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SQUAMOUS CELL CARCINOMA ACROSS ANATOMICAL SITES: EXPLORING CLINICODEMOGRAPHIC AND MORPHOLOGICAL HETEROGENEITY

Pathology

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ABSTRACT

Background: Squamous cell carcinoma (SCC) is a prevalent malignant epithelial tumor originating from stratified squamous epithelium, with occurrence across diverse anatomical sites. Its clinicodemographic characteristics and morphological features vary according to the site of origin. **Aim:** To evaluate the age and gender distribution, anatomical site involvement, and histopathological differentiation of SCC cases in a tertiary care teaching hospital, and to assess site-specific variations. **Materials and Methods:** This retrospective study comprised 643 histopathologically confirmed SCC cases from January 2022 to February 2023. Data on age, gender, anatomical location, and histological differentiation were collected and analyzed using descriptive statistical methods. **Results:** Most patients belonged to the ≥40 years age group (82.74%), with a mean age of 51.65 years. A male predominance was observed (64.39% vs. 35.61%). The oral cavity (72.63%) was the most frequently involved site, followed by the cervix (14%). Moderately differentiated SCC was the most common histological subtype across sites. **Conclusion:** SCC demonstrates notable site-specific variations in both demographic and morphological patterns. Recognition of these variations is essential for early detection, appropriate screening strategies, and improved clinical management.

KEYWORDS

Squamous Cell Carcinoma, Clinicodemographic Profile, Anatomical Distribution

INTRODUCTION

Squamous cell carcinoma (SCC) is a malignant epithelial neoplasm arising from stratified squamous epithelium and occurring across diverse anatomical sites, including the oral cavity, cervix, esophagus, skin, and respiratory tract. Despite a common histogenetic origin, SCC exhibits considerable heterogeneity in its biological behavior, clinical presentation, and histopathological features depending on the site of origin. [1]

Globally, SCC represents a major health burden, particularly in the head and neck region, where it is strongly associated with established risk factors such as tobacco use, alcohol consumption, and human papillomavirus (HPV) infection. [2] In addition, demographic and socioeconomic factors have been shown to contribute significantly to delayed diagnosis and disease progression, especially in oral SCC. [3]

Histopathologically, SCC demonstrates a wide spectrum of differentiation ranging from well differentiated to poorly differentiated forms, along with several variants such as basaloid and sarcomatoid types, which may influence prognosis and clinical outcomes. [4,5]

This study aims to evaluate the age and gender distribution and anatomical site of squamous cell carcinoma (SCC) cases in a tertiary care setting and to provide insights into the clinicodemographic profile of SCC in this setting.

MATERIALS AND METHODS

This study is a retrospective observational study conducted in the Department of Pathology at a tertiary care teaching hospital, from January 2022 to February 2023.

Study Population

A total of 643 histopathologically confirmed SCC cases were included.

Inclusion Criteria

- Confirmed cases of SCC
- Complete clinical and histopathological data

Exclusion Criteria

- Incomplete records
- Non-SCC malignancies

Data Collection

Data was extracted from the medical records of the individuals diagnosed with SCC, which included: Age, Gender, Anatomical site and Histopathological differentiation.

Statistical Analysis

Descriptive statistics were used to calculate frequencies, percentages, and mean values.

RESULTS

A total of 643 histopathologically confirmed SCC cases were analyzed. The majority of patients were aged ≥40 years (82.74%, n=532), while 17.26% (n=111) were <40 years, with a mean age of 51.65 years. Males predominated (64.39%, n=414) compared to females (35.61%, n=219). This male predominance was observed in both age groups.

Table 1:- Age and Gender Wise Distribution of SCC Cases

Age	Male	Female
<40 years	72	39
≥40 years	342	190

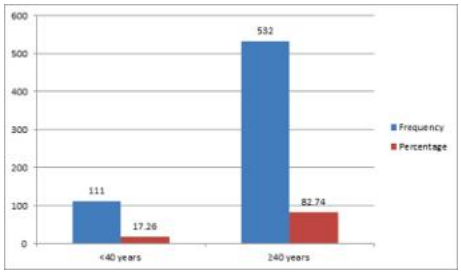

Figure 1: Age Wise Distribution of SCC Cases

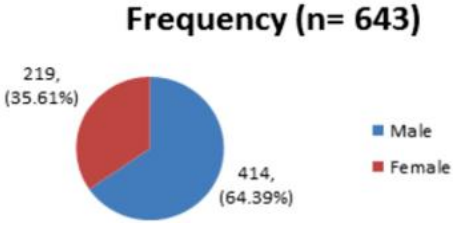

Figure 2:- Gender Wise Distribution of SCC Cases

Table 2:- Site Wise Distribution of SCC Cases

Site	Frequency	Percentage
Oral Cavity	467	72.63
Cervix	90	14.00

Oesophagus	18	2.80
Skin (Face, Cheek, Foot, Leg, Hand, Elbow, Thigh)	16	2.49
Penis	13	2.02
Larynx	9	1.40
Lip	7	1.09
Neck	4	0.62
Lymph node	3	0.47
Uterus with bilateral adnexa	3	0.47
Nasal Cavity	3	0.47
Lung	2	0.31
Scrotum	2	0.31
Nasopharynx	1	0.16
Vulva	1	0.16
Brain	1	0.16
Ear	1	0.16
Rectum	1	0.16
Uterus with cervix	1	0.16

The oral cavity was the most common site (72.63%, n=467), followed by the cervix (14%, n=90). Other sites included the esophagus (2.80%), skin (2.49%), penis (2.02%), larynx (1.40%), and lip (1.09%), while remaining sites each accounted for less than 1% of cases.

Table 3:- Site Wise Histopathological Differentiation of Cases

3A:- Oral Cavity (n=467)

Histological Type	Frequency	Percentage
Well differentiated SCC	65	13.92
Moderately differentiated SCC	334	71.52
Poorly differentiated SCC	52	11.14
Sarcomatoid SCC	4	0.86
Squamous cell Carcinoma	4	0.86
Basaloid SCC	3	0.64
Microinvasive SCC	3	0.64
Moderate to severe dysplasia with areas of invasive SCC	1	0.21
Squamous Papilloma	1	0.21

Among the poorly differentiated SCC cases, 4 cases showed basaloid morphology and 2 cases showed sarcomatoid type morphology.

3B:- Cervix (n=90)

Histological Type	Frequency	Percentage
Large Cell Keratinizing SCC	30	33.33
Large Cell Non- Keratinizing SCC	57	63.33
Micro-invasive Carcinoma	1	1.11
Basaloid SCC	1	1.11
High grade Dysplasia	1	1.11

2 cases of Large cell keratinizing SCC showed transitional type morphology.

3C:- Oesophagus (n=18)

Histological Type	Frequency	Percentage
Well differentiated SCC	3	16.67
Moderately differentiated SCC	13	72.22
Poorly differentiated SCC	2	11.11

3D:- Histological Differentiation Among Other Sites

Site	Well Differentiated SCC	Moderately differentiated SCC	Poorly differentiated SCC	Any other morphology	Total
Skin	9	5	1	1	16
Penis	5	8	-	-	13
Larynx	-	8	1	-	9
Lip	4	3	-	-	7
Neck	1	3	-	-	4
Uterus with bilateral adnexa	-	2	1	-	3
Nasal Cavity	1	1	1	-	3
Scrotum	1	1	-	-	2
Nasopharynx	-	1	-	-	1
Ear	-	1	-	-	1
Rectum	-	1	-	-	1
Uterus with Cervix	-	1	-	-	1
Total	21	35	4	1	61

Histopathologically, moderately differentiated SCC was the most common subtype across sites. In the oral cavity, it accounted for 71.52%, followed by well differentiated (13.92%) and poorly differentiated SCC (11.14%), with rare variants being minimal. In the cervix, large cell non-keratinizing SCC predominated (63.33%), followed by keratinizing SCC (33.33%). Esophageal SCC also showed a predominance of moderately differentiated tumors (72.22%).

At other sites, moderately differentiated SCC remained the dominant pattern. The brain showed metastatic poorly differentiated SCC. Lymph nodes had one case each of metastatic, poorly differentiated, and moderately differentiated SCC. The lung had two SCC cases, while the vulva showed basaloid SCC suggestive of HPV association. One case of microinvasive SCC was noted in the skin.

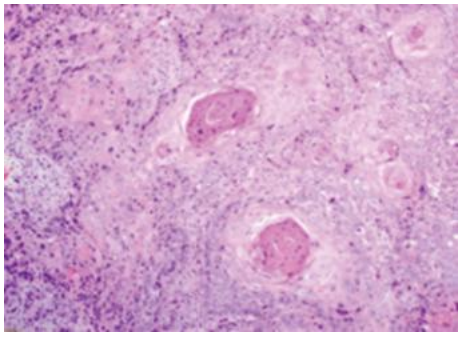

Figure 3:- Well Differentiated SCC

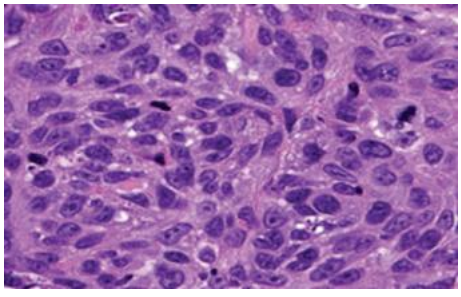

Figure 4:- Moderately Differentiated SCC

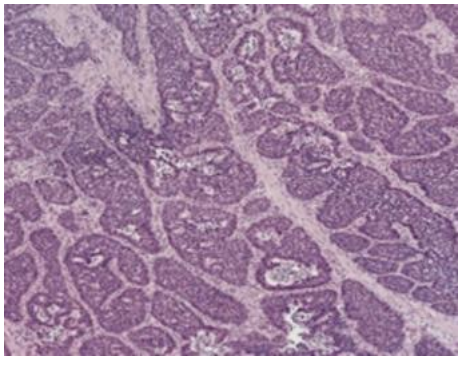

Figure 5:- Basaloid SCC

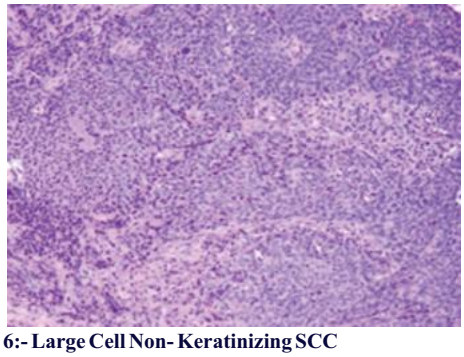

Figure 6:- Large Cell Non- Keratinizing SCC

DISCUSSION

The present study provides a comprehensive clinicodemographic and histomorphological evaluation of squamous cell carcinoma (SCC) and demonstrates patterns that are largely consistent with previously published literature, while also highlighting certain region-specific variations.

Table 4:- Comparison Table (Present Study vs. Reference Studies)

Parameter	Present Study (n=643)	Chauhan et al., 2025 (n=440)	Gurram et al., 2023 (n=31)
Age ≥40 years	82.74%	81.82%	Majority (44–70 yrs peak)
Mean Age	51.65 years	Not specified	50.90 years
Gender Distribution	Male 64.39%Female 35.61%	Female predominance (55.68%)	Nearly equal (M 51.6%, F 48.4%)
Most Common Site	Oral cavity (72.63%)	Cervix (44.32%), Oral cavity (40%)	Head & neck sites common
Second Common Site	Cervix (14%)	Oral cavity	Cervix / oral lesions
Histological Type (Most Common)	Moderately differentiated	Moderately differentiated (52.73%)	Moderately differentiated (45.2%)
Well Differentiated	Lower proportion	28.86%	35.5%
Poorly Differentiated	Least common	18.41%	16.1%
Anatomical Variation	oral cavity dominant	Cervix and oral dominant	Multiple sites including tongue, cervix

Age Distribution

The majority of patients in the present study were aged ≥40 years (82.74%), which closely parallels the findings of Chauhan et al.[7] (81.82%) and Gurram et al [6], where peak incidence was observed in the 44–70-year age group. This consistency reinforces the well-established association between SCC and advancing age, likely reflecting cumulative exposure to carcinogenic factors such as tobacco, alcohol, ultraviolet radiation, and viral infections.

Gender Distribution

A notable finding in the present study is the male predominance (64.39%), which is in agreement with Gurram et al.[6] but contrasts with the female predominance reported by Chauhan et al.[7]

Anatomical Site Distribution

The oral cavity emerged as the most common site (72.63%) in the present study, significantly higher than reported by Chauhan et al.[7] (40%), but consistent with the known high burden of oral cancer in India . In contrast, Chauhan et al.[7] reported the cervix as the most frequent site (44.32%), highlighting geographical and institutional variations in case distribution.

Gurram et al. [6] also reported a predominance of head and neck SCC, supporting the observation that these regions remain the most commonly affected anatomical sites overall. The high oral cavity involvement in the present study underscores the ongoing public health challenge posed by tobacco-related carcinogenesis.

Histopathological Differentiation

Across all three studies, moderately differentiated SCC was the most common histological subtype, accounting for the majority of cases (present study, Chauhan et al.[7] and Gurram et al. [6]. This uniformity suggests a consistent biological behavior of SCC across different populations.

Well-differentiated tumors formed the second most common category, while poorly differentiated SCC constituted the smallest proportion in all studies.

Site-Specific Variability

The present study highlights significant site-specific variation in SCC distribution, with oral cavity lesions dominating, whereas Chauhan et al.[7] reported a dual predominance of cervical and oral SCC . Such variation reflects differences in risk factor exposure, screening practices, and healthcare access.

Clinical and Epidemiological Implications

The findings of this study, in concordance with previous literature, emphasize that SCC remains a disease of middle-aged and elderly populations.

Additionally, the variation in gender distribution across studies highlights the importance of site-specific cancer control measures, such as cervical cancer screening and HPV vaccination.

Overall, the present study shows strong agreement with existing literature regarding age distribution and histopathological patterns of SCC, while demonstrating regional variation in gender distribution and anatomical site prevalence.

CONCLUSION

Squamous cell carcinoma (SCC) predominantly affected individuals aged ≥40 years with a male predominance in the present study. The oral cavity was the most common site, reflecting the impact of tobacco-related risk factors. Moderately differentiated SCC was the most frequent histological subtype. The findings are consistent with existing literature while demonstrating regional variations in site distribution and gender patterns. These results emphasize the need for targeted prevention, early detection, and awareness programs for effective SCC control.

Limitations

This study is limited by its retrospective, single-center design, which may affect generalizability. Incomplete data on risk factors and lack of follow-up restrict causal and prognostic analysis. Multicentric studies with larger cohorts are needed for validation.

REFERENCES

[1] Yan W, Wistuba II, Emmert-Buck MR, Erickson HS. Squamous cell carcinoma: similarities and differences among anatomical sites. Am J Cancer Res. 2011;1(3): 275–300.
[2] Barsouk A, Aluru JS, Rawla P, Saginala K, Barsouk A. Epidemiology, risk factors, and prevention of head and neck squamous cell carcinoma. Med Sci (Basel). 2023;11(2):42.
[3] Yuktha A, Bandari SC, Fathima SJH, et al. Determinants of diagnostic delays in oral squamous cell carcinoma: insights from demographic and socio-economic factors. Asian Pac J Cancer Prev. 2024;25(11):3997–4003.
[4] Yanofsky VR, Mercer SE, Phelps RG. Histopathological variants of cutaneous squamous cell carcinoma: a review. J Skin Cancer. 2011;2011:210813.
[5] Padma R, Kalaivani A, Sundaresan S, et al. The relationship between histological differentiation and disease recurrence of primary oral squamous cell carcinoma. J Oral Maxillofac Pathol. 2017;21(3):461.
[6] Gurram, H. B., Prasanthi, M. V. R. K., Veeragandham, S., & Yarlagadda, K. B. (2023). Age, gender distribution, and anatomical location of squamous cell carcinoma patients in a tertiary care teaching hospital. International Journal of Academic Medicine and Pharmacy, 5(4), 617–622.
[7] Chauhan, L., Kumari, N., Purohit, K., & Chauhan, R. (2025). Understanding squamous cell carcinomas: A site-wise morphological and demographic correlation. International Journal of Current Pharmaceutical Review and Research, 17(5), 535–540.