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A RETROSPECTIVE STUDY OF EYE AFFECTIONS IN ANIMALS OF KASHMIR VALLEY

HAKIM ATHAR*, JALAL UD DIN PARRAH, DIL MOHAMMAD MAKHDOOMI, SHAHID HUSSAIN DAR[1], MUJEEB UR REHMAN FAZILI[1] and MEHRAJ U DIN DAR
Division of Veterinary Surgery and Radiology, [1]Veterinary Clinical Services Complex
Faculty of Veterinary Science and Animal Husbandry,
Sher-e Kashmir University of Agricultural Sciences and Technology of Kashmir

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SUMMARY

Eye affections in various animals brought to the Veterinary Clinical Services Complex were studied retrospectively. The overall occurrence was 1.72%. Among species, equine were most affected (7.84%), followed in decreasing order by feline (3.03%), avian (2.56%), canine (2.26%), ovine (2.18%), bovine (1.42%) and caprine (1.12%). Equal distribution of eye affections between right and left eyes was recorded. Twenty-eight different ocular affections were recorded in various species of animals of which corneal opacity was the most common ocular affection recorded in 22.73% of the animals followed by corneal ulcer (15.58%) and eye ball puncture (10.4%).

Key words: Corneal Opacity, Corneal Ulcer, Puncture, Equine, Eye

Ocular affections are commonly recorded in all species of the animals. Vision impairment in animals affects physiology, draught ability, utility and productivity of animals leading to direct economic loss to the farmers and an indirect loss to the society (Reichman, 2008). Eye is very sensitive organ, the function of which may be affected even with mild insult to its homeostasis, due to direct injury or due to other local or systemic diseases and hence studies on ocular affections may provide information on prevalence of ocular diseases and also help to limit diagnostic possibilities and treatment options (Andrade *et al*., 2005). The occurrence of ocular affections varies with geographical location. The animals of plain area suffer less from ocular affections as compared to those reared in hilly terrains due to hostile environment. Likewise managemental conditions have profound effect on occurrence of ocular affections in animals. On perusal of available literature, documentation of ocular affections in animals from Kashmir was found scarce. Hence, this study was undertaken to record the occurrence and document various types of ocular affections in animals

The study was conducted on the animals which were treated for various eye affections at Veterinary Clinical Services Complex during the period of 5 years from January, 2010 to December, 2014 based on the available case records. The data obtained was analyzed on the basis of the species, age, side, season, sex and different ocular diseases.

The overall occurrence of the ocular affections in animals presented to the clinics from 2010-2014 was 1.72% (Table 1). Year wise break up of ocular affections showed no definite trend with regard to the incidence during different years.

Among the animal species, equines were most affected (7.84%), followed by feline (3.03%), avian (2.56%), canine (2.26%), ovine (2.18%), bovine (1.42%) and caprine species (1.12%). The performance of the equines, i.e. draught activity is dependent upon good vision of the eyes besides their proper locomotor system. Any ocular affection, having the prospect of causing impairment in vision is therefore immediately referred to super specialty hospital. This could be the reason for higher hospital occurrence of ocular affections in equines. Month wise distribution of ocular affections in animals showed highest incidence of ocular affections in the month of July (n=21), and least during the month of November (n=7). Seasonal variation was recorded in the occurrence of ocular affections (Table 2). Age wise distribution of ocular affections revealed that the majority (76/154, 49.3%) of the animals presented with ocular affections were below one year of age, of which ruminant neonates formed 32.9% (25/76) of the cases (Table 3). No neonate other than that of ruminants was found affected with any kind of ocular affection. However, in equines, half of the affected animals were above 5 years of age. Similar findings have been reported by Kalaiselvan *et al*. (2009) who recorded maximum number of cases suffering from ocular affections to be below 1 year of age in cattle (47.05%) and goats (56.25%). Contrarily, Tamilmahan *et al*. (2013) reported higher incidence of ocular affections in animals of more than 5 years of age except in caprine where maximum number of cases were seen in middle (1-5 years) age group. Pratap *et al*. (2005) also observed higher occurrence of ocular affections in adults followed by young ones and middle aged animals

Perusal of sex wise distribution of ocular affections in different species of animals (Table 3) revealed that female animals (92/154, 59.74%) were more affected than male (62/154, 40.26%) with ocular affections. Male animals among ovines (52.78%), felines (100%) and equines (62.5%) over represented the cases as compared to their female counterparts while as among bovines (68.6%), and caprines (75%), female animals formed majority of the cases. In canines, there were equal

*Corresponding author: hakimathar@gmail.com

Table 1
Occurrence of eye affections in different animal species during 2010-2014

Year	Cases recorded	Animal Species							Total
		Bovine	Ovine	Caprine	Equine	Canine	Feline	Avian	
2010	Total	954	220	149	28	43	1	1	1396
	Ocular affections	13 (1.36)	7 (3.18)	4 (2.68)	6(21.43)	1 (2.33)	0 (0.00)	0 (0.00)	31(2.22)
2011	Total	1368	365	160	48	50	4	10	2005
	Ocular affections	20 (1.46)	9 (2.47)	1 (0.63)	3 (6.25)	1 (2.00)	1(25.00)	0 (0.00)	35 (1.75)
2012	Total	1269	250	120	45	50	6	5	1745
	Ocular affections	21 (1.65)	2 (0.80)	1 (0.83)	2 (4.44)	2 (4.00)	0 (0.00)	0 (0.00)	28 (1.60)
2013	Total	1189	380	150	42	65	10	16	1852
	Ocular affections	12 (1.01)	8 (2.11)	1 (0.67)	3 (7.14)	1 (1.54)	0 (0.00)	1 (6.25)	26 (1.40)
2014	Total	1273	437	133	41	58	12	7	1961
	Ocular affections	20 (1.57)	10(2.29)	1 (0.75)	2 (4.88)	1 (1.72)	0 (0.00)	0 (0.00)	34 (1.73)
Total number of cases		6053	1652	712	204	266	33	39	8959
Animals with ocular affections		86 (1.42)	36 (2.18)	8 (1.12)	16 (7.84)	6 (2.26)	1 (3.03)	1 (2.56)	154 (1.72)

Figures in parentheses indicate percentage

distribution of cases between sexes while as in feline; only one tom was presented with the ocular affection. Contrary to our findings, Tamilmahan *et al*. (2013) recorded higher occurrence of ocular affections in male animals (60.32%) than female animals (39.29%). However, Pratap *et al*. (2005) did not find any effect of gender on the occurrence of ocular affections in animals. Higher annual hospital occurrence of ocular affections among animals has been reported by other researchers which vary from 2.72 to 5.47 % (Kalaiselvan *et al*. 2009) and 4.38 to 18.02% (Tamilmahan *et al*., 2013). The true incidence of ophthalmic disease in cattle is not accurately known, as slaughterhouse surveys of the incidence of ocular lesions varied from 14.6% (Spradbrow *et al*., 1985) to 100% (Ammann, 1968) depending on the age and productivity of the animals examined. Chakrabarti *et al*. (2014) in one study, conducted on bovine eye diseases, recorded a high incidence 15.22% of ocular affection.

Majority of the ocular affections were reported during the summer season (31.2%), followed in decreasing order by spring (29.2%), winter (21.4%) and autumn (18.2%) season. The findings of the study are in total consonance with those of Osmani *et al.* (2000) and Pratap *et al*. (2005) who also reported most of the ocular affections during dry summer months (40.5%) followed by rainy season (33.5%) and winter (25.9%). A lot of dust, pollen grains and other small pollutant particles in the external environment, during dry summer months could be predisposing factors for high ocular affections in animals. Chakrabarti *et al.* (2014) also reported lowest incidences during winter months (3.46%). On contrary, Kalaiselvan *et al.* (2009) observed high incidence of ocular affection during winter season.

Female animals among bovines (68.6%) and caprines (75.0%) were observed to be more affected with ocular affection than male animals. Similar to our observations, Kalaiselvan *et al*. (2009) and Tamilmahan *et al*. (2013) also reported higher incidence of ocular affections in female cattle. This could be attributed to the fact that mainly female bovines are reared for milching purpose. Bulls have been long replaced by mechanized agriculture and artificial insemination technology so hardly any bull can be found in any community.

Of 154 ocular affections, condition was bilateral in 60 cases and unilateral in 94 cases (Table 3). Both the eyes were found equally affected with ocular diseases during the study, thus substantiating the findings of Pratap *et al*. (2005) who also reported similar involvement of both the eyes. Contrarily, Tamilmahan *et al*. 2013 observed higher incidence in ocular affections left eye (42.89%) than right eye (37.79%). Among the unilateral ocular affections, right and left eyes were affected in equal proportion (30.52%). Interestingly left eye was not found affected in canine, feline or avian.

A total of twenty eight different ocular affections were recorded in various species of animals during the

Table 2
Season wise distribution of ocular affections in different animals

Season	Bovine	Ovine	Caprine	Equine	Canine	Feline	Avian	Total
Spring (Mar., Apr., Aug.)	22	17	0	3	2	0	1	45
Summer (May –July)	35	4	2	4	2	1	0	48
Autumn (Sep. –Nov.)	17	3	3	4	1	0	0	28
Winter (Dec. - Feb.)	12	12	3	5	1	0	0	33
Total	86	36	8	16	6	1	1	154
Percentage	55.84	23.38	5.19	10.39	3.90	0.65	0.65	

Table 3
Age, side and sex wise distribution of ocular affections in different animals

Species	Age (Years)					Eye			Sex	
	Newborn	<1	1-2	2-5	>5	Right	Left	Both	Male	Female
Bovine n=86	16	27	16	19	8	26	31	29	27	59
Ovine n=36	7	19	4	5	1	9	11	16	19	17
Caprine n=8	2	2	1	2	2	1	1	6	2	6
Equine n=16	0	1	0	7	8	7	4	5	10	6
Canine n=6	0	1	0	4	1	2	0	4	3	3
Feline n=1	0	0	0	0	1	1	0	0	1	0
Avian n=1	0	1	0	0	0	1	0	0	0	1
Total n=154	25	51	21	37	20	47	47	60	62	92

study period (Table 4). Corneal opacity was the most common ocular affection recorded in 22.73% of the animals followed by corneal ulcer (15.58%), eye ball puncture (10.4%). Ocular dermoid, malignant catarrhal fever, congenital blindness, proptosis, chemosis, corneal oedema, hyphema and keratitis were noticed only in bovines. Circling with blindness and decreased vision were reported only in ovines. Eye worm, entropion, eye lid laceration, phthisis bulbi and squamous cell carcinoma were documented only in equines. While as glaucoma was reported only in canines. Of 154 ocular affections recorded during the retrospective study, condition was bilateral in 60 cases and unilateral in 94 cases. This is in agreement with Chakrabarti (1996). Bilateral affections are usually associated with some systemic disease like MCF in bovines, malnutrition like hypovitaminosis- A or poor management. Ocular form of hypovitaminosis A was recorded in 9.1% of the animals. Primarily vitamin deficiency causes a variety of clinical signs including blindness, convulsions, ataxia, stillbirth, ill thrift, diarrhoea and poor coat quality (Van der Lugt and Prozesky, 1989).

Table 4
Different ocular affections recorded among various species of animals during 2010-2014

S.No.	Disease	Bovine	Ovine	Caprine	Equine	Canine	Feline	Avian	Total	Rank
1	Amurosis	3	2	0	1	0	0	0	6	VII
2	Cataract	0	0	0	1	2	0	0	3	IX
3	Chemosis	1	0	0	0	0	0	0	1	XI
4	Circling/blindness	0	1	0	0	0	0	0	1	XI
5	Congenital Blindness	2	0	0	0	0	0	0	2	X
6	Conjuctivitis	5	0	0	0	0	0	1	6	VII
7	Corneal Oedema	1	0	0	0	0	0	0	1	XI
8	Corneal Opacity	18	10	4	2	1	0	0	35	I
9	Corneal Ulcer	14	7	1	2	0	0	0	24	II
10	Decreased Vision	0	1	0	0	0	0	0	1	XI
11	Dermoid	8	0	0	0	0	0	0	8	VI
12	Entropion	0	0	0	1	0	0	0	1	XI
13	Exophthalmos	1	1	0	0	0	0	0	2	X
14	Eye lid laceration	0	0	0	1	0	0	0	1	XI
15	Eye Worms	0	0	0	2	0	0	0	2	X
16	Ocular Foreign body	0	2	0	0	0	0	0	2	X
17	Glaucoma	0	0	0	0	1	0	0	1	XI
18	Hyphema	1	0	0	0	0	0	0	1	XI
19	Ocular form of Hypovitaminosis A	7	5	2	0	0	0	0	14	IV
20	Keratitis	1	0	0	0	0	0	0	1	XI
21	Lacrimation	7	2	1	0	1	0	0	11	V
22	Ocular form of MCF	5	0	0	0	0	0	0	5	VIII
23	Nasolacrimal Duct blockade	1	1	0	0	0	0	0	2	X
24	Phthisis Bulbi	0	0	0	1	0	0	0	1	XI
25	Proptosis	2	0	0	0	0	0	0	2	X
26	Globe Puncture	7	3	0	4	1	1	0	16	III
27	Squammous Cell Carcinoma	0	0	0	1	0	0	0	1	XI
28	Staphyloma	2	1	0	0	0	0	0	3	IX
	Total	86	36	8	16	6	1	1	154	

Corneal opacity ranked number one ocular affection during present retrospective study. Chakrabarti (1996) also observed highest incidences of corneal opacity than any other eye ailment in his study. Corneal opacity is quick to ensure following any kind of external trauma, foreign bodies, violence and parasites (Pratap *et al*., 2003). Poor handling of the ocular cases other than those of cornea may also lead to corneal opacity for considerable period of time (Riss, 2008). Corneal ulcer was ranked II ocular affection with an overall prevalence of 15.6%. Arafat *et al*. (2016) also observed corneal ulceration to be the most common ocular affection (22.64%) in farm and companion animals. On contrary, Kalaiselvan *et al*. (2009) reported corneal ulcer in only 3.61% of animals suffering from ocular affection. Globe puncture ranked III, occurring in 10.4% of animals with ocular affections during this retrospective study. Globe puncture usually occurs because of trauma despite of the fact that eye is enclosed within the orbit. Prominence of eyeball especially in bovines, make it vulnerable to any kind of blunt trauma besides penetrating injury. Aggression between animals or knocks and bumps during handling and transit can damage the eye (Alexander, 2010). A high (33.73%) hospital occurrence of traumatic eye injuries has been reported by Kalaiselvan *et al*. (2009) while as Pratap *et al*. (2005) reported similar percentage (12%) of traumatic ocular affections.

Dermoids have been reported frequently in cattle calves (Parrah *et al*., 2013). In a recent study, Sarangom *et al*. (2016) reported incidence of ocular dermoids to be 0.942% among cattle calves and 0.345% among total cattle based on hospital population from India. During this retrospective study, dermoid was seen in 5.2% cases exclusively in bovines.

Amaurosis, the partial or total blindness without visible change in the eye, typically due to disease of the optic nerve, spinal cord, or brain was reported in 3.9% cases of the study. Similar to our findings, Tamilmahan *et al*. (2013) reported amaurosis in 4.50% of the animals.

Conjunctivitis was seen in 3.9% of the cases. A high incidence of conjunctivitis 9.03% and 10.1% was reported respectively by Kalaiselvan *et al*. (2009) and Pratap *et al*. (2005). In another study conducted on horses, conjunctivitis (51.27%) constituted major ocular affection (Al-Khafaji *et al*., 1996).

No case of ocular form of malignant catarrhal fever has been reported, in any study conducted on the hospital occurrence of eye affections in India (Pratap *et al*., 2005; Kalaiselvan *et al*., 2009; Tamilmahan *et al*., 2013). However during this retrospective study ocular form of malignant catarrhal fever was recorded in 3.2% of the animals. Cataract was seen in 1.9% of the animals with ocular affections of this study. These results are in consonance with those of Kaslaiselvan *et al*. (2009) who also reported occurrence of cataract in 1.50% of animals. However Chakrabarti *et al*. (2014) recorded cataract in only 0.81% of the cases. Staphyloma, recorded in 1.9% of the cases during the retrospective study is greater as compared to figures (0.81%) recorded by the Chakrabarti *et al*. (2014).

Congenital blindness was observed in 1.3% of cases. The cause of blindness could not be known. Bovine viral diarrhea has been incriminated as one of the cause of congenital blindness in cattle (Laureyns, 2014). Exophthalmos, abnormal bulging out of the globe is usually caused by some space occupying lesion like tumor, cyst or abscess. Progressive acquired exophthalmos ultimately leads to exposure keratitis and proptosis (Riss, 2008). In sheep, parasitic cyst of *Coenurus cerebralis* has been implicated in causing exophthalmos (Haridy *et al*., 2014). During this study exophthalmos, was recorded in two cases constituting 1.3% of all the cases.

Eye worms were reportedly only in equines with a hospital occurrence of 1.3%. A high incidence of ocular setariasis (9.43%) has been reported by Arafat *et al*. (2016). There are many other reports available regarding the surgical management of eye worm in equines (Parrah *et al*., 2004). Corneal foreign bodies are found frequently in food animals with painful, irritated eyes and usually foodstuffs, although other plant material, hairs (eyelash or tail), metallic, glass, shot, or other substances have been found (Irby, 2017). There have been reports of corneal foreign body in literature but no study on their incidences in ruminant could be located. During this study ocular foreign bodies were observed in two (1.3%) animals.

Inflammatory debris, foreign bodies, or masses pressing on the duct are the common cause of obstruction of the nasolacrimal sac and proximal nasolacrimal duct. It results in epiphora and secondary conjunctivitis refractory to treatment. Nasolacrimal duct blockade has been reported by Dar *et al*. (2016). During this study nasolacrimal duct blockade was observed in two animals. Proptosis is commonly caused by trauma which exposes the eye to exposure keratitis or may cause irreversible damage to the eye and intra-ocular contents. This affection in the retrospective study was noticed only in 2 bovines. In a study conducted on enucleation proptosis of globe leading to enucleation of the eye was recorded in 4(8%) cases (Schulz and Anderson, 2010). Entropion is the inward rolling of the eyelid. It is commonly encountered in lambs but during retrospective study, a single case of entropion was recorded in equine. In consonance with our findings, Kalaiselvan *et al*. (2009) noted (0.60%) incidence of entropion and ectropion in animals.

Eyelid laceration, Phthisis bulbi, and squamous cell carcinoma were recorded in one equine each (0.65%). Phthisis bulbi is gradual shrinkage of the globe due to chronic inflammation and hypotony. Blunt or sharp

traumatic injury is common in horses. Upper eyelid is injured most commonly and it has more critical protective function (Gerrard, 2009).Ocular squamous cell carcinoma (OSCC) is a malignant tumour of the eye and ocular adnexa (Dubielzig, 2002) and has been reported in horses (Lassaline *et al*., 2014) and is the most common ocular tumor in equine (Lavach and Severin, 1977).

Circling with blindness and decreased vision were documented only in ovines. These may be attributed to various diseases, some being coenurosis, listeriosis, polioencephalomalacia (Adane *et al*., 2015) Eye affections cause significant discomfort to the animals and should be treated at an early stages, both for the animal welfare as well as for economic purposes. Standard ophthalmic examination therefore, should form a regular part of the health checkup in animals.

REFERENCES

Adane, P, Kumsa B, Hiko A and Afera B. (2015). Prevalence of *Coenurus cerebralis* in Small Ruminants Slaughtered at Hashim Export Abattoir, DebreZeit, Central Oromia. *Eur. J. Appl. Sci.* **7(2)**: 56-63.

Andrade, S.F, Goncahes, I. N. and Junior, M.M.A. (2005). Evaluation of Schimer tear test with the use of melting filter paper prudente. *Clin. Vet.* **10**: 34-36.

Alexander, D. (2010). Infectious bovine keratoconjunctivitis: A Review of cases in clinical practice. *Vet. Clin. North Am. Food Anim. Pract.* **26 (3)**: 487-503.

Al-Khafaji, N.J., Hadad, J.J. and Al-Saad, K.M. (1996). Common eye affections in horses in Mosul, Iraq. *Iraqi J. Vet. Sci.* **9**: 53-60.

Ammann, K. (1968). Eye diseases in ruminants. Copenhagen: Medical Book Co.

Arafat, I., Gupta, A.K., Bhadwal, M.S. and Soodan, J.S. (2016). Occurrence of ocular affections in farm and companion animals. *Intas Polivet.* **17 (2):** 336-338.

Chakrabarti, A., Kumar, P., Chandran, P.C., Deyy, A. and Dayal, S. (2014). Prevalence of eye diseases of cattle in Bihar, India. *J. Anim. Health Prod.* **2 (2)**: 25-27.

Chakrabarti, A. (1996). A survey of eye diseases of cattle in Tripura state (India). *Sri Lanka Vet. J.* **41(2)**:112-114.

Dar, S.H., Fazili, M.R., Dar, K.H., Nissar, S. and Mir, A.Q. (2016). Surgical management of ocular dermoid cyst - A clinical study in eight calves. *Intas Polivet.* **17(2)**: 473-475.

Dubielzig, R.R. (2002). Tumors of the eye. In: Tumors in Domestic Animals. 4th edn., Meuten D.J. (edt.) Wiley-Blackwell, Ames, Iowa pp. 739-754.

Gerrard, M.P. (2009). Acute care of soft tissue injuries involving the eyelids ears and face. In: Current therapy in Equine Medicine 6th edn., Robinson, N.E. and Sprayberry, K.A. (eds.). Wiley-Blackwell.pp. 664

Haridy, M., Sadan, M., Omar, M., Sakai, H. and Yanai T.(2014). *Coenurus cerebralis* cyst in the orbit of a ewe. *Onderstepoort J. Vet. Res.* **81**(1).doi: 10.4102/ojvr.v81i1.707

Irby, N.L. (2017). Surgery of the Eyes. In: Farm animal surgery 2nd edn. Fubini, S.L. and Ducharme, N.G. (eds.). Saunders, Elsevier. pp.145-173.

Kalaiselvan, A., Pawde, A. M., Kinjavdekar, P., Amarpal, Aithal, H.P. and Gupta O.P. (2009). Occurrence of ocular affections in domestic animals. *Indian J. Anim. Sci.* **79(10)**: 1020-1021.

Lassaline, M., Cranford, T. L., Latimer, C.A. and Bellone, R.R. (2014). Limbal squamouscell carcinoma in Haflinger horses. *Vet. Ophthalmol.* **18(5)**:404-408.

Laureyns, J. (2014). Challenges in the control of bovine viral diarrhoea virus- Implications for a Belgian eradication programme http://www.rohh.ugent.be/ v3/research/phd/2014/ Laureyns_J.pdf.

Lavach, J.D. and Severin, G. A. (1977). Neoplasia of the equine eye, adnexa, and orbit: a review of 68 cases. *J. American Vet. Med. Assoc.* **170**: 202-203.

Osmani, T., Hassain, M.A., Rahman, M.M. and Alam, M.R. (2000). Corneal opacity in cattle. *Bangladesh Vet. J.* **17**: 42-45.

Parrah, J. D., Moulvi, B. A, Athar, H., Mir, M. S., Mehraj u din, Gazi, M. and Handoo, N. (2013). A retrospective study on the surgical affections of young calves. *J. Advan. Vet. Res.* **3**: 77-82.

Parrah, J. D., Buchoo, B. A. and Moulvi, B. A. (2004). Ocular filarisis in equines: A study of 9 cases. *Centaur* **20**: 70-71.

Pratap, K., Amarpal, Aithal, H. P., Hooque, M., Kinjavdekar, P. and Pawde, A. M. (2005). Survey of eye disorders in domestic animals. *Indian J. Anim. Sci.* **75 (1)**: 33-34.

Pratap, K., Amarpal., Aithal, H.P., Hoque, M. and Kinjavdekar, P. (2003). Corneal opacity and its therapeutic management in domestic animals. *J. Remount Vet. Corps*. 127-139.

Reichmann, P. (2008). Occurrence of ophthalmologic diseases in horses used for urban cart hauling in Londrina, PR, Brazil. *Ciencia Rural* **38**: 2225-2528.

Riss, R. (2008). Ocular diseases. In: Rebhun's diseases of dairy cattle. 2nd edn., Divers, T.J. and Peek, S.F. (edts.). Saunder Elsevier Missouri. pp. 561- 589.

Sarangom, S. B., Singh, K., Gopinathan, A., Sangeetha, P., Kallianpur, N., Shivaraju, S., Praveen, K., Sharma, D. and Singh, P. (2016). Ocular dermoids in crossbred Indian cattle: A comparative evaluation of four year (2012-2015) study results and literature reviews. *Adv. Anim. Vet. Sci.* **4(1)**: 46-52.

Schulz, K.L. and Anderson D.E. (2010). Bovine enucleation: A retrospective study of 53 cases (1998–2006). *Canadian Vet. J.* **51 (6)**: 611-614.

Spradbrow, P. B., Samuel, J. L. and Kelly, W. R. (1985). Ocular lesions in slaughtered cattle in Queensland. *Australian Vet. J.* **62**: 203-205.

Tamilmahan, P., Zama, M. M. S., Pathak, R., Muneeswaran, N. S. and Karthik, K. (2013). A retrospective study of ocular occurrence in domestic animals: 799 cases. *Vet. World* **6 (5)**: 274-276.

Van Derlugt, J. J. and Prozesky, L. (1989). The pathology of blindness in newborn calves caused by hypovitaminosis A. *Onderstepoort J. Vet.Res.* **56**: 99-109.