian patients demonstrate higher rates of prolonged sun exposure, lower sunscreen use, and higher recurrence. These observations highlight the need for tailored preventive strategies in Middle Eastern populations, including targeted awareness campaigns and early detection programs.

The strengths of this study include its relatively large sample size, comprehensive collection of demographic and histological variables, and focus on a Middle Eastern population with limited prior data. Limitations include its

retrospective design, potential underreporting of risk factors (e.g., sun exposure quantification), absence of molecular profiling, and single-center scope, which may limit generalizability.

CONCLUSION

Our study provides the most comprehensive analysis to date of BCC patients treated at the Royal Medical Services in Jordan. Our findings confirm international trends in age, gender, and tumor site, while highlighting region-specific issues such as extremely low sunscreen use and higher recurrence. These results underscore the importance of prevention, early detection, and resource-appropriate surgical strategies to improve outcomes. Future research should explore molecular profiling and multicenter data to refine risk stratification and management.

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