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## Prevalence of eye cancer in cattle in the Hyderabad-Karnataka region of Karnataka, India: A retrospective study

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### Abstract

Ocular tumours are an important neoplastic condition in cattle, with ocular squamous cell carcinoma (OSCC) being the most frequently reported malignant tumour of the bovine eye. The present retrospective study was undertaken to determine the incidence of ocular cancer in cattle presented to selected veterinary hospitals in the Hyderabad-Karnataka region of Karnataka, India. Case records of cattle presented for surgical treatment during the study period from March 2016 to April 2026 were reviewed. Data were collected from three major veterinary clinical centres, namely the Veterinary Clinical Complex (VCC), Veterinary College, Bidar; Veterinary Polyclinic, Bidar; and Veterinary Polyclinic, Kalaburagi. A total of 8,206 surgical cases were reviewed, among which 383 cases of ocular cancer were identified. The overall incidence of ocular cancer was 4.67 percent. The highest number of cases was recorded at TVCC, Veterinary College, Bidar, with 256 cases, followed by Veterinary Polyclinic, Kalaburagi, with 102 cases and Veterinary Polyclinic, Bidar, with 25 cases. The findings demonstrated that ocular cancer constitutes a clinically important neoplastic condition in cattle in the region. The observed occurrence may be associated with several predisposing factors, including prolonged exposure to ultraviolet radiation, breed and genetic susceptibility, age, pigmentation around the eye and environmental conditions. The findings highlight the importance of early recognition, clinical examination and timely treatment of ocular tumours in cattle.

**Keywords:** Cattle, ocular tumour, eye cancer, squamous cell carcinoma, incidence, bovine, Karnataka

### Introduction

Ocular squamous cell carcinoma (OSCC) is the most frequently occurring neoplasm of the eye in cattle. It originates from epithelial tissues and can affect ocular and periocular structures. Commonly known as “eye cancer,” OSCC is the most malignant and economically significant tumours seen in large animals. Its economic impact arises from whole carcass condemnations estimated at 12.6%, due to production losses, treatment expenses and management costs (Heeney and Valli, 1985) [2].

Bovine ocular squamous cell carcinoma is generally considered to be a multifactorial disease. Ultraviolet radiation is regarded as one of the major environmental risk factors, particularly in animals with reduced ocular pigmentation. Other factors such as genetic predisposition, age, breed, chronic irritation and environmental conditions may also contribute to tumour development. The disease is clinically important because progressive ocular lesions may interfere with vision and may eventually result in extensive local tissue destruction.

Ocular squamous cell carcinoma (OSCC) involves various ocular and periocular tissues, including the conjunctival surface, limbus, nictitating membrane, cornea and eyelid skin (Tsujita and Plummer, 2010) [4]. Although the precise etiology of OSCC is not fully understood, several predisposing factors contribute to its occurrence. These include genetic predisposition, nutritional deficiencies, advanced age, prolonged exposure to ultraviolet (UV) radiation, light pigmentation of the periocular region and certain viral infections are considered to play a role in its pathogenesis (Reddy *et al.*, 2017 and Pazhanivel and Umarani, 2022) [8, 9].

Although ocular squamous cell carcinoma has been reported from different parts of India, region-specific information regarding its occurrence in cattle is comparatively limited. The Hyderabad-Karnataka region includes several important cattle-rearing areas and experiences substantial solar exposure throughout much of the year. Therefore, assessment of the occurrence of ocular cancer in this region is relevant from both clinical and epidemiological perspectives.

The present study was undertaken to determine the incidence and distribution of ocular cancer in cattle presented to selected veterinary hospitals in the Hyderabad-Karnataka region of Karnataka during the study period.

## Materials and Methods

### Study area and study period

A retrospective study was conducted using clinical records of cattle presented to selected veterinary hospitals in the Hyderabad-Karnataka region of Karnataka. The study covered the period from March 2016 to April 2026.

The records were obtained from three major veterinary clinical centres:

1. Veterinary Clinical Complex (TVCC), Veterinary College, Bidar
2. Veterinary Polyclinic, Bidar
3. Veterinary Polyclinic, Kalaburagi

### Data collection

Hospital records of cattle presented for surgical management were reviewed. The total number of surgical cases and the number of cattle diagnosed with ocular cancer were recorded for each centre. Available information regarding the year-wise occurrence of ocular cancer was also compiled.

The incidence was calculated as the proportion of ocular cancer cases among the total number of surgical cases presented during the corresponding period.

Cases clinically diagnosed as ocular cancer and subsequently confirmed through appropriate clinical and pathological examination were included in the study.

## Results

### Prevalence of eye Cancer in Bovines at the Veterinary Clinical Complex, Veterinary College, Bidar: Records

from the Veterinary Clinical Complex (VCC), Veterinary College, Bidar, showed considerable year-wise variation in the prevalence of ocular tumours in bovines during 2016-2026 (Table 1). The annual number of surgical cases ranged from 244 to 490, while ocular tumour cases ranged from 1 to 33. The prevalence increased from 0.27% in 2016 to a peak of 7.64% in 2018, with higher rates also recorded in 2020 (7.25%) and 2021 (6.96%). Thereafter, prevalence remained relatively high, ranging from 4.98% in 2022 to 5.71% in 2025. During the first four months of 2026, 10 ocular tumour cases were recorded among 172 surgical cases, yielding a prevalence of 5.81%.

### Prevalence of eye cancer in bovines at Veterinary Polyclinic, Bidar

A retrospective analysis of bovine cases presented to the Veterinary Polyclinic, Bidar, during 2016-2026 identified 25 cases of ocular squamous cell carcinoma (OSCC) among 1,180 surgical cases, yielding an overall prevalence of 2.12% (Table 2). The year-wise prevalence varied from 0.91% in 2016 to 3.70% in 2025, with a generally increasing trend during the later years. In 2026, the prevalence remained relatively high at 3.13%, indicating a sustained occurrence of OSCC.

### Prevalence of eye cancer in bovines at Veterinary Polyclinic, Kalaburagi

A retrospective analysis of bovine cases presented to the Veterinary Polyclinic, Kalaburagi, during 2016-2026 identified 102 cases of ocular squamous cell carcinoma (OSCC) among 3,088 surgical cases, yielding an overall prevalence of 3.30% (Table 4). The prevalence fluctuated over the study period, with a decline during 2020-2021, followed by a marked increase from 2022 onwards. The highest prevalence was recorded in 2024 (5.84%), followed by 2023 (5.58%), while it remained relatively high in 2025 (4.56%) and 2026 (4.41%).

Overall, (table 4) the highest prevalence of ocular cancer was recorded at the Veterinary Clinical Complex, Veterinary College, Bidar (6.50%), followed by the Veterinary Polyclinic, Kalaburagi (3.30%) and Veterinary Polyclinic, Bidar (2.12%) during the study period.

**Table 1:** Prevalence of eye cancer in bovines treated at vveterinary clinical complex, veterinary college, Bidar from 2016 to 2026

| Year  | Number of Surgical Cases Treated | Number of Eye Cancer Cases in Bovines | Prevalence of Eye Cancer (%) |
|-------|----------------------------------|---------------------------------------|------------------------------|
| 2016  | 366                              | 1                                     | 0.27                         |
| 2017  | 244                              | 9                                     | 3.68                         |
| 2018  | 432                              | 33                                    | 7.63                         |
| 2019  | 355                              | 15                                    | 4.22                         |
| 2020  | 400                              | 29                                    | 7.25                         |
| 2021  | 385                              | 33                                    | 8.57                         |
| 2022  | 369                              | 38                                    | 10.29                        |
| 2023  | 273                              | 28                                    | 10.25                        |
| 2024  | 421                              | 33                                    | 7.83                         |
| 2025  | 581                              | 32                                    | 5.50                         |
| 2026  | 112                              | 5                                     | 4.46                         |
| Total | 3938                             | 256                                   | 6.50                         |

**Table 2:** Prevalence of eye cancer in bovines treated at veterinary polyclinic, Bidar during 2016 to 2026

| Year  | Number of Surgical Cases Treated | Number of Eye Cancer Cases in Bovines | Prevalence of Eye Cancer in Bovines (%) |
|-------|----------------------------------|---------------------------------------|-----------------------------------------|
| 2016  | 110                              | 1                                     | 0.91                                    |
| 2017  | 96                               | 1                                     | 1.04                                    |
| 2018  | 79                               | 2                                     | 2.53                                    |
| 2019  | 98                               | 1                                     | 1.02                                    |
| 2020  | 126                              | 2                                     | 1.58                                    |
| 2021  | 94                               | 2                                     | 2.12                                    |
| 2022  | 113                              | 2                                     | 1.76                                    |
| 2023  | 122                              | 3                                     | 2.45                                    |
| 2024  | 148                              | 4                                     | 2.70                                    |
| 2025  | 162                              | 6                                     | 3.70                                    |
| 2026  | 32                               | 1                                     | 3.12                                    |
| Total | 1180                             | 25                                    | 2.12                                    |

**Table 3:** Prevalence of eye cancer in bovines treated at veterinary polyclinic, Kalaburagi during 2016 to 2026

| Year  | Number of Surgical Cases Treated | Number of Eye Cancer Cases in Bovines | Prevalence of Eye Cancer in Bovines (%) |
|-------|----------------------------------|---------------------------------------|-----------------------------------------|
| 2016  | 273                              | 7                                     | 2.56                                    |
| 2017  | 309                              | 9                                     | 2.91                                    |
| 2018  | 291                              | 6                                     | 2.06                                    |
| 2019  | 336                              | 8                                     | 2.38                                    |
| 2020  | 325                              | 5                                     | 1.54                                    |
| 2021  | 337                              | 6                                     | 1.78                                    |
| 2022  | 282                              | 12                                    | 4.26                                    |
| 2023  | 269                              | 15                                    | 5.58                                    |
| 2024  | 291                              | 17                                    | 5.84                                    |
| 2025  | 307                              | 14                                    | 4.56                                    |
| 2026  | 68                               | 3                                     | 4.41                                    |
| Total | 3088                             | 102                                   | 3.30                                    |

### Centre-wise distribution

The Veterinary Clinical Complex (TVCC), Veterinary College, Bidar, recorded the highest number of ocular cancer cases, with 256 cases. This was followed by the

Veterinary Polyclinic, Kalaburagi, which recorded 102 cases, while the Veterinary Polyclinic, Bidar, recorded 25 cases.

| Veterinary centre                 | Total surgical cases | Ocular cancer cases | Incidence (%) |
|-----------------------------------|----------------------|---------------------|---------------|
| TVCC, Veterinary College, Bidar   | 3,938                | 256                 | 6.50          |
| Veterinary Polyclinic, Kalaburagi | 3,088                | 102                 | 3.30          |
| Veterinary Polyclinic, Bidar      | 1,180                | 25                  | 2.12          |
| Total                             | 8,206                | 383                 | 3.97          |

The incidence was highest at TVCC, Veterinary College, Bidar (6.50%), followed by Veterinary Polyclinic, Kalaburagi (3.30%) and Veterinary Polyclinic, Bidar (2.12%).

The higher number of cases recorded at TVCC may partly be attributable to its status as a referral and teaching hospital, where animals with advanced or complicated ocular lesions are more likely to be presented. Differences in cattle population, referral patterns, accessibility of veterinary services and awareness among owners may also contribute to variation between centres.

### Discussion

The present study documented 383 ocular cancer cases among 8,206 surgical cases, resulting in an overall incidence of 3.97 percent. The findings indicate that ocular cancer is an important neoplastic condition encountered in cattle presented to veterinary hospitals in the Hyderabad-Karnataka region.

The predominance of ocular squamous cell carcinoma among bovine ocular tumours has been widely recognized. Moulton (1961) described ocular squamous cell carcinoma as one of the important neoplastic conditions affecting cattle. The clinical importance of the disease is primarily

associated with its progressive local invasion, potential interference with vision and the possibility of recurrence following incomplete treatment.

The relatively high incidence observed in the present study may be related to the environmental conditions prevailing in the region. Prolonged exposure to sunlight and ultraviolet radiation is considered an important risk factor in the development of bovine ocular squamous cell carcinoma. Cattle maintained under conditions of prolonged solar exposure may therefore have an increased risk of developing ocular neoplasia.

The variation in incidence among the three veterinary centres may be influenced by differences in the population of cattle served by each hospital. The highest incidence was recorded at TVCC, Bidar. As a teaching and referral hospital, VCC receives cases from a wider geographical area, including animals referred because of advanced ocular lesions or failure of previous treatment. Consequently, hospital-based incidence may not necessarily represent the true population prevalence of ocular cancer in the entire cattle population.

The Veterinary Polyclinic, Kalaburagi, recorded an incidence of 3.30 percent, whereas the Veterinary Polyclinic, Bidar, recorded 2.12 percent. These differences

may reflect variation in referral patterns, cattle population structure, breed composition, owner awareness and accessibility to veterinary care.

The year-wise variation observed in the present study is also noteworthy. The relatively low incidence during the initial year was followed by an increase in subsequent years, with the highest value recorded in 2018. Thereafter, the incidence remained consistently detectable, with comparatively higher values during 2020 and 2021. The persistence of cases over several years suggests that ocular cancer is an established clinical problem in the study region.

The higher prevalence observed during recent years may be attributed to improved facilities created at these polyclinics and availability of specialization in recent years. Palfi and Fabian (1969) <sup>[1]</sup> reported a 3.60 percent occurrence of bovine ocular squamous cell carcinoma in Cegled region of Hungary which is comparable to the present findings. The increasing occurrence of ocular neoplasms has also been reported by Fazili *et al.* (2001) <sup>[3]</sup>. Tsujita and Plummer (2010) <sup>[4]</sup> reported that bovine ocular squamous cell carcinoma affected 10-20% of cattle in some herds in Australia. Gharagozlou *et al.* (2007) <sup>[5]</sup> reported an overall prevalence of 0.64% (32 cases among 5,000 dairy cattle) they identified prolonged sunlight exposure and advancing age as important predisposing factors. Priyanka *et al.* (2021) <sup>[6]</sup> evaluated 1,629 cases in Hassan and identified 51 animals with ocular tumours, representing an overall prevalence of 3.13%. Sugan *et al.* (2024) <sup>[7]</sup> evaluated 2,059 cattle presented to the outpatient unit of the Veterinary Clinical Complex, Veterinary College and Research Institute, Namakkal and recorded 80 cases of bovine ocular squamous cell carcinoma representing an overall prevalence of 3.89% in the cattle population. Most of these reports and the present study confirm that eye cancer in cattle has a prevalence of about 3.97% and is a very important surgical condition of economic importance.

## Conclusion

The present retrospective study recorded 383 cases of ocular cancer among 8,206 surgical cases of cattle, giving an overall incidence of 4.67 percent during the study period from March 2016 to April 2026. The highest incidence was recorded at TVCC, Veterinary College, Bidar (6.50%), followed by Veterinary Polyclinic, Kalaburagi (3.30%) and Veterinary Polyclinic, Bidar (2.12%).

The persistent occurrence of ocular cancer throughout the study period indicates that it represents an important clinical and economic problem in cattle in the Hyderabad-Karnataka region. The observed variation among centres and years may be influenced by environmental exposure, breed and genetic susceptibility, age, ocular pigmentation, referral patterns and increased case detection.

Early recognition, accurate diagnosis and timely therapeutic intervention are therefore essential for effective management of bovine ocular cancer. The present findings also provide useful baseline epidemiological information for further prospective studies investigating risk factors, geographical distribution and preventive strategies for ocular squamous cell carcinoma in cattle.

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