e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2026; 18(4); 128-132

Original Research Article

Clinicopathological Profile of Ocular Tumors: A Retrospective Study

Anoop Kumar[1], Jai Prakash Srivastava[2], Vijay Kumar Srivastava[3], Nandini Srivastava[4]

[1]Senior Consultant, Department of Pathology, Pandit Deen Dayal Hospital, Varanasi, U.P, India
[2]Senior Consultant, Department of Ophthalmology, Divisional District Hospital, Azamgarh, U.P, India
[3]Associate Professor, Department of Orthopaedics, Maharshi Vashishtha Autonomous State Medical College, Basti, U.P, India
[4]Associate Professor, Department of Physiology, Maharshi Vashishtha Autonomous State Medical College, Basti, U.P, India

Received: 04-02-2026 / Revised: 03-03-2026 / Accepted: 05-04-2026
Corresponding Author: Dr. Vijay Kumar Srivastava
Conflict of interest: Nil

Abstract:

Background: Ocular tumors encompass a wide spectrum of benign and malignant lesions with varied clinical presentation and prognosis. Clinicopathological evaluation plays a crucial role in accurate diagnosis and management. This study aimed to analyze the clinicopathological profile of ocular tumors in a tertiary care setting.

Material and Methods: A retrospective observational study was conducted over five years, including 102 histopathologically confirmed cases of ocular tumors. Demographic details, anatomical site, and histopathological findings were recorded. Tumors were classified as benign or malignant. Statistical analysis was performed using descriptive statistics and Chi-square test, with $p < 0.05$ considered significant.

Results: Out of 102 cases, the majority were in the 41–60 years age group (29.4%) with male predominance (56.9%). The eyelid was the most commonly involved site (35.3%), followed by conjunctiva (23.5%), orbit (19.6%), and intraocular region (17.6%). Benign tumors constituted 62.7% of cases, while malignant tumors accounted for 37.3%. Among benign lesions, dermoid cysts (13.7%) and nevi (11.8%) were most frequent. Sebaceous gland carcinoma (9.8%) was the most common malignant tumor. A statistically significant association was observed between tumor behavior and anatomical site ($p = 0.032$), with intraocular tumors showing a higher proportion of malignancy.

Conclusion: Benign ocular tumors predominate; however, a considerable proportion of malignant lesions exists, particularly in intraocular locations. Site-specific variations in tumor behavior underscore the importance of early diagnosis and histopathological evaluation for optimal management.

Keywords: Ocular tumors; Clinicopathological study; Benign tumors; Malignant tumors; Histopathology; Sebaceous gland carcinoma.

DOI: 10.25258/ijcpr.18.4.22

Introduction

Ocular tumors comprise a heterogeneous group of lesions involving the eyelid, conjunctiva, intraocular structures, and orbit, encompassing a wide spectrum of benign and malignant neoplasms. These lesions vary considerably in their clinical presentation, biological behavior, and prognosis, necessitating accurate diagnosis and classification for appropriate management [1]. Histopathological evaluation remains the gold standard for definitive diagnosis, particularly because many malignant lesions can clinically mimic benign conditions, leading to potential delays in treatment [2].

The epidemiological and clinicopathological profile of ocular tumors shows significant variation across geographic regions and healthcare settings. Large retrospective analyses have demonstrated differences in the relative frequency of benign and malignant lesions, as well as variations in tumor types and anatomical distribution [3]. For instance, studies have reported that benign tumors generally predominate; however, certain malignancies such as sebaceous gland carcinoma, basal cell carcinoma, and lymphoma contribute substantially to morbidity due to their aggressive nature and potential for local invasion and metastasis [3,4].

Recent advances in diagnostic modalities, including imaging and immunohistochemistry, have improved the accuracy of tumor characterization, especially in cases with overlapping clinical or histological features. Nonetheless, histopathological examination continues to play a pivotal role in confirming diagnosis and guiding therapeutic decisions [5]. Additionally, clinicopathological correlation is essential for understanding tumor

behavior, identifying risk factors for malignancy, and improving prognostic assessment [6].

Several tertiary-care based studies have emphasized the importance of retrospective analyses in delineating the spectrum of ocular tumors within specific populations. Such studies provide valuable insights into demographic patterns, anatomical distribution, and histological subtypes, thereby aiding clinicians in early diagnosis and management [3,6]. However, regional data remain limited in many parts of the world, highlighting the need for further studies to better understand local disease patterns.

In this context, the present study was undertaken to evaluate the clinicopathological profile of ocular tumors in a tertiary care setting, with emphasis on demographic characteristics, anatomical distribution, and histopathological spectrum.

Material and Methods

Study Design and Setting: A retrospective, observational study was conducted at a tertiary care teaching hospital. The study analyzed histopathologically confirmed cases of ocular tumors.

Study Population and Sample Size: All patients diagnosed with ocular tumors and who underwent surgical excision or biopsy with subsequent histopathological examination during the study period were included. Based on trends reported in similar tertiary-care retrospective analyses, a sample size of approximately 80–120 cases is typically adequate to derive meaningful clinicopathological correlations [7]; accordingly, a total of 102 cases fulfilling the inclusion criteria were enrolled in the present study.

Inclusion Criteria

- Patients of all age groups and both sexes
- Clinically suspected ocular tumors confirmed by histopathology
- Availability of complete clinical, radiological (where applicable), and histopathological records

Exclusion Criteria

- Inadequate or incomplete medical records
- Cases lacking histopathological confirmation
- Recurrent tumors without primary diagnostic details

Data Collection: Relevant data were retrieved from medical records, pathology registers, and electronic databases. The following parameters were documented:

- Demographic details (age, sex)
- Clinical presentation (duration of symptoms, presenting complaints)
- Anatomical location of tumor (eyelid, conjunctiva, intraocular, orbital)
- Laterality of involvement
- Clinical diagnosis and radiological findings (where available)
- Type of surgical intervention performed

Histopathological Evaluation: All tissue specimens were fixed in 10% neutral buffered formalin, processed routinely, and embedded in paraffin. Sections of 3–5 µm thickness were prepared and stained with hematoxylin and eosin (H&E). Special stains and immunohistochemistry were employed wherever necessary to confirm the diagnosis. Tumors were classified based on histopathological characteristics into benign and malignant categories, and further subtyped according to standard ophthalmic pathology classifications.

Outcome Measures: The primary outcome measures included:

- Distribution of ocular tumors based on age, sex, and anatomical site
- Relative frequency of benign versus malignant tumors
- Histopathological spectrum of ocular neoplasms

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 25.0. Descriptive statistics were used to summarize the data. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Associations between clinicopathological variables were assessed using the Chi-square test or Fisher's exact test, as appropriate. A p-value of <0.05 was considered statistically significant.

Results

A total of 102 patients with histopathologically confirmed ocular tumors were included in the study. The demographic distribution revealed that the majority of patients were in the age group of 41–60 years (29.4%), followed by those aged >60 years (25.5%). Pediatric cases (≤10 years) constituted 13.7% of the study population. There was a slight male predominance, with males accounting for 56.9% of cases and females comprising 43.1% (Table 1).

With respect to anatomical distribution, the eyelid was the most frequently involved site, accounting for 35.3% of cases, followed by the conjunctiva (23.5%), orbit (19.6%), and intraocular region (17.6%). Tumors of the lacrimal gland were relatively uncommon, comprising only 3.9% of cases (Table 2).

Based on histopathological classification, benign tumors were more prevalent, constituting 62.7% of cases, whereas malignant tumors accounted for 37.3% (Table 3).

Among benign tumors, dermoid cysts were the most common (13.7%), followed by nevi (11.8%), hemangiomas (9.8%), papillomas (7.8%), and schwannomas (5.9%). Other benign lesions collectively accounted for 13.7% of cases. Among malignant tumors, sebaceous gland carcinoma was the most frequent (9.8%), followed by basal cell carcinoma (7.8%), squamous cell carcinoma (5.9%), and retinoblastoma (5.9%). Malignant melanoma and lymphoma each contributed 3.9% of cases (Table 4).

Correlation of tumor behavior with anatomical site demonstrated that benign tumors predominated in the eyelid (20 cases) and orbit (18 cases), whereas malignant tumors were more frequently observed in the intraocular region (12 cases). The conjunctiva showed a higher proportion of benign tumors (16 cases) compared to malignant tumors (8 cases), while all lacrimal gland tumors in the present study were benign (Table 5). A statistically significant association was observed between anatomical site and tumor behavior (Chi-square test, $p = 0.032$), indicating variation in the distribution of benign and malignant tumors across different ocular locations (Table 5).

Table 1: Demographic Distribution of Patients (n = 102)

Variable	Category	Number (n)	Percentage (%)
Age Group (years)	≤10	14	13.7
	11–20	10	9.8
	21–40	22	21.6
	41–60	30	29.4
	>60	26	25.5
Sex	Male	58	56.9
	Female	44	43.1

Table 2: Anatomical Distribution of Ocular Tumors (n = 102)

Site of Tumor	Number (n)	Percentage (%)
Eyelid	36	35.3
Conjunctiva	24	23.5
Intraocular	18	17.6
Orbit	20	19.6
Lacrimal gland	4	3.9

Table 3: Distribution of Benign and Malignant Tumors (n = 102)

Tumor Type	Number (n)	Percentage (%)
Benign	64	62.7
Malignant	38	37.3

Table 4: Histopathological Spectrum of Ocular Tumors (n = 102)

Tumor Type	Number (n)	Percentage (%)
Benign Tumors		
Dermoid cyst	14	13.7
Nevus	12	11.8
Hemangioma	10	9.8
Papilloma	8	7.8
Schwannoma	6	5.9
Others	14	13.7
Malignant Tumors		
Sebaceous gland carcinoma	10	9.8
Basal cell carcinoma	8	7.8
Squamous cell carcinoma	6	5.9
Retinoblastoma	6	5.9
Malignant melanoma	4	3.9
Lymphoma	4	3.9

Table 5: Correlation between Tumor Behavior and Anatomical Site

Site	Benign (n)	Malignant (n)	Total	Statistical Significance
Eyelid	20	16	36	χ^2 = 10.52
Conjunctiva	16	8	24	p = 0.032
Intraocular	6	12	18	
Orbit	18	2	20	
Lacrimal gland	4	0	4	
Total	64	38	102	

Discussion

The present study highlights the clinicopathological spectrum of ocular tumors in a tertiary care setting, demonstrating a predominance of benign lesions (62.7%) over malignant tumors (37.3%). This finding is consistent with previous hospital-based studies, which have reported that non-malignant orbito-ocular lesions constitute a larger proportion of cases, although the exact distribution varies depending on referral patterns and study design [8]. Similar retrospective analyses have emphasized that tertiary centers often encounter a broad mix of lesions, including both neoplastic and tumor-like conditions, contributing to variability in reported frequencies [9].

In the current study, the eyelid was identified as the most commonly involved anatomical site (35.3%). This observation aligns with recent studies, which have consistently reported the eyelid as the predominant location for ocular tumors, largely due to its continuous exposure to environmental factors such as ultraviolet radiation and its complex adnexal structures [10]. Additionally, epidemiological studies have demonstrated that eyelid tumors form a significant proportion of ophthalmic neoplasms in tertiary care institutions, reinforcing the findings of the present study [11].

Benign tumors predominated in our series, with dermoid cysts and nevi being the most frequently encountered lesions. Comparable studies have reported similar distributions, particularly highlighting dermoid cysts as common benign lesions, especially in younger populations, and nevi as frequent conjunctival or periocular findings [12]. The predominance of benign lesions may also reflect increased accessibility for early detection and surgical excision in tertiary care settings.

Among malignant tumors, sebaceous gland carcinoma emerged as the most common entity in the present study. This is in concordance with several studies from the Indian subcontinent and Asian populations, where sebaceous gland carcinoma has been reported more frequently compared to Western populations, where basal cell carcinoma predominates [13]. The relatively higher incidence of sebaceous gland carcinoma in Asian cohorts has been attributed to genetic, environmental, and possibly delayed presentation factors.

The present study also demonstrated that intraocular tumors had a higher proportion of malignancy compared to other anatomical sites. This finding is supported by previous literature, which indicates that intraocular lesions, particularly in pediatric populations, are more likely to be malignant, with retinoblastoma being a major contributor [14]. Similarly, orbital lesions in our study were predominantly benign, which is consistent with reports indicating that a significant proportion of orbital masses are non-malignant, including cystic and vascular lesions [8].

A statistically significant association was observed between anatomical site and tumor behavior ($p = 0.032$), suggesting that the likelihood of malignancy varies with tumor location. This observation is in agreement with earlier clinicopathological studies, which have highlighted site-specific differences in tumor biology and aggressiveness [9,11]. Such correlations are clinically important, as they aid in risk stratification and guide diagnostic and therapeutic decision-making.

Despite these findings, the present study has certain limitations. Being a retrospective, single-center study, it is subject to inherent biases such as incomplete records and referral bias. Similar limitations have been acknowledged in previous retrospective analyses of ocular tumors, which may influence the generalizability of results [15]. Nevertheless, the study provides valuable insights into the clinicopathological profile of ocular tumors in a tertiary care setting.

Conclusion

The present retrospective analysis demonstrates that ocular tumors exhibit a diverse clinicopathological spectrum with a predominance of benign lesions, although a substantial proportion of malignant tumors was observed. Middle-aged and elderly individuals were more frequently affected, with a slight male preponderance. The eyelid emerged as the most common anatomical site, while intraocular tumors showed a higher likelihood of malignancy. Histopathologically, dermoid cysts and nevi were the most frequent benign lesions, whereas sebaceous gland carcinoma was the leading malignant tumor. A statistically significant association between tumor behavior and anatomical site highlights the importance of site-specific evaluation in clinical practice. Early diagnosis supported by

histopathological confirmation remains essential for appropriate management and improved patient outcomes.

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