

**ETIOPATHOGENESIS, DIAGNOSIS AND MANAGEMENT OF
EXTRA OCULAR DISEASES IN RUMINANTS**

By

CHAKALI ERESHA

B.V.Sc. & A.H

TVM/2015 - 33

THESIS SUBMITTED TO THE
SRI VENKATESWARA VETERINARY UNIVERSITY
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE AWARD OF THE DEGREE OF

**MASTER OF VETERINARY SCIENCE
(VETERINARY SURGERY AND RADIOLOGY)**

IN THE FACULTY OF VETERINARY SCIENCE



**DEPARTMENT OF VETERINARY SURGERY AND RADIOLOGY
COLLEGE OF VETERINARY SCIENCE, TIRUPATI
SRI VENKATESWARA VETERINARY UNIVERSITY
TIRUPATI - 517 502, ANDHRA PRADESH
DECEMBER 2017**

CERTIFICATE

Dr. C.ERESHA satisfactorily prosecuted the course of research and that the thesis entitled **“ETIOPATHOGENESIS, DIAGNOSIS AND MANAGEMENT OF EXTRA OCULAR DISEASES IN RUMINANTS”** submitted is the result of original research work and is of sufficiently high standard to warrant its presentation to the examination. I also certify that the thesis or part there of has not been previously submitted by him for a degree of any University.

Date :

Place : Tirupati

(Dr. K.RAMBABU)

Major Advisor

Assistant Professor & Head

Dept. of Veterinary Surgery & Radiology

College of Veterinary Science

Proddatur - 516 360 (A.P)

CERTIFICATE

This is to certify that the thesis entitled “**ETIOPATHOGENESIS, DIAGNOSIS AND MANAGEMENT OF EXTRA OCULAR DISEASES IN RUMINANTS**” submitted in partial fulfillment of the requirements for the degree of **MASTER OF VETERINARY SCIENCE** of the Sri Venkateswara Veterinary University, Tirupati is a record of the bonafide research work carried out by **Dr. C.ERESHA, ID.NO.TVM/2015-33** under our guidance and supervision. The subject of the thesis has been approved by the Student’s Advisory Committee.

No part of the thesis has been submitted for any other degree or diploma. The published part has been fully acknowledged. All the assistance and help received during the course of investigation have been duly acknowledged by the author of the thesis.

(Dr. K.RAMBABU)
Chairman of the Advisory Committee

Thesis approved by the Student’s Advisory Committee

CHAIRMAN: **Dr. K .RAMBABU** _____

Assistant Professor & Head
Dept. of Veterinary Surgery & Radiology
College of Veterinary Science
Proddatur - 516 360 (A.P)

MEMBER : **Dr. R.V.SURESH KUMAR** _____

Professor & University Head
Dept. of Veterinary Surgery & Radiology
College of Veterinary Science
Tirupati - 517 502 (A.P)

MEMBER : **Dr.P.JAGAPATHI RAMAYYA** _____

Professor & University Head
Dept. of Veterinary Anatomy
College of Veterinary Science
Tirupati - 517 502 (A.P)

DECLARATION

I, **Dr.C.ERESHA** hereby declare that the thesis entitled **“ETIOPATHOGENESIS, DIAGNOSIS AND MANAGEMENT OF EXTRA OCULAR DISEASES IN RUMINANTS”** submitted to Sri Venkateswara Veterinary University, Tirupati for the degree of **MASTER OF VETERINARY SCIENCE** is the result of original research work done by me. I also declare that the materials contained in this thesis have not been published earlier.

Date:

Place: Tirupati

(C.ERESHA)

ACKNOWLEDGEMENTS

I express my gratitude and heartfelt thanks to my guide, and chairman of the Advisory committee, **Dr. K.Rambabu, Assistant Professor & Head, Department of Veterinary Surgery and Radiology**, College of Veterinary Science, Proddatur for his involvement with originality for his valuable suggestions for this research and excellent guidance. This work would not have been possible without his guidance, generous moral support and encouragement. I am grateful in every possible way and hope to keep up to his expectations.

I feel it is my pleasure in extending thanks to **Dr. R.V.Suresh Kumar, Professor & University Head, Department of Veterinary Surgery & Radiology**, College of Veterinary Science, Tirupati, member of Advisory committee for his valuable advice and compendious help during the pursue of research work .

I owe my heartfelt thanks to **Dr. P.Jagapathi Ramayya, Professor & University Head, Department of Veterinary Anatomy**, College of Veterinary Science, Tirupati member of advisory committee for their constant help and encouragement during my research work.

I express my heartfelt thanks to **Dr. P.Veena, Professor, Department of Veterinary Surgery & Radiology**, and **Dr. N.Dhanalakshmi, Professor ,Department of Veterinary Clinical Complex**, College of Veterinary Science, Tirupati, for her help during my research work.

I express my heartfelt thanks to **Dr. S.Bharathi, Professor & Head, Department of Veterinary Clinical Complex**, College of Veterinary Science, Proddatur, for her help in my research work.

No words to express my gratitude to *Dr.G.Vani, Dr.Ch.Mallikarjunarao, Dr.B.Prakash*, Assistant Professors, College of Veterinary Science, Tirupati, for their cooperation during my research work.

I acknowledge my sincere thanks to *Dr.J.Devarathnam, Dr.N.Sumiran, Dr.R.Mahesh, Dr.G.Kamalakar, Dr.L.Sivasudarshan*, Assistant Professors, College of Veterinary Science, Proddatur, who have been a supportive during my study.

I gladly record my bountiful thanks for all the encouragement bestowed on me by my seniors and classmates *Dr.M.Saibaba, Dr.P.Harish, Dr.P.Sudharshan Reddy, Dr.M.Phaneendra, Dr.M.Sreehari, Dr.K.Chandrasekar, Dr.P.Krishnaveni, Dr.A.Thennavan, Dr.K.Ramohan Rao, Dr.S.Alekhya, Dr.M.Moulalibasha, Dr.S.Ragavendrasharma, Dr.Y.Mahendra, Dr.B.Prakash, Dr.K.Suvarna*.

I am very much thankful to juniors M.V.Sc 1st year students *Dr.T.Rajanna, Dr.M.Swamibabu, Dr.G.Padmavathi and Dr.B.Goutham* for their cooperation during my research work.

On my personal note, it gives me immense pleasure to express my sincere gratitude and heartfelt respect to the blessings of my parents *Shri. C.Venkaatesh and Smt. C.Lakshmi* who have always inspired me. Their assiduous efforts in shaping up of my life, everlasting love are the main reasons for where I stand now. I reserve special thanks to my brother *C.Suresh* and my sister *C.Venkatalakshmi* who have always been with me boosting my morale in all aspects of my life.

I express my gratitude to *Sri M.Viswanatha Reddy*, Radiographer for his unlimited help in my work.

I am happy to express my sincere gratitude to *K.Ramanaiah, Y.Kannaiah, B.Govindaiah, G.Nirmalamma and B.Rangaiah* staff of Department of Veterinary Surgery and Radiology, College of Veterinary Science, Tirupati, and *M.Obulesu, B.Michel, D.Srinath, B.Ramana* staff of Department of Veterinary Surgery and Radiology, College of Veterinary Science, Proddatur, for their co-operation and help rendered throughout the research period

This is the ripe and right time to express my amiability to my Friends and my beloved *Teachers* to build my life from childhood, for their constant encouragement and cooperation during my studies.

I place on record my apology and sincere thankfulness to the unmentioned personalities, who have played a role in this study and preparation of this manuscript.

I am greatly beholden beyond words to express my heartfelt thanks and gratitude to *Dr. T.S.Chandra Sekhara Rao*, Dean of Veterinary Science, Sri Venkateswara Veterinary Science, Tirupati, without whose help I could not have completed my M.V.Sc successfully.

I greatly acknowledge to *Sri Venkateswara Veterinary University, Tirupati*, for providing all facilities and help during my masters programme.

Finally I fill my heart with praise, bow my heads with reverence and fold my hands with thanks giving towards my *Lord Venkateshwara* for his abundant grace without which I could not have accomplished my studies.

Place: Tirupati

Date:

(C.ERESHA)

LIST OF CONTENTS

Chapter No.	Title	Page No.
I	INTRODUCTION	1-3
II	REVIEW OF LITERATURE	4-17
	2.1 EYELIDS	4
	2.1.1 EYELID LACERATION	4
	2.1.2 ENTROPION	5
	2.2 CONJUNCTIVA	6
	2.2.1 CONJUNCTIVITIS	6
	2.2.2 INFECTIOUS BOVINE KERATOCONJUNCTIVITIS	6
	2.2.3 DERMOID	7
	2.2.4 CYST	9
	2.3 THIRD EYELID	9
	2.4 CORNEA & SCLERA	10
	2.4.1 CORNEAL LACERATION	10
	2.4.2 CORNEAL FOREIGN BODY	11
	2.4.3 CORNEAL OPACITY	11
	2.4.4 CORNEAL ULCER	12
	2.5 EXTRA OCULAR NEOPLASMS	12
	2.6 INCIDENCE OF EXTRA OCULAR AFFECTIONS	14
	2.7 EXTRA OCULAR EYE WORM	16
III	MATERIALS AND METHODS	18-32
	3.1 INCIDENCE	18
	3.2 SELECTION OF ANIMALS AND DESIGN OF THE STUDY	18
	3.2.1 Inclusion criteria	19
	3.2.2 Exclusion criteria	19

	3.3 INSTRUMENTS AND EQUIPMENT FOR DIAGNOSIS	19
	3.3.1 Direct Ophthalmoscope	19
	3.3.2 Indirect Ophthalmoscope with +20D Volk Lens	19
	3.3.3 Pen torch light	19
	3.3.4 Schiotz Tonometer	20
	3.4 OPHTHALMIC INSTRUMENTS FOR SURGERY	20
	3.5 ANAESTHESIA	21
	3.6 PATIENT POSITIONING	21
	3.7 PREPARATION OF SURGICAL SITE	21
	3.8 SURGICAL TECHNIQUE	21
	3.8.1 Enucleation	21
	3.9 POSTOPERATIVE MANAGEMENT	22
	3.9.1 Medications	22
	3.9.1.1 Tear substitutes	22
	3.9.1.2 Topical antibiotics	22
	3.9.1.3 Systemic antibiotics	22
	3.9.2 Suture removal	23
	3.10 PARAMETERS STUDIED	23
	3.11 STATISTICAL ANALYSIS	24
IV	RESULTS	33-76
	4.1 INCIDENCE	33
	4.1.1 Species	33
	4.1.2 Gender	33
	4.1.3 Anatomical location	36
	4.1.3.1 Eyelid affections	36
	4.1.3.2 Conjunctiva affections	36

	4.1.3.3 Third eyelid affections	36
	4.1.3.4 Cornea & Sclera affections	37
	4.1.4 Age	37
	4.1.5 Eyes affected	37
	4.2 SELECTION OF CASES FOR STUDY	58
	4.3 PARAMETERS STUDIED	58
	4.3.1 General ophthalmic examination	58
	4.3.2 Schirmer Tear Test (STT)	58
	4.3.3 Culture and ABST	58
	4.3.4 Fluorescein Dye Test (FDT)	58
	4.4 EXTRA OCULAR AFFECTIONS AND THEIR TREATMENT	58
	4.4.1 Eyelid affections	58
	4.4.2 Conjunctiva affections	59
	4.4.3 Third eyelid affections	59
	4.4.4 Cornea & Sclera affections	59
	4.5 OUTCOME OF MEDICAL AND SURGICAL MANAGEMENT	64
	4.5.1 Abscess	64
	4.5.1.1 Subconjunctival abscess in a Cattle Calf (OS)	64
	4.5.1.2 Subconjunctival abscess in a Buffalo calf (OS)	64
	4.5.1.3 Subconjunctival abscess in a Buffalo calf (OS)	64
	4.5.1.4 Third eyelid abscess in a Buffalo calf (OS)	64
	4.5.1.5 Third eyelid abscess in a Goat (OS)	64
	4.5.1.6 Complicated Subconjunctival abscess in a Buffalo calf (OD)	64
	4.5.2 Haematoma	64
	4.5.2.1 Subconjunctival haematoma in a Cow (OS)	64
	4.5.2.2 Subconjunctival haematoma in a Buffalo calf (OD)	65

	4.5.3 Chemosis	65
	4.5.3.1 Chemosis in a Cow (OS)	65
	4.5.3.2 Chemosis in a Buffalo (OD)	65
	4.5.4 Tumours	65
	4.5.4.1 Subconjunctival Tumour in a Cow (OS)	65
	4.5.4.2 Third eyelid Tumour in a Cow (OD)	65
	4.5.4.3 Third eyelid Tumour in a Cow (OS)	65
	4.5.4.4 Third eyelid Tumour in a buffalo calf (OD)	66
	4.5.5 Acute Conjunctivitis (OD)	66
	4.5.6 Enucleation	66
	4.5.6.1 Enucleation in a Buffalo calf (OS):	66
	4.5.6.2 Enucleation in a cow (OS):	66
	4.5.7 Coenurus cyst	67
V	DISCUSSION	77-84
VI	SUMMARY	85-87
VII	LITERATURE CITED	88-96

LIST OF FIGURES

Figure No.	TITLE	Page No.
1	Species Wise Incidence of Extra Ocular Affections	34
2	Gender Wise Incidence of Extra Ocular Affections	34
3	Anatomical Location wise Incidence of Extra Ocular Affections	38
4	Age Wise Incidence of Extra Ocular Affections	38
5	Incidence of Eyes Affected	39

LIST OF TABLES

Table No.	TITLE	Page No.
1	Species Wise Incidence of Extra Ocular Affections In Ruminants	35
2	Gender Wise Incidence of Extra Ocular Affections In Ruminants	35
3	Anatomical Location wise Incidence of Extra Ocular Affections In Ruminants	35
4	Age Wise Incidence of Extra Ocular Affections In Ruminants	43
5	Incidences of Eyes Affected In Ruminants	43
6	Different Ocular Affections Based on Anatomical Location In Ruminants	44
7	Incidence of Extra Ocular Lesions In Ruminants	45
8	Eyelid Affections and Treatment In Ruminants	60
9	Conjunctiva Affections and Treatment In Ruminants	61
10	Third Eyelid Affections and Treatment In Ruminants	62
11	Cornea & Sclera Affections and Treatment In Ruminants	63

LIST OF PLATES

Plate No.	TITLE	Page No.
1	Pen torch light	25
2	Direct Ophthalmoscope	25
3	Indirect Ophthalmoscope	25
4	Schiotz tonometer	25
5	Schirmer Tear Test Strip	26
6	Fluorescein Dye Test Strip	26
7	Rose Bengal Test Strip	26
8	Xylazine Hcl	26
9	Lignocaine Hcl	27
10	Proparacaine Hcl eye drops	27
11	Surgical eye drape	27
12	Povidone iodine solution	27
13	Extra ocular surgical instruments set	28
14	Polyglycolic acid (No.1)	28
15	Chromic Catgut (No.1)	28
16	Silk (No.2)	29
17	Hydroxypropyl methylecellulose, borax, boric acid, sodium chloride & potassium chloride eye drops	29
18	Hydroxypropyl methylecellulose 2% eye gel	29
19	Tobramycin eyedrops	29
20	Moxifloxacin with dexamethasone eye drops	30
21	Chloramphenicol with hydrocortisone acetate eye ointment	30
22	Direct ophthalmoscopic Examination in a Calf	30
23	Schirmer Tear Test performing in a Cow	30
24	Schirmer Tear Test performing in a Buffalo	31

Plate No.	TITLE	Page No.
25	Fluorescein dye test in a Buffalo	31
26	Direct ophthalmoscopic Examination in a Sheep	31
27	Schirmer tear test in sheep	31
28	Fluorescein dye test in sheep	32
29	Direct ophthalmoscopic Examination in a Goat	32
30	Measuring Intra Ocular Pressure with Schiötz tonometry in a goat	32
31	Blepharitis in a Bullock (OD)	40
32	Ocular papilloma in a Cow (OD)	40
33	Eyelid tumour in a Cow (OS)	40
34	Swelling of lower eyelid in a Cow (OS)	40
35	Entropion in a Cow (OD)	40
36	Periocular dermatitis in a Cow (OD)	40
37	Ocular papilloma in a Bullock (OD)	41
38	Blepharitis in a Cow (OS)	41
39	Upper eyelid ocular myiasis in a Cow (OD)	41
40	Ectropion in a Buffalo (OD)	41
41	Upper eyelid laceration in Buffalo (OS)	41
42	Upper eyelid swelling in a Buffalo calf (OD)	41
43	Lower eyelid laceration in a Buffalo (OD)	42
44	Shrinkage of eyeball in a Buffalo calf (OS)	42
45	Chemosis in a Bullock (OS)	46
46	Acute conjunctivitis in a Cow (OS)	46
47	Conjunctival tumour in a Cow (OS)	46
48	Conjunctival laceration in a Bullock (OS)	46
49	Conjunctival haematoma in a Cow (OS)	46
50	Subconjunctival abscess in Calf (OS)	46

Plate No.	TITLE	Page No.
51	Chemosis in a Cow(OS)	47
52	Epiphora in a Cow (OS)	47
53	Conjunctival ocular myiasis in a Cow (OD)	47
54	Conjunctival tumour in a Cow (OD)	47
55	Subconjunctival tumour in a Cow (OS)	47
56	Acute conjunctivitis in a Bullock (OD)	47
57	Subconjunctival abscess in a Buffalo calf (OS)	48
58	Subconjunctival abscess in a Buffalo calf (OS)	48
59	Chemosis in a Buffalo (OD)	48
60	Purulent Conjuncticitis in a Buffalo calf (OS)	48
61	Pterygium in a Buffalo (OS)	48
62	Subconjunctival abscess in a Buffalo calf (OS)	48
63	Purulent conjunctivitis in a Buffalo calf (OD)	49
64	Chemosis in a Buffalo (OS)	49
65	Pallor of Conjunctiva in a Buffalo (OD)	49
66	Bilateral Chemosis in a Buffalo (OU)	49
67	Subconjunctival abscess in Buffalo calf (OS)	49
68	Conjunctival foreign body in a Buffalo (OD)	49
69	Subconjunctival absces in a Sheep (OD)	50
70	Ocular coenurus cyst in a Goat (OD)	50
71	Third Eyelid tumour in a Cow (OD)	51
72	Third Eyelid laceration in a Cow (OD)	51
73	Massive Third eyelid tumour with destruction of eye in a Bullock (OD)	51
74	Third Eyelid melanoma in a Buffalo (OS)	51
75	Third Eyelid abscess in a Buffalo calf (OS)	51

Plate No.	TITLE	Page No.
76	Cherry eye in a Buffalo (OS)	51
77	Third Eyelid absces in a Buffalo calf (OD)	52
78	Third Eyelid absces in a Goat (OS)	52
79	Scleral limbal tumour in a Cow (OD)	53
80	Corneal opacity in a calf (OD)	53
81	Corneal tumour in a Cow (OD)	53
82	Heterochromia with episcleritis in a Cow(OS)	53
83	Pink eye (Bilateral) in a Cow (OU)	53
84	Corneal foreign body in a Cow (OS)	53
85	Corneal opacity in a Calf (OD)	54
86	Corneal dermoid in a Cow (OD)	54
87	Panophthalmitis in a Bullock (OS)	54
88	Pink eye in a Cow (OS)	54
89	Corneal dermoid in a Cow (OS)	54
90	Corneal melanoma in Cow (OD)	54
91	Pannus in a Buffalo (OS)	55
92	Corneal opacity in a Buffalo (OS)	55
93	Corneal inclusion cyst in a Buffalo calf (OS)	55
94	Massive ocular abscess with destruction of eye in a Buffalo (OS)	55
95	Corneal opacity in a Buffalo (OS)	55
96	Cornea opacity & scleral melanoma in a Buffalo (OS)	55
97	Corneal epithelial inclusion cyst in a Sheep (OS)	56
98	Pannus in a Sheep (OS)	56
99	Corneal opacity in a Sheep (OD)	56
100	Corneal ulcer in a Sheep (OD)	56

Plate No.	TITLE	Page No.
101	Corneal opacity in a Sheep (OD)	56
102	Corneal inclusion cyst in a Kid (OD)	56
103	Corneal opacity in a Kid (OS)	57
104	Corneal ulcer in a Goat (OS)	57
105 a	Subconjunctival abscess in a Calf (OS)	68
105 b	Intra operative nick incision	68
105 c	Pus discharge after incision	68
105 d	Postoperative 9 th day (OS)	68
106	Subconjunctival tumour in a Cow (OS)	68
107	Postoperative 12 th day (OS)	68
108	Chemosis in a Cow (OS)	69
109	Postoperative 6 th day (OS)	69
110	Subconjunctival haematoma in a Cow (OS)	69
111	Postoperative 7 th day (OD)	69
112	Acute conjunctivitis in a bullock (OD)	69
113	Postoperative 7 th day (OD)	69
114	Subconjunctival abscess in a Buffalo calf (OS)	70
115	Postoperative 12 th day (OS)	70
116	Chemosis in a Buffalo (OD)	70
117	Postoperative 9 th day (OD)	70
118	Subconjunctival haematoma in a Buffalo calf (OD)	70
129	Postoperative 12 th day (OD)	70
120 a	Subconjunctival abscess in Buffalo calf (OS)	71
120 b	Aspiration	71
120 c	Pus discharge after incision	71
120 d	Postoperative 2 nd day	71

Plate No.	TITLE	Page No.
120 e	Postoperative 3 rd day	71
120 f	Postoperative 8 th day (OS)	71
121 a	Complicated subconjunctival abscess in a Buffalo calf (OD)	72
121 b	Postoperative 2 nd day	72
121 c	Postoperative 3 rd day	72
121 d	Postoperative 9 th day (OD)	72
122	Conjunctival tumour in a Buffalo calf (OS)	72
123	Postoperative 15 th day (OD)	72
124 a	Third Eyelid tumour in a Cow (OD)	73
124 b	Intra operative	73
124 c	Excised mass	73
124 d	Postoperative 15 th day (OD)	73
125	Third eyelid tumour in a Cow (OS)	73
126	Postoperative 6 th day (OS)	73
127	Third Eyelid abscess in Buffalo calf (OD)	74
128	Postoperative 10 th day (OD)	74
129	Third Eyelid tumour in a Buffalo calf (OD)	74
130	Postoperative 13 th day (OD)	74
131	Third Eyelid abscess in a Goat (OS)	74
132	Postoperative 5 th day (OS)	74
133 a	Ocular tumour in a Cow (OS)	75
133 b	Intra operative	75
133 c	Excised mass	75
133 d	Permanent tarsorrhaphy with small opening for seton	75
133 e	Postoperative 25 th day (OS)	75

Plate No.	TITLE	Page No.
133 f	Histopathology of Squamous Cell Carcinoma of Eye (OS)	75
134 a	Ocular coenurus cyst in a Kid (OD)	76
134 b	Fine needle aspiration	76
134 c	Cyst observed through incision	76
134 d	Coenurus cyst	76
134 e	Applied CD ointment	76
134 f	Postoperative 21 st day (OD)	76

LIST OF SYMBOLS AND ABBREVIATIONS

OD	:	Oculus Dexter
OS	:	Oculus Sinister
OU	:	Oculi Uterque
b.wt	:	Body weight
Kg	:	Kilogram (s)
Mm	:	Millimetres
<i>et al.</i>	:	and others
i.e.	:	that is
@	:	at the rate of
%	:	Per cent
Hb	:	Haemoglobin
Fig.	:	Figure
FDT	:	Fluorescein dye test
STT	:	Schirmer tear test
RBT	:	Rose Bengal test
ABST	:	Antibody sensitivity test
IOP	:	Intra ocular pressure
W/V	:	Weight/Volume
ml	:	Millilitre
PGA	:	Polyglycolic acid

compared to males 36.73 per cent. As per anatomical location, the highest incidence of extra ocular affections was recorded in Conjunctiva i.e 43.90 per cent. The highest percentage of prevalence for eyelid (18), conjunctiva (43), third eyelid (11), cornea and scleral (26) affections were recorded in eyelid tumors (27.78 per cent), subconjunctival abscess (30.23 per cent), third eyelid tumors (27.27 percent) and corneal opacity (23.07 percent) respectively. The age group of 1 to 5 years had the highest incidence of 52.04 per cent. Highest incidence was recorded in Left eye (OS) i.e 48.98 per cent than right eye (OD).

Subconjunctival abscess, Subconjunctival haematoma, Chemosis, Acute conjunctivitis, third eyelid tumours and ocular coenurus cyst were recorded and suitable medical management and surgical procedure were done.

To diagnose extra ocular affections in ruminants detailed physical examination, ophthalmic examination were carried out and the cases were treated effectively by meticulous preparation of the patient, medical management and good surgical techniques or both appropriately for successful recovery.

Introduction

CHAPTER – I

INTRODUCTION

Vision is essential for food or fiber producing animals to safely exist in their environments and compete for food. Ocular diseases can result in considerable (up to extreme) discomfort to the patient with resultant poor weight gain, decreased milk production, behavioral problems and poor performance. Ocular disease and injury remain a common occurrence in ruminants. In many instances, medical management is sufficient for the resolution and amelioration of clinical signs. In selected cases, surgical intervention is required (Irby, 2004).

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 incidence of ocular diseases and also help to limit diagnostic possibilities and treatment options. Vision impairment in livestock caused by various ocular affections lead to greater economic loss to farmers and indirectly to society (Andrade *et al.*, 2005). Due to lack of awareness among the farmers and clinicians, the ocular problems in domestic animals are getting worsen day by day. It is not easy to diagnose them in earlier cases with the naked eyes, hence advanced diagnostic facilities are required (Slater, 2008).

In ruminants, eyes are laterally placed, especially in sheep, goats and cattle, so the binocular visual field is small and the unioocular visual field is extensive. The orbit is enclosed and the orbital floor is incomplete; there is substantial orbital fat in cattle. An upper and lower lacrimal punctum is the usual arrangement for tear drainage in farm animal species. The pupil is horizontally oval and granula iridica (corpora nigra) are located on the dorsal and ventral pupillary borders (Sheila, 2005). Caprines have prominent eyes, a panoramic field of 320°-340° and a binocular vision of 20°-60°. Injury to an eye can take place during browsing by thorns or pointed grass causing trauma or by horn injury

during fight with other herd mates. Acquired traumatic injuries of eye occur at higher incidence than the congenital diseases (Ahmed and Hassanein, 2012).

Thorough physical examination, proper preparation of patient, appropriate pre-operative management and surgical technique will assure the best results possible (Ali *et al.*, 2015).

Buffaloes are generally allowed for grazing and while passing by bushy and spiny areas, they may get their eyes traumatized. As the third eyelid in these species is functional, deep corneal injuries due to trauma usually do not ensue. Dry form of keratoconjunctivitis (keratoconjunctivitis sicca) due to inadequate tear production is comparatively rare in large animals; Morbidity is high in animals with keratoconjunctivitis of infectious origin, when compared to others. In buffaloes, allergic keratoconjunctivitis rarely occurs alone. It may be seen as a concomitant clinical sign in conditions like allergic dermatitis, poisoning etc. (Killinger, 1977).

Eye diseases of animals may occur due to unscientific management practices, particularly poor health management and also unhygienic condition prevailing in animal houses or due to environmental and nutritional factors. Eye diseases remain one of the most important problems which reduce the livestock productivity causing a great economic loss to the farmers (Chakrabarti, 1996).

The most common corneal injuries are foreign bodies and abrasions. Although superficial foreign bodies often spontaneously exit from the cornea in tear film, occasionally leaving residual abrasion, other foreign bodies remain on or within the cornea. Sometimes, a foreign body trapped under the eyelid causes one or more vertical corneal abrasions that worsen as a result of blinking (Rahman *et al.*, 2012). Foreign bodies, such as wood splinters, can be difficult to detect if not visualized directly. Corneal foreign bodies of plant origin are frequently observed in food animals (Irby, 2004). Continuous irritation in the eye leads to severe pain and discomfort. Self-inflicted damage and that caused by futile attempts by

owners to remove the foreign object or treat this extremely delicate organ exacerbate the condition (Fazili *et al.*, 2010).

Main causes for exophthalmoses include orbital abscess, orbital cellulitis, orbital cyst, eosinophilic myositis, lacrimal gland disease, foreign body granuloma, haematoma and trauma (Boydell, 1991). Ocular affections are of common occurrence in animal patients and their diagnosis and management throws up a challenge for the Veterinarians unless they are adequately equipped with instrumentation and sound knowledge to deal with these affections (Miller, 2008). There is need to create awareness among livestock owners to bring such cases in time to veterinary dispensaries/ hospitals (Devi *et al.*, 2016).

In India, ophthalmological problems in animals are being dealt by general veterinary surgeon, therefore with few exceptions the important ones remains more or less neglected. Fortunately, field surgery remains a viable option for most cases of the ocular diseases. While the surgical techniques are not new, thorough physical examination, proper preparation of the patient, appropriate preoperative management and good surgical technique will assure the best results possible (Schulz and Anderson, 2010).

In India, a lot of literature was available on ocular affections of pet animals when compared to ruminants. Keeping in view the productivity and longevity of the animals the present study has been carried out. Perusal of literature revealed scanty information regarding the extra ocular affections in ruminants. Hence, the present study was taken up with the following objectives:

1. To record the incidence of extra ocular affections in ruminants.
2. To study and classify the etiology to attribute the probable factors that are responsible for extra ocular conditions.
3. To conduct clinical and detailed ophthalmic examination on various extra ocular conditions.
4. To adopt appropriate treatment options for above pathological condition.

Review of Literature

CHAPTER – II

REVIEW OF LITERATURE

The available literature regarding the various extra ocular diseases and their treatment is reviewed under the following headings

2.1 EYELIDS

2.1.1 EYELID LACERATION

Lassaline (2003) stated that eyelid lacerations should be repaired promptly to prevent lid deformities, infections and exposure induced damage to cornea.

Irby (2004) mentioned that the wounds of eye may range from simple laceration perpendicular to the margin of eye lid to an extensive one with a flap of eye lid hanging from a pedicle or laceration with complete loss of eye lid margin in farm animals and also stated that the upper or lower eyelid injuries result from hooks, nails or other pointed objects whereas extensive wounds may occur due to crushing of the tissue by blunt objects.

Gahlot *et al.* (2007) opined that the wounds over the eye lids in animals may happen during grazing at thorny bushes or trees, sometimes by contact of barbed wires.

Jena *et al.* (2015) opined that the edema of eyelids was observed immediately after injury as they were more sensitive and vascular.

Ravikumar *et al.* (2016) repaired extensive eyelid laceration in a buffalo using three layer technique by suturing fibrous tarsal, orbicularis oculi as deep layer, subcutaneous layer as intermediate and superficial layer involving skin.

Vani *et al.* (2016) reported 19.23 percent incidence of ocular affections in cattle (10) in which a prevalence of 11.53 percent of blepharitis, 3.84 and 1.92 percent of traumatic lacerations of upper and lower eyelids respectively among all ocular affections of bovines.

2.1.2 ENTROPION

Joyce (1981) mentioned that the incidence of entropion in lambs was unilateral or bilateral. Bilateral condition was a congenital defect and affecting both sexes of lambs.

Moore and whitely (1984) reported that the administration of irritants like penicillins or oxytetracycline locally will form subcutaneous bleb in affected eyelid resulting in immediate reversal of the entropion and may cause fibrosis overtime which is thought to prevent recurrence.

Sakul and Kellam (1996) recorded that the incidence rate of entropion was 3.1% over a 9 year period, ranging from 1.1% in 1988 to 5.0% in 1989. Breed group ranking within each year was consistent, with overall mean incidence rates of 10.4%, 6.9%, 6.4%, 3.7%, and 3.3% for Suffolk, Merino-crosses, Columbia, Targhee, and Rambouillet groups, respectively.

Slatter (2003) stated that the congenital entropion which is usually seen as bilateral condition is seen in almost all species whereas acquired entropion is usually unilateral and is mainly due to ocular pain, loss of orbicular oculi muscle tone and cicatrix formation after chronic inflammation or trauma.

Donnelly *et al.* (2014) reported that the entropion was a commonly observed veterinary ophthalmic abnormality in all species including cattle, sheep, goat, dogs, cats and pigs.

Vidyasagar *et al.* (2016) opined that epiphora, blepharospasm, corneal opacity and keratitis were due to irritation by eyelashes observed in entropion. They opined Hotz-celsius technique was superior to the medical management for immediate correction and recovery.

2.2 CONJUNCTIVA

2.2.1 CONJUNCTIVITIS

Killinger (1977) stated that the keratoconjunctivitis is a common ocular discomfort in bovines referred to as inflammation of conjunctiva and cornea and mentioned that the economic losses due to this condition is by loss of weight gain which is more pronounced in bilateral infection compared to unilateral infection.

George *et al.* (1988) successfully treated bovine keratoconjunctivitis by subconjunctival administration of antimicrobials that helped in achieving higher ocular concentration at low doses.

Ravi kumar *et al.* (2016) studied 23 cases of keratoconjunctivitis in buffaloes resulted due to trauma followed by secondary bacterial infection.

2.2.2 INFECTIOUS BOVINE KERATOCONJUNCTIVITIS (IBK)

Barner (1952) mentioned that the *Moraxella bovis* was a gram negative bacterium which was usually found in corneal tissues of animals suffering from infectious keratoconjunctivitis.

Whittaker *et al.* (2003) recorded outbreaks of infectious keratoconjunctivitis and cases of phenothiazine toxicosis with symptoms of corneal opacity, corneal edema, keratitis, anterior uveitis, and many systemic diseases in goats.

Fubini and Ducharme (2004) stated that chronic conjunctivitis, epiphora, blepharospasm, ocular discomfort and corneal ulceration occur as a result of poor distribution of tear film.

Snowder *et al.* (2005) opined that the Vitamin-A will prevent recurrence of IBK by maintaining the integrity of surface of eye, mucous membrane and skin.

Angelos *et al.* (2007) opined that the infectious bovine keratoconjunctivitis was highly contagious, causing great economic impact such as reduction in growth rate of calves, reduction in milk production of dairy cows and also reduction in market values of affected cows.

Abdullah *et al.* (2013) stated that animals affected with in IBK or pink eye, infection show inflammation of tissue lining the eyelid, cornea and conjunctiva with ulceration leading to pain and temporary or permanent blindness.

Ravi Kumar *et al.* (2016) opined that the keratoconjunctivitis in majority of animals was mainly due to trauma followed by secondary bacterial infestation. This condition may also be caused by infectious agents like *Moraxella bovis* and sometimes due to allergy, less tear production which are referred to as Infectious bovine keratoconjunctivitis, allergic keratoconjunctivitis and keratoconjunctivitis sicca respectively.

Sunandhadevi *et al.* (2016) stated that the IBK will be influenced by season, mechanical irritation (dust, grass, weeds etc), host immune response and eye pigmentation. They reported successful management of early stages of infectious bovine keratoconjunctivitis in a cow with antibiotic, anti-inflammatory drugs and vitamin - A.

2.2.3 DERMOID

Deas (1959) mentioned that the ocular dermoids rarely occurs in newborn calves and are associated with other congenital eye defects like corneal opacity and described it as recessive condition in Holsteins.

Barkyoumb and Leipold (1984) reported that bilateral occurrences of ocular dermoid are more than unilateral dermoid.

Shields *et al.* (1986) reported that the dermoids are choristomatous abnormalities that often arise in the ocular region. Dermoids may be solitary or

multiple, firm to fluctuant, well circumscribed, smooth, and round with normal overlying skin. It was also reported that the ocular dermoid has been attributed to metaplasia of corneal epithelium secondary to excessive exposure of cornea to intrauterine environment caused by abnormal development and closure of eyelid.

Gelatt (1991) opined that the dermoids may not be clinically recognized until the animal is several weeks old.

Ismail (1993) reported that the inferonasal corneconjunctival dermoids, followed by nasal canthal dermoids in cattle.

Golubovic *et al.* (1995) stated that the dermoid consists of ectodermal constituents (keratinized epithelium, hairs, and sebaceous and apocrine glands) and mesenchymal constituents (fibrous tissue and fat) in different proportions.

Cook (1999) proposed that the metaplasia of mesenchyme of the neural ectoderm, resulting in abnormal differentiation of the surface ectoderm, was the most likely mechanism of dermoid occurrence.

Edwards (2002) opined that the dermoid cysts are formed due to defective epidermal closure along embryonic fissures, which isolates an island of ectoderm in dermis or subcutis and also reported that the cyst usually contains hair, keratin, and sebum, and these materials may produce progressive enlargement of the structure making it clinically apparent.

Yeruham *et al.* (2002) reported different forms of ocular dermoids in dairy cattle herds' namely corneal, corneoscleral, corneconjunctival and conjunctival dermoids. It was further reported that ocular dermoids are not common in cattle and the prevalence was estimated to be 0.002%. They opined that the dermoid is not inherited even though it is a congenital anomaly.

Hillyer *et al.* (2003) reported acquired dermoid cysts, secondary to traumatic epithelial dislocations.

Munoz *et al.* (2007) stated that histologically, dermoids are lined with stratified epithelium resembling normal skin with adnexa and filled with keratinous material.

Menditti *et al.* (2008) mentioned that the dermoids occur along the midline due to the origin of cysts from an incarceration and subsequent growth of embryonic epithelial cells during the closure of the neural tube.

Pandey *et al.* (2011) reported symptoms like chronic epiphora, conjunctivitis, and keratitis in ocular dermoids which might be attributed due to the irritation of eye by hair or tissues.

Alam and Rahman (2012) mentioned that the ocular dermoid is a congenital cyst like growth containing skin and hair and may be solitary or multiple, firm to fluctuant, well circumscribed, smooth and round.

Kilic *et al.* (2012) reported that the hair from dermoids was predominantly responsible for irritation resulting in chronic inflammation of conjunctiva and cornea which may lead to visual impairment of the eye.

2.2.4 CYST

Taylor *et al.* (2007) stated that coenurus cyst in sheep is a metacestode larval stage of *Taenia multiceps* result in ocular affection.

2.3 THIRD EYELID

Panchbhai *et al.* (1987) estimated that 70% of squamous cell carcinomas are located in limbus (Corneo-Scleral junction), followed by third eyelid and palpebral conjunctiva. The most frequent ophthalmic neoplasm in cattle is squamous cell carcinoma complex, a primary neoplasm of epithelial origin.

Goldschmidt and Hendrick (2002) reported that the ocular squamous cell carcinoma was the most common neoplasm of eye in cattle. Most commonly affected areas of eye include limbus, third eyelid and upper and lower eyelid margins primarily at muco-cutaneous junctions.

Gaham *et al.* (2006) reported that 37% of ocular tumors were on third eyelid, 25% on limbus, 23% on lower eyelid and 14% were on canthus.

2.4 CORNEA & SCLERA

2.4.1 CORNEAL LACERATION

Moore (2003) reported that the various techniques available for repair of full thickness defects are contact lenses, collagen based biomaterials, cyanoacrylate tissue adhesives, third eyelid, acrylate tissue adhesives and corneal graft.

Hollingsworth (2003) suggested that the sutures should be placed deeply in stroma down to Descemet's membrane without perforating the cornea completely, as endothelium was exquisitely sensitive to trauma, while suturing cornea.

Gilger *et al.* (2007) concluded that the temporary tarsorrhaphy has to be performed in corneal laceration to provide protection to ocular surface by reducing exposure and mechanical abrasion to the cornea.

Macasai (2011) stated that the challenge in repairing the lacerated cornea results from inherent lack of elasticity of corneal tissue.

Sarangom *et al.* (2012) opined that the prognosis for vision and cosmetic appearance in prolapsed iris and lacerated cornea is fair to good if damaged cornea is repaired, provided intraocular structures are not severely damaged by trauma.

Udehiya *et al.* (2016) reported corneal laceration of right eye in a cross bred cow with history of trauma by a sharp object. Ophthalmic examination revealed lacerated wound over the lateral margin of corneal limbus. The cornea appeared shrunk oedematous and opaque. Hyphema was also visible in anterior chamber. Keratorrhaphy was done under sedation and with regional nerve block in left lateral recumbency. The corneal laceration was sutured using simple interrupted suture pattern, after keratorrhaphy, temporary tarsorrhaphy was undertaken.

2.4.2 CORNEAL FOREIGN BODY

Rebhun *et al.* (1995) mentioned that the foreign bodies like plant materials may be embedded in cornea to variable depths following exposure to strong winds, blowers or fans and they reported phthisis bulbi (shrinking of globe) was the end result in few cases of perforating corneal wounds and a calf suffered from iris prolapse following severe pink eye. This may be due to evacuation of ocular contents following corneal perforation.

Williams *et al.* (2002) opined that the presence of corneal foreign body beyond 24 hours provokes an inflammatory infiltrate and degradation of the surrounding stroma resulting in opacity of cornea and also reported that the mydriatic cycloplegic agent should be used in every corneal affection presented with apparent pain.

Ali *et al.* (2015) extracted the corneal foreign body (wooden piece) successfully through the entrance opening of foreign body at the level of limbus using mosquito artery forceps in a buffalo.

2.4.3 CORNEAL OPACITY

Atulya *et al.* (2011) reported that the autohaemotherapy was effective in treatment of rapidly occurring corneal opacity due to unknown causes in caprines. Freshly drawn whole blood was injected intramuscularly. Opacity of cornea got

cleared completely due to the immune-stimulatory effect produced due to autohaemotherapy.

Tamilmahan *et al.* (2013) stated that the corneal opacity was high in Caprine (38.88 %) Buffaloes (37.14 %), and Canines (29.41 %), followed by Cattle (28.57 %), Equines (28.09 %), Avian (25 %) and Felines (25 %).

2.4.4 CORNEAL ULCER

Miller (2001) reported that corneal ulcer was a common condition in companion animal practice. He opined that the prominence and direct exposure of cornea to the external environment made it more prone to corneal ulcers.

Dubielzig *et al.* (2010) reported that corneal ulcer (ulcerative keratitis) is an inflammatory condition of cornea involving loss of its outer layer.

Arafat *et al.* (2016) mentioned that the corneal ulceration was the most common ocular affection (22.64 %) followed by conjunctivitis (15.09 %), prolapse of gland of third eye lid, glaucoma, ocular setariasis and cataract (9.43 % each), corneal opacity (7.54 %), anophthalmia, traumatic proptosis and traumatic perforation of cornea (3.77 % each), eyelid neoplasm, eyelid laceration, and ocular myiasis (1.88 % each). Affection wise prevalence revealed that corneal ulceration was the most common ocular affection followed by conjunctivitis.

2.5 EXTRA OCULAR NEOPLASMS

Gellet and Williams (1985) reported that the superficial keratectomy might be used to remove corneal or limbal neoplasms without affecting vision.

Panchbhai *et al.* (1987) stated that the 70 % of squamous cell carcinoma are located in limbus followed by third eyelid and palpebral conjunctiva.

Gellat and wolf (1988) noticed corneal scar tissue after removing corneal and limbal neoplasms by superficial keratectomy procedure.

Pandey *et al.* (1989) treated eye cancer in cattle by surgical excision followed by cauterisation of growth bed with silver nitrate lead to healing of wound in 20-25 days.

Bhume *et al.* (1992) observed no recurrence of ocular tumour after autogenous vaccination post surgery. This might be due to regression of tumor by eliciting immune response.

Wilcock (1993) mentioned that the lesion usually begins as plaques on conjunctival surface, which may regress or progress to papilloma and then to squamous cell carcinoma or directly to malignant stage.

Goldschmidt and Hendrick (2002) reported that the most commonly affected areas of eye include limbus, third eyelid, upper and lower eyelid margins primarily at muco-cutaneous junctions.

Ivany (2004) reported that even though the retrobulbar nerve block may be ideal choice for surgery, it has many disadvantages like retrobulbar haemorrhages, optic nerve injury and intrathecal injection.

Sastry and Ramarao (2005) mentioned that the eye cancers may occur due to prolonged exposure to actinic rays of sun.

Gerry and Ballarat (2006) stated that while developing precancerous to cancerous stage, the eye becomes ulcerated which may attract flies and bacteria leading to foul smelling growth.

Gaham *et al.* (2006) reported that 37 % of ocular tumors occur on third eyelid, 25 % on limbus, and 23% on lower eyelid and 14 % on canthus.

Gharagazlou *et al.* (2007) recorded 22 % of squamous cell carcinoma as intraocular tumors and remaining 78 % of squamous cell carcinoma as extraocular tumors, and out of which 72 % were located on conjunctiva or skin of eyelids and nictitating membrane and 6 % on limbus and cornea.

Payne *et al.* (2009) stated that the surgical excision is the most common treatment adopted for ocular squamous cell carcinoma.

Bheemappa *et al.* (2013) concluded that cauterisation of tumor with 1% silver nitrate in addition to superficial keratectomy will reduce recurrence.

Martins *et al.* (2014) reported incidence of ocular and periocular lesions in cattle in decreasing order of frequency, with eyelid, cornea and third eyelid. Squamous cell carcinoma (SCC) alone accounted for 80.3 % of all diagnoses, while all neoplastic lesions made up for 85.0 % of the lesions diagnosed in cattle.

Jahangirbasha *et al.* (2016) concluded that squamous cell carcinoma, may invade eye and orbit and metastasis to parotid and submandibular lymph nodes, lungs and liver occurs in later stages of disease. When located on cornea, invasion is reduced, due to resistance of corneal structures.

Arnab Kr Majie *et al.* (2016) observed bulbar conjunctival tumor near right medial canthus with epiphora. The tumor was successfully excised after physical restraining, auriculopalpebral nerve block and local infiltration.

2.6 INCIDENCE OF EXTRA OCULAR AFFECTIONS

Mosbah (2008) studied ocular affections and classified the same into congenital anomalies viz. lateral convergent strabismus with exophthalmos and panophthalmitis and acquired conditions viz. conjunctivitis, keratitis, lacerations of the eyelids, punctured wounds of eyelids, hyphema, subconjunctival lower eyelid abscess, bilateral prolapse of third eyelid, nodular conjunctival lesion after

lumpy skin disease, foreign body in cornea, perforating corneal wounds and buphthalmos in cattle.

Tamilmahan *et al.* (2013) studied ocular affections in 799 animals, in which canines and equines were most commonly affected, followed by cattle, buffaloes, caprines, felines, avian and lab animals. Among the disease conditions corneal opacity showed higher incidence and the caprines and buffaloes were the most affected. As per age mostly animals of more than 5 years were affected except in caprines, ages between 1 to 5 years were most commonly affected. Left side of the eye was most commonly affected than the right side and fewer incidences were noted in both sides of the eye. Sex wise distribution showed increased incidences of eye diseases in male canines and equines and female cattle, buffaloes and caprines.

Chakrabarti *et al.* (2014) mentioned that the incidence of eye disorders is more in crossbred animals than the non descriptive Zebu cattle due to lesser immunity in the crossbreds.

Ali *et al.* (2015) reported corneal foreign body, third eye lid and corneal dermoid, lens luxation, corneal ulcer, ocular tumor (squamous cell carcinoma), microphthalmia, purulent panophthalmitis and cataract in a study of ocular affections in ruminants.

Arafat *et al.* (2016) revealed that overall incidence of ocular affections was 1.93 %. Canines contributed 50.94 % (27 cases) of the ophthalmic cases, followed by bovine (22.64 %, 12 cases), equine (20.75 %, 11 cases) and caprine (5.66 %, 3 cases).

Balagopalan *et al.* (2016) recorded 3.02 per cent of incidence in cross bred cattle with age less than 5 years among 128 ocular affections in cattle during a period of two years.

Vani *et al.* (2016) reported 52 bovines (3.80 %) with ocular affections during the three years study where they recorded ocular dermoids, eyelid affections, conjunctival affections, corneal affections, eyeball affections, ocular tumors, traumatic eye injuries and their surgical management.

2.7 EXTRA OCULAR EYE WORM

Lia *et al.* (2004) reported that *Thelazia* was an important spirurida nematode of cattle, buffalo, sheep, goat, horse, dog and man, which causes *Thelaziosis* characterized by severe lacrimation, conjunctivitis, corneal opacity, keratitis, absces in the eyelid, photophobia and blindness in affected animals.

Otranto and Traversa (2005) reported clinical signs of conjunctivitis, swelling of conjunctiva, lacrimation, corneal opacity and corneal ulcerations in the animals affected with eye worms.

Shen *et al.* (2006) reported that *Thelazia* sps have been found in various tissues of orbit of the eye including within the eyelids, tear glands, tear ducts, third eye lid and in eye ball itself and they recorded *Thelazia* in various tissues of orbit (or socket) of eye, including within eyelids, in tear glands, tear ducts, nictitating membrane in eyeball itself.

Xue *et al.* (2007) concluded that the human *Thelaziosis* is characterized by slight irritation of conjunctiva, eye discomfort and follicular hypertrophy. Clinically, the disease was considered important because of its zoonotic nature.

Otranto and Dutto (2008) reported that *Thelazia* spp. caused excessive lacrimation, photophobia, conjunctivitis, keratitis, corneal ulceration and blindness in cattle.

Djungu *et al.* (2014) mentioned that the lowest prevalence of *Thelaziosis* in cattle at January, February and March months is assumed to be related to decrease in breeding flies.

Ajit Kumar and Madhurendra Bachan (2016) diagnosed thelaziosis in two black bengal goats with observation of congestion, corneal opacity (bluish coloured eye) and thin milky white, spiral, thread like worm moving in anterior chamber of left eye and treated successfully with levamisole orally along with instillation of eye drops.

Manjunath *et al.* (2016) observed eye worms in 311 animals. Among all one animal had ruptured eyeball and for one extirpation of eyeball was done. Five animals exhibited severe lacrimation, irritation and eyelid laceration, 12 had corneal rupture, 18 animals had lacrimation with conjunctival edema, 82 animals exhibited lacrimation with corneal opacity, 84 animals exhibited only lacrimation, 108 animals died without exhibiting any symptoms but both the eyes were infected.

Prakash *et al.* (2016) examined a jersey crossbred heifer and two Holstein Friesian crossbred calves with history of conjunctivitis, cloudiness, excessive lacrimation, epiphora and corneal opacity in right eye showed eye worm (*Thelazia sp.*) with vigorous movement which was managed non-surgically.

Dhana Lakshmi *et al.* (2016) observed two cattle with symptoms of excessive lacrimation, watery eyes (epiphora), conjunctivitis, cloudiness, ulcerative keratitis and opacity of cornea in left and right eyes respectively. On detailed clinical examination, eyeworms (*Thelazia sp.*) were seen with wriggling and movement in the eye.

Materials and Methods

CHAPTER – III

MATERIALS AND METHODS

The present study was carried out on clinical cases presented to the Department of Veterinary Surgery and Radiology, Department of Veterinary Clinical Complex, College of Veterinary Science, Proddatur and Department of Veterinary Surgery and Radiology, College of Veterinary Science, Tirupati related to extra ocular affections in ruminants i.e. cattle, buffaloes, sheep and goats over a period of 12 months. Thorough clinical and detailed ophthalmic examination was done to confirm the diagnosis of extra ocular affections in ruminants which resulted suitable medical and surgical correction formed the material of the study.

3.1 INCIDENCE

Incidence of extra ocular affections i.e eyelids, conjunctiva and cornea of ruminants were recorded and the variable factors were species, age, gender, eyes affected over a period of 12 months.

3.2 SELECTION OF ANIMALS AND DESIGN OF THE STUDY

Selection criteria for surgical patients were as follows: bilateral/unilateral extra ocular affections i.e. eyelids, conjunctiva, third eyelid and cornea and sclera. The patients in this study were selected after assessing vision function tests, pre-existing systemic disorders. The patients were further screened for routine hematological (hemoglobin) and serum biochemical (glucose) parameters for assessment of pre-operative health status and to rule out systemic diseases.

Clinical cases of ruminants presented with the history of ocular diseases and visual impairment in ruminants were subjected to detailed ophthalmic examination by specific diagnostic tests like culturing of ocular samples, STT, FDT and IOP. Based on the results from the above parameters, suitable treatment

modalities were attempted with modifications owing to the local conditions, availability of the facilities etc.

3.2.1 Inclusion criteria:

Animals with extra ocular pathologies were included in the study.

3.2.2 Exclusion criteria:

Animals with intra ocular pathologies were excluded from the study.

3.3 INSTRUMENTS AND EQUIPMENTS FOR DIAGNOSIS

3.3.1 Direct Ophthalmoscope (Plate 2)

The HEINE direct ophthalmoscope was used to study the anterior segment of the eye i.e cornea, anterior chamber, iris and lens as it provided a real image with a magnification of 15X. A dioptric range of +12 to +20D was used for the procedure. It consisted of a light source, a mirror or prism to direct the light into patient's eye, a view hole with a series of convex and concave lenses in diopters to focus the image reflected from fundus and a circular dial to change the shape and color of illumination.

3.3.2 Indirect Ophthalmoscope with +20D Volk Lens (Plate 3)

The HEINE indirect ophthalmoscope was used for the assessment of internal structures of the eye. A bright parallel beam of light emitted from the head piece, while directed to the eyes of the animal was focused onto the ocular structures by a condensing lens of +20 Diopter Volk lens held at a short distance from the eye. The binocular light source was mounted on the head and the view was adjusted through the eye piece. The intensity of the light was adjusted to avoid excessive illumination and inverted, magnified and real image was observed.

3.3.3 Pen torch light (Plate 1)

The pen torch light is a light source used for diagnostic purpose as it produces an intense directed beam of light. The pen torch light is used in the case of diagnostic tests such as dazzle reflex and pupillary light response.

3.3.4 Schiötz Tonometer (Plate 4)

Indentation tonometry (Schiötz tonometer) was used to measure the intraocular pressure. The Schiötz tonometer uses the principle of indentation tonometry for the determination of IOP. Various weights like 5.5g, 7.5g and 10g were added to the plunger of the Schiötz tonometer based on the scale reading to calculate the IOP. The scale readings were then converted by using IOP conversion chart for the Schiötz tonometer.

3.4 OPHTHALMIC INSTRUMENTS FOR SURGERY (Plate 13).

The standard extra ocular ophthalmic instruments were used for the procedure.

- A. No. 11 bard parker blade
- B. No.3 bard parker blade handle
- C. Needle holder
- D. Eye scissors (straight)
- E. Eye scissors (curved)
- F. Colibri forceps
- G. Thumb forceps
- H. Sterile cotton buds
- I. Baby jones towel clamp
- J. Eye window drape
- K. Ophthalmic atraumatic suture needle
- L. Ophthalmic traumatic suture needle
- M. Mosquito forceps (curved)
- N. Mosquito forceps (straight)
- O. Suture removal scissor
- P. No.1 chromic catgut suture material
- Q. No.1 PGA suture material
- R. Sterile surgical gauze

3.5 ANAESTHESIA (Plates 8, 9 & 10)

Xylazine premedication was used @ 0.1 mg/kg b.wt I.M for all cases but in case of goats dose rate @ 0.02 mg/kg b.wt I.M was used. Examination of the eye was facilitated by reducing upper eyelid movement by Auriculopalpebral nerve block with an injection of 5 milliliters of 2% Lignocaine Hcl subcutaneously on the dorsal aspect of the zygomatic arch and topical analgesia by using 0.5% Proparacaine hydrochloride solution (Aurocaine).

3.6 PATIENT POSITIONING

The surgical site was prepared aseptically and all the ruminants were positioned on lateral recumbency for surgical repair.

3.7 PREPARATION OF SURGICAL SITE

The hair around the eye was clipped and the skin was sterilized with betadine solution. The surgical area was draped with disposable adhesive ophthalmic drapes (Surgiwear) carefully to expose only the palpebral fissure (Plate 11). Conjunctival surface and sac were cleaned using sterile cotton buds soaked with 0.5% povidone-iodine solution (Plate 12). Saline solution rinse was used and an ophthalmic ointment was placed on the cornea prior to aseptic preparation.

3.8 SURGICAL TECHNIQUE

Surgical technique varied according to the animal health condition and severity of the condition.

3.8.1 Enucleation

The upper and lower eyelids were sutured together. A circumferential skin incision was made approximately one centimeter from the edges of the eyelids. By using a combination of blunt and sharp dissection, through the orbicularis oculi, fascia, muscles and after separation of medial and lateral canthal ligaments, the eye ball was separated from the surrounding tissues of the orbit. The retrobulbar musculature and the optic nerve sheath were transected caudally as far as feasible.

Gauze packs or drains, or both, were temporarily placed in the orbit of all operated animals for the first 24 hours after operation. The bleeding points were controlled by use of No. 1 PGA & Chromic catgut (Plate 14 and Plate 15). The skin incision was then closed in a simple interrupted suture patterns with No. 1 Silk (Plate 16).

3.9 POSTOPERATIVE MANAGEMENT

Animals were kept in a confined area for several days after surgery to allow appropriate hemostasis and healing to occur. Daily observation of the surgical site and assessment of impairment was made until suture removal.

3.9.1 Medications

3.9.1.1 Tear substitutes (Plates 17 & 18)

Topical artificial tear substitutes eye drops and gel were administered topically every 2 hrs for the first 24 hours to maintain the ocular health to reduce the dryness of the eye following which the frequency was progressively reduced.

3.9.1.2 Topical antibiotics (Plates 19, 20 & 21)

Topical antibiotic/corticosteroid combination eye drops namely **ONEMOX** (Moxifloxacin with Dexamethasone), **ZOBRA** (Tobramycin) & **CD** (Chloramphenicol with Hydrocortisone Acetate) eye ointment were administered topically every 2 hrs for the first 24 hours, following which the frequency was progressively reduced to every 4 hours by 72 hours and then every 6 hours by 1 week post surgery. Topical treatment was continued for 4 weeks post-operatively.

3.9.1.3 Systemic antibiotics

Broad spectrum systemic antibiotic therapy was required in all cases especially in those cases in which eye enucleation will be performed. Antibiotics (Ceftriaxone @ 10 mg/kg b.wt IM & Amoxicillin @ 10 mg/kg b.wt IM), Corticosteroids (Prednisolone @ 0.5 mg/kg b.wt) and NSAIDS (Meloxicam @ 0.5 mg/kg b. wt) intramuscularly will be used.

3.9.2 Suture removal

Sutures were removed in 14 days to allow for complete healing of the skin.

3.10 PARAMETERS STUDIED

The complete history was obtained from the owner regarding probable etiological factors, time of occurrence of injury/disease, duration of clinical signs, progress of clinical signs, presence of any systemic diseases and medication undertaken.

- Detailed ophthalmic examination was carried out after physical restraint of animals. Physical examination of Eyelids, Conjunctiva, 3rd Eyelid, Cornea and Sclera in ruminants like cattle, buffaloes, sheep and goat was carried out and clinical symptoms viz. photophobia, blepharospasm, ocular reflexes, discharge if any and extent corneal transparency were noted (Plate 22 - 30).
- Schirmer tear test (STT) was employed to measure reflex tear production in affected eye in terms of mm of wetting on a paper strip (Plate 5).
- Fluorescein Dye Test (FDT) was performed to study the integrity of corneal surface. Pre wetted fluorescein dye strip was placed gently over the non - anesthetized dorsal sclera and the animal was made to blink for equal spreading of the dye (Plate 6).
- Rose Bengal Test (RBT) was performed to study the corneal dead cells. Pre wetted Rose Bengal impregnated sterile strip was placed on the dorsal sclera (Plate 20) and the animal was made to blink for equal spreading of the eye. White light was used to assess the amount of staining (Plate 7).
- The patients were further screened for routine haematological and serum biochemical parameters for assessment of pre-operative health status and to rule out systemic diseases.
- The parameters like menace reflex, blink rate, ABST, culture and IOP were carried out.

- Based on the results obtained from the above parameters, suitable treatment modalities were attempted with modifications owing to the local conditions, availability of the facilities etc.

3.11 STATISTICAL ANALYSIS

The results obtained were tabulated and analyzed statistically in SPSS and Microsoft Excel 2010.

Plate: 1
Pen torch light



Plate: 2
Direct Ophthalmoscope



Plate : 3
Indirect Ophthalmoscope



Plate: 4
Schiotz tonometer

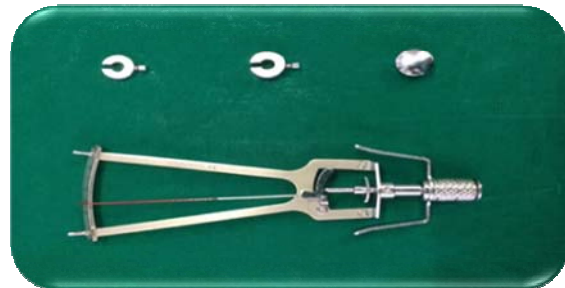


Plate: 5
Schirmer Tear Test Strip



Plate: 6
Fluorescein Dye Test Strip



Plate: 7
Rose Bengal Test Strip



Plate: 8
Xylazine Hcl



Plate : 9
Lignocaine Hcl



Plate: 10
Proparacaine Hcl
eye drops



Plate: 11
Surgical eye drape



Plate:12
Povidone iodine solution



Plate: 13
Extra ocular surgical
instruments set



Plate: 14
Polyglycolic acid (No.1)



Plate: 15
Chromic Catgut (No.1)



Plate: 16
Silk (No.2)



Plate: 17
Hydroxypropyl
methylecellulose, borax, boric
acid, sodium chloride &
potassium chloride eye drops



Plate: 18
Hydroxypropyl
methylecellulose 2% eye gel



Plate: 19
Tobramycin eyedrops



Plate: 20
Moxifloxacin with
dexamethasone eye drops



Plate:21
Chloramphenicol with
hydrocortisone acetate eye
ointment

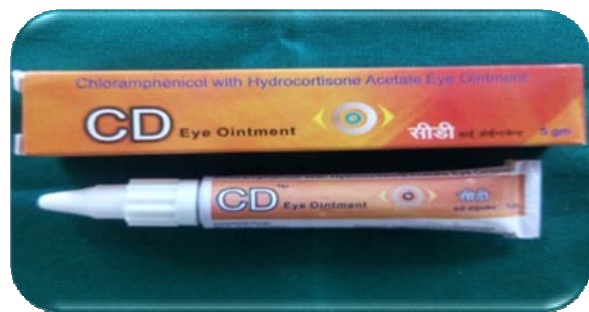


Plate: 22
Direct ophthalmoscopic
Examination in a Calf



Plate: 23.
Schirmer Tear Test
performing in a Cow



Plate: 24
Schirmer Tear Test
performing in a Buffalo



Plate: 25
Fluorescein dye test in a
Buffalo



Plate: 26
Direct ophthalmoscopic
Examination in a Sheep



Plate: 27
Schirmer tear test in sheep



Plate:28
Fluorescein dye test in sheep



Plate: 29
Direct ophthalmoscopic
Examination in a Goat



Plate: 30
Measuring Intra Ocular
Pressure with Schiottz
tonometry in a goat



Results

CHAPTER – IV

RESULTS

4.1 INCIDENCE

The cases presented over a period of 12 months from October 2016 to September 2017 to the Department of Veterinary Surgery and Radiology, Department of Veterinary Clinical Complex, College of Veterinary Science, Proddatur and Department of Veterinary Surgery and Radiology, College of Veterinary Science, Tirupati formed material related to extra ocular affections in ruminants. Out of a total of 1286 surgical cases, 98 (7.62%) were having extra ocular conditions in which cattle 38 (2.95 %), followed by buffaloes 31 (2.41 %), sheep 17 (1.32 %) and goats 12 (0.93 %) cases were reported with extra ocular affections, diagnosed on the basis of general clinical, and ophthalmological examination in ruminants.

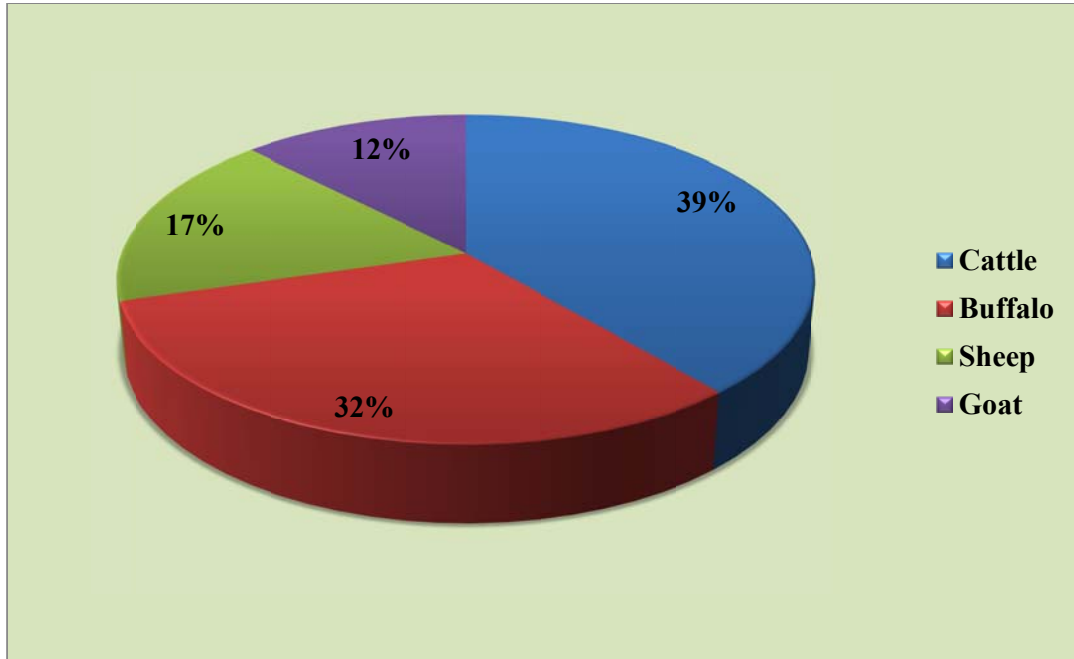
4.1.1 Species (Table 1)

Out of the total 98 cases, the species wise distribution of extra ocular affections in ruminants showed highest incidence in cattle 38.77 per cent (38) , followed by buffaloes 31.64 per cent (31), sheep 17.34 per cent (17) and goats 12.25 per cent (12) (Fig.1).

4.1.2 Gender (Table 2)

The higher incidence of extra ocular affections in ruminants was observed in females 63.27 per cent (62) when compared with males 36.73 per cent (36). Among female sex, higher occurrence was recorded in goats 75 per cent (9) followed by sheep 64.71 per cent (11), buffaloes 61.29 per cent (19) and cattle 60.53 per cent (23) and among male sex, the incidence was as follows: cattle 39.47 per cent (15), buffaloes 38.71 per cent (12), sheep 35.29 per cent (6) and goat 25 per cent (3) (Fig. 2).

**Fig. 1 SPECIES WISE INCIDENCE OF EXTRA OCULAR AFFECTIONS
IN RUMINANTS**



**Fig. 2 GENDER WISE INCIDENCE OF EXTRA OCULAR AFFECTIONS
IN RUMINANTS**

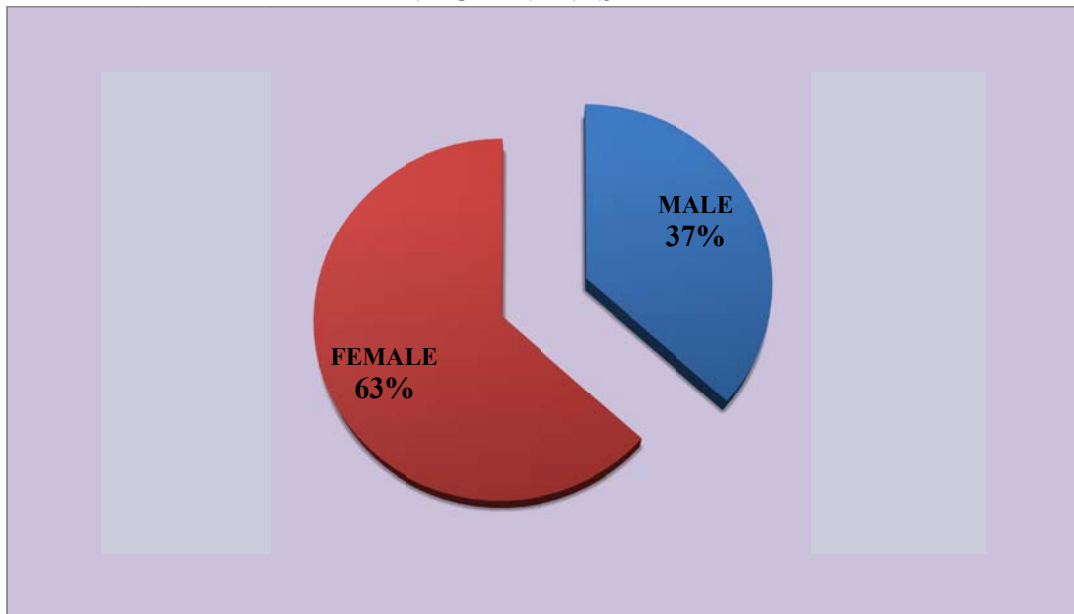


Table: 1 SPECIES WISE INCIDENCE OF EXTRA OCULAR AFFECTIONS IN RUMINANTS (N = 98)

S.No	Species	Number	% of incidences	% of lesions
1	Cattle	38	2.95	38.77
2	Buffalo	31	2.41	31.64
3	Sheep	17	1.32	17.34
4	Goat	12	0.93	12.25
5	Total	98	7.62	100

Table: 2 GENDER WISE INCIDENCE OF EXTRA OCULAR AFFECTIONS IN RUMINANTS (N = 98)

S.No	Species	Male	%	Female	%
1	Cattle	15	39.47	23	60.53
2	Buffalo	12	38.71	19	61.29
3	Sheep	6	35.29	11	64.71
4	Goat	3	25.00	9	75.00
5	Total	36 (36.73%)		62 (63.27%)	

Table: 3 ANATOMICAL LOCATION WISE INCIDENCE OF EXTRA OCULAR AFFECTIONS IN RUMINANTS (N = 98)

S.No	Anatomical location	Number	% of Incidence	% of Lesions
1	Eyelids	18	1.40	18.37
2	Conjunctiva	43	3.34	43.90
3	Third eyelid	11	0.85	11.22
4	Cornea & Sclera	26	2.02	26.51
5	Total	98	7.62	100

4.1.3 Anatomical location (Table 3 and 7)

Based on the anatomical location, the highest incidence was recorded in conjunctiva 43.90 per cent (43) followed by cornea & sclera 26.51 per cent (26), eyelids 18.37 per cent (18) and third eyelid 11.22 per cent (11) out of 98 extra ocular affections (Fig.3).

4.1.3.1 Eyelid affections (Table 6)

Among various eyelid affections (18), highest percentage of prevalence was eyelid tumours 27.78 per cent (5) followed by blepharitis 22.22 per cent (4), entropion 16.67 per cent (3), papilloma 11.76 per cent (2), eyelid laceration 5.55 per cent (1), eyelid myiasis 5.55 per cent (1), ectropion 5.55 per cent (1) and periocular dermatitis 5.55 per cent (1) (Plates 31 - 44).

4.1.3.2 Conjunctiva affections (Table 6)

Among various conjunctiva affections (43), highest percentage of prevalence was subconjunctival abscess 30.23 per cent (13) followed by chemosis 11.63 per cent (5), conjunctival tumours 11.63 per cent (5) conjunctival haematoma 6.98 per cent (3), acute conjunctivitis 6.98 per cent (3), purulent conjunctivitis 6.98 per cent (3), conjunctival foreign body 4.65 per cent (2), conjunctival laceration 4.65 per cent (2), ephiphora 4.65 per cent (2), ocular myiasis 2.32 per cent (1), coenurus cyst 2.32 per cent (1), pterygium 2.32 per cent (1), pallor of conjunctiva 2.32 per cent (1), conjunctival dermoid 2.32 per cent (1) (Plates 45 - 70).

4.1.3.3 Third Eyelid affections (Table 6)

Among various third eyelid affections (11), highest percentage of prevalence was third eyelid tumours 27.27 per cent (3), third eyelid abscess 27.27 per cent (3) followed by cherry eye 18.18 per cent (2), third eyelid melanoma 18.18 per cent (2) and third eyelid laceration 9.09 per cent (1) (Plates 71 - 78).

4.1.3.4 Cornea & Sclera affections (Table 6)

Among various cornea and sclera affections (26), highest percentage was corneal opacity (6) followed by corneal tumours 11.54 (3), corneal ulcer 7.69 (2), corneal dermoid 7.69 (2), corneal epithelial inclusion cyst 7.69 (2), pink eye 7.69 (2), corneal foreign body 3.84 (1), heterochromia eye with episcleritis 3.84 (1), panophthalmitis 3.84 (1), corneal melanoma 3.84 (1), pannus 3.84 (1), scleral melanoma 3.84 (1), pthisis bulbi 3.84 (1), scleral limbal tumour 3.84 (1) and massive ocular abscess with destruction of vital structures of eye 3.84 per cent (Plates 79 - 104).

4.1.4 Age (Table 4)

The age wise distribution of extra ocular affections (98) in ruminants was found to range from 0 year to above 5 years. The age group of 1 to 5 years had the highest incidence of 52.04 per cent (51) followed by 0 to 1 year age group had incidence of 38.77 per cent (38) and over 5 years of age had incidence of 9.18 per cent (Fig. 4).

4.1.5 Eyes affected (Table 5)

Among the cases studied left eye (OS) 48.98 per cent (48) showed higher incidence than right eye (OD) 43.90 per cent (42) and both eyes (OU) 8.14 per cent (8) (Fig.5).

Fig. 3 ANATOMICAL LOCATION WISE INCIDENCE OF EXTRA OCULAR AFFECTIONS IN RUMINANTS

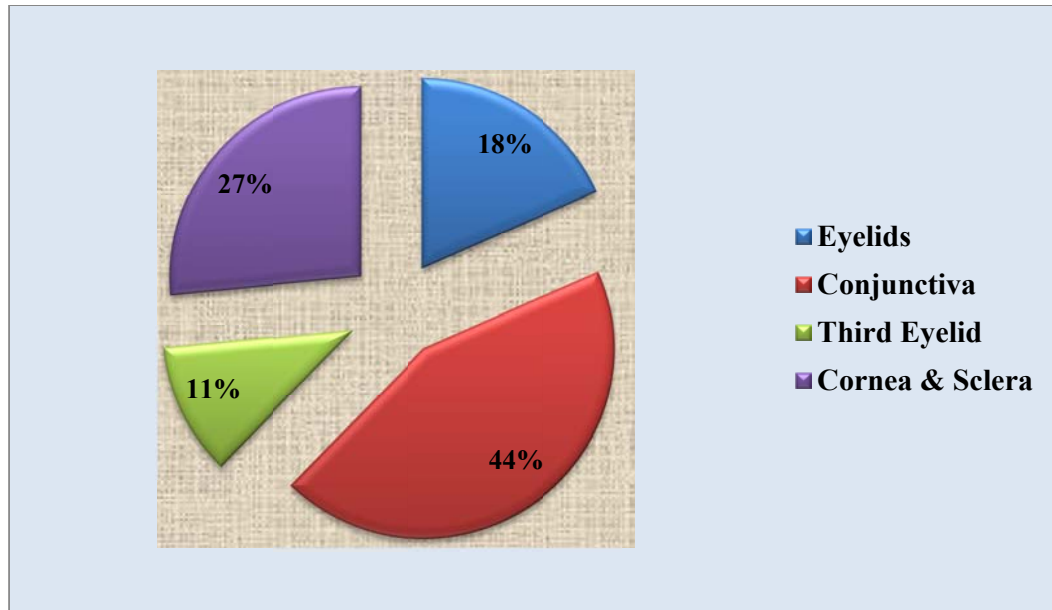


Fig. 4 AGE WISE INCIDENCE OF EXTRA OCULAR AFFECTIONS IN RUMINANTS

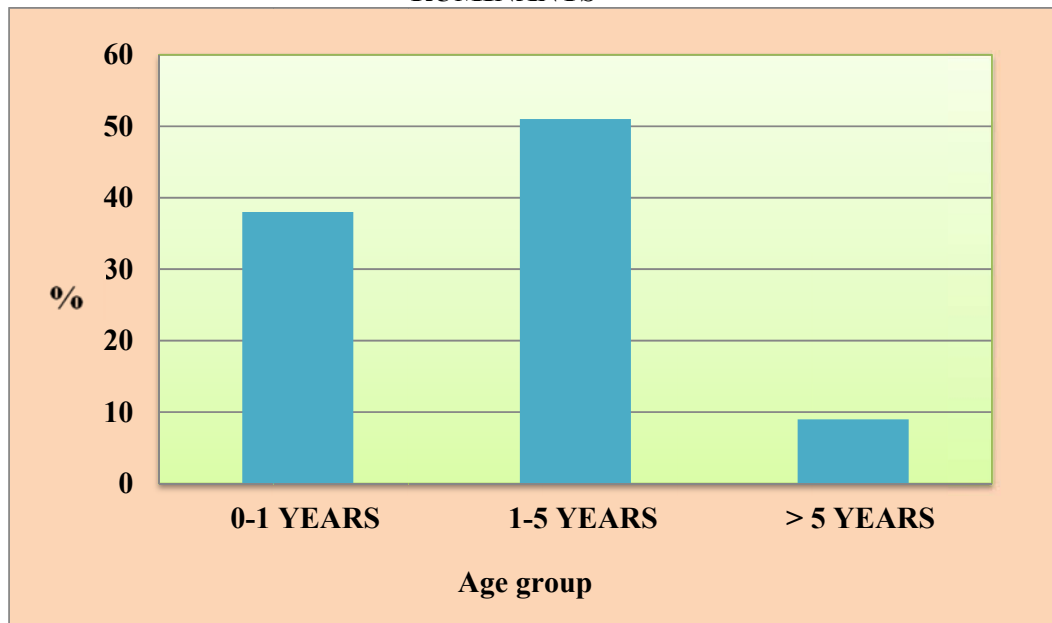
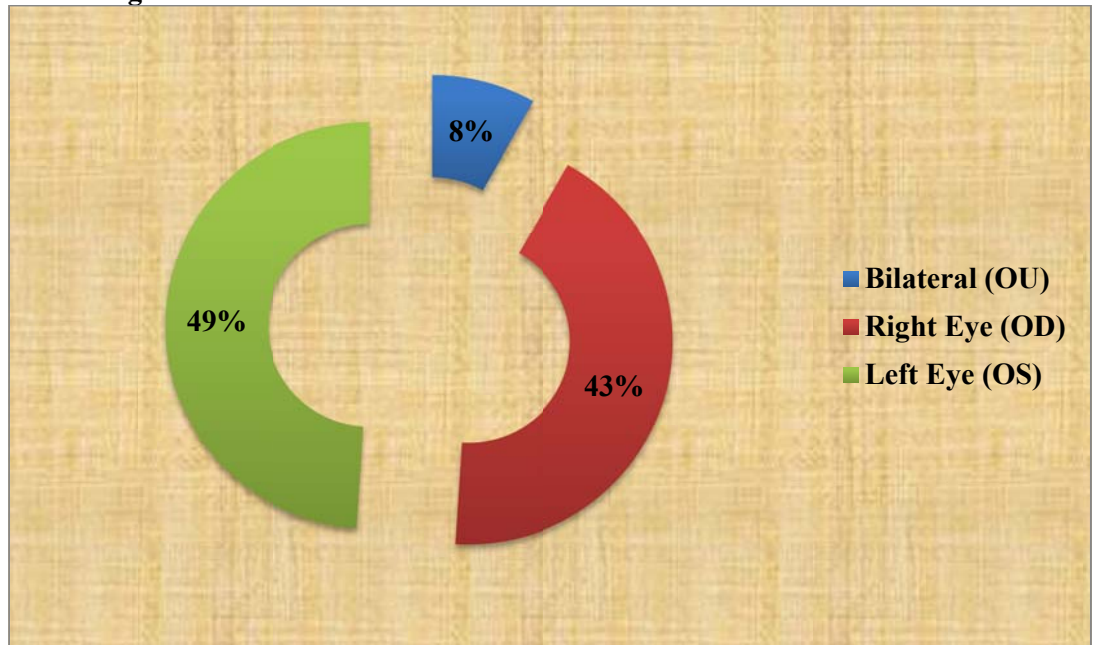


Fig. 5 INCIDENCE OF EYES AFFECTED IN RUMINANTS



VARIOUS EYELID AFFECTIONS



Plate:31 Blepharitis in a Bullock (OD)



Plate:32 Ocular papilloma in a Cow (OD)



Plate:33 Eyelid tumour in a Cow (OS)



Plate:34 Swelling of lower eyelid in a Cow (OS)



Plate:35 Entropion in a Cow (OD)



Plate:36 Periocular dermatitis in a Cow (OD)



Plate:37 Ocular papilloma in a Bullock (OD)



Plate:38 Blepharitis in a Cow (OS)



Plate:39 Upper eyelid ocular myiasis in a Cow (OD)



Plate:40 Ectropion in a Buffalo (OD)



Plate:41 Upper eyelid laceration in Buffalo (OS)



Plate:42 Upper eyelid swelling in a Buffalo calf (OD)



**Plate:43 Lower eyelid laceration
in a Buffalo (OD)**



**Plate.44 Shrinkage of eyeball in a
Buffalo calf (OS)**

**Table: 4 AGE WISE INCIDENCE OF EXTRA OCULAR AFFECTIONS
IN RUMINANTS (N = 98)**

Species	Age (Years)					
	0 – 1	Percentage	1 - 5	Percentage	> 5	Percentage
Cattle	9	23.68	24	63.16	5	13.17
Buffalo	8	25.81	19	61.29	4	12.9
Sheep	12	70.59	5	29.41	0	0
Goat	9	75.00	3	25.00	0	0
Total	38 (38.77)		51 (52.04)		9 (9.18)	

Table: 5 INCIDENCE OF EYES AFFECTED IN RUMINANTS (N = 98)

S.No	Species	Cattle		Buffalo		Sheep		Goat		Total	%
		No.	%	No.	%	No.	%	No.	%		
1	OD	13	34.22	17	54.84	9	52.94	3	25.00	42	43.90
2	OS	22	57.90	12	38.71	7	41.18	7	58.30	48	48.98
3	OU	3	7.90	2	6.45	1	5.88	2	16.70	8	8.14
4	Total	38		31		17		11		98	100

Table: 6 DIFFERENT OCULAR AFFECTIONS BASED ON ANATOMICAL LOCATION (N = 98)

S.No.	Anatomical Location	Affections
1	Eyelids (18)	Eyelid tumours 5 (27.78%), Blepharitis 4 (22.22%), Entropion 3 (16.67%), Papilloma 2 (11.76%), Eyelid laceration 1 (5.55%), Eyelid myiasis 1 (5.55%), Ectropion 1 (5.55%) and Periocular dermatitis 1 (5.55%).
2	Conjunctiva (43)	Subconjunctival abscess 13 (30.23%), Chemosis 5 (11.63%), Conjunctival tumours 5 (11.63%), Conjunctival haematoma 3 (6.98%), Acute Conjunctivitis 3 (6.98%), Purulent conjunctivitis 3 (6.98%), Conjunctival foreign body 2 (4.65%), Conjunctival laceration 2 (4.65%), Ephemera 2 (4.65%), Ocular myiasis 1 (2.32%), Coenurus cyst 1 (2.32%), Pterygium 1 (2.32%), Pallor of conjunctiva 1 (2.32%) and Conjunctival dermoid 1 (2.32%).
3	Third eyelid (11)	Third Eyelid tumours 3 (27.27%), Third Eyelid abscess 3 (27.27%), Cherry eye 2 (18.18%), Third Eyelid melanoma 2 (18.18%) and Third Eyelid laceration 1 (9.09%).
4	Cornea & Sclera (26)	Corneal opacity 6 (23.07%), Corneal tumours 3 (11.54%), Corneal ulcer 2 (7.69%), Corneal dermoid 2 (7.69%), Corneal epithelial inclusion cyst 2 (7.69%), Pink eye 2 (7.69%), Corneal foreign body 1 (3.84%), Heterochromia eye with episcleritis 1 (3.84%), Panophthalmitis 1 (3.84%), Corneal melanoma 1 (3.84%), Pannus 1 (3.84%), Scleral melanoma 1 (3.84%), Pthisis bulbi 1 (3.84%), Scleral limbal tumour 1 (3.84%) and Massive ocular abscess with destruction of vital structures of eye 1 (3.84%).

Table: 7 Incidence of Extra ocular lesions in Ruminants (N=1286)

S.No	Species	Cattle			Buffaloes			Sheep			Goat		
		No.	% of Incidence	% of lesions	No.	% of Incidence	% of lesions	No.	% of Incidence	% of lesions	No.	% of Incidence	% of Lesions
1	Eyelids	7	0.54	18.42	4	0.31	12.90	4	0.31	23.53	3	0.23	25.00
2	Conjunctiva	18	1.40	47.37	19	1.48	61.29	3	0.23	17.65	3	0.23	25.00
3	Third eyelid	5	0.39	13.16	3	0.23	9.68	2	0.15	11.76	1	0.08	8.33
4	Cornea & Sclera	8	0.61	21.02	5	0.39	16.13	8	0.61	47.06	5	0.39	41.67
5	Total	38	2.95	100	31	2.41	100	17	1.32	100	12	0.93	100

VARIOUS CONJUNCTIVAL AFFECTIONS



Plate:45 Chemosis in a Bullock(OS)



Plate:46 Acute conjunctivitis in a Cow (OS)



Plate:47 Conjunctival tumour in a Cow (OS)



Plate:48 Conjunctival laceration in a Bullock (OS)



Plate:49 Conjunctival haematoma in a Cow (OS)



Plate:50 Subconjunctival abscess in Calf (OS)



Plate:51 Chemosis in a Cow(OS)



Plate:52 Epiphora in a Cow (OS)



Plate:53 Conjunctival ocular myiasis in a Cow (OD)



Plate:54 Conjunctival tumour in a Cow (OD)



Plate:55 Subconjunctival tumour in a Cow (OS)



Plate:56 Acute conjunctivitis in a Bullock (OD)



Plate:57 Subconjunctival abscess in a Buffalo calf (OS)



Plate:58 Subconjunctival abscess in a Buffalo calf (OS)



Plate:59 Chemosis in a Buffalo (OD)



Plate:60 Purulent Conjunctivitis in a Buffalo calf (OS)



Plate:61 Pterygium in a Buffalo (OS)



Plate:62 Subconjunctival abscess in a Buffalo calf (OS)



Plate:63 Purulent conjunctivitis in a Buffalo calf (OD)



Plate:64 Chemosis in a Buffalo (OS)



Plate:65 Pallor of Conjunctiva in a Buffalo (OD)



Plate:66 Bilateral Chemosis in a Buffalo (OU)



Plate:67 Subconjunctival abscess in Buffalo calf (OS)



Plate:68 Conjunctival foreign body in a Buffalo (OD)



Plate:69 Subconjunctival absces in a Sheep (OD)



Plate:70 Ocular coenurus cyst in a Goat (OD)

VARIOUS THIRD EYELID AFFECTIONS



Plate:71 Third Eyelid tumour in a Cow (OD)



Plate:72 Third Eyelid laceration in a Cow (OD)



Plate:73 Massive Third eyelid tumour with destruction of eye in a Bullock (OD)



Plate:74 Third Eyelid melanoma in a Buffalo (OS)



Plate:75 Third Eyelid abscess in a Buffalo calf (OS)



Plate:76 Cherry eye in a Buffalo (OS)



Plate:77 Third Eyelid abscess in a Buffalo calf (OD)



Plate:78 Third Eyelid abscess in a Goat (OS)

VARIOUS CORNEA & SCLERAL AFFECTIONS



Plate:79 Scleral limbal tumour in a Cow (OD)



Plate:80 Corneal opacity in a calf (OD)



Plate:81 Corneal tumour in a Cow (OD)



Plate:82 Heterochromia with episcleritis in a Cow(OS)



Plate:83 Pink eye (Bilateral) in a Cow (OU)



Plate:84 Corneal foreign body in a Cow (OS)



Plate:85 Corneal opacity in a Calf (OD)



Plate:86 Corneal dermoid in a Cow (OD)



Plate:87 Panophthalmitis in a Bullock (OS)

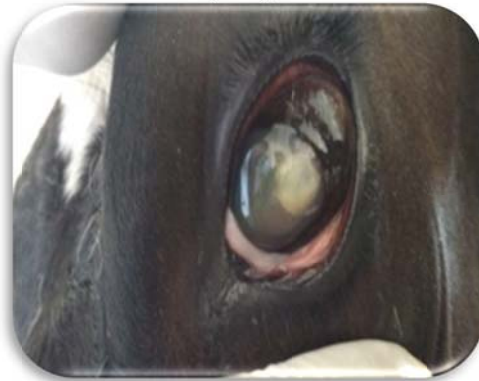


Plate:88 Pink eye in a Cow (OS)



Plate:89 Corneal dermoid in a Cow (OS)



Plate:90 Corneal melanoma in a Cow (OD)



Plate:91 Pannus in a Buffalo (OS)



Plate:92 Corneal opacity in a Buffalo (OS)



Plate:93 Corneal inclusion cyst in a Buffalo calf (OS)



Plate:94 Massive ocular abscess with destruction of eye in a Buffalo (OS)



Plate:95 Corneal opacity in a Buffalo (OS)



Plate:96 Cornea opacity & scleral melanoma in a buffalo (OS)



Plate:97 Corneal epithelial inclusion cyst in a Sheep (OS)



Plate:98 Pannus in a Sheep (OS)



Plate:99 Corneal opacity in a Sheep (OD)



Plate:100 Corneal ulcer in a Sheep (OD)



Plate:101 Corneal opacity in a Sheep (OD)



Plate:102 Corneal inclusion cyst in a Kid (OD)



**Plate:103 Corneal opacity in a Kid
(OS)**



**Plate:104 Corneal ulcer in a Goat
(OS)**

4.2 SELECTION OF CASES FOR STUDY

The details of the cases selected for surgery were bilateral/unilateral extra ocular affections i.e. eyelids, conjunctiva, third eyelid, cornea and sclera diseases in ruminants diagnosed by detailed ophthalmic examination.

Schirmer tear test, Fluorescein dye test, Rose bengal test and IOP were performed as a part of the detailed ophthalmic examination in all the clinical cases for differential diagnosis of extra ocular cases from intra ocular cases. The routine hematological and biochemical parameters are screened and ruled preoperative health status and concluded all are within the normal range.

4.3 PARAMETERS STUDIED

4.3.1 General ophthalmic examination

All the animals were examined for the general ocular health and vision assessment as per the standard diagnostic protocol used in standard ophthalmic examination and a detailed examination was conducted for eyelids, conjunctiva, 3rd eyelid and cornea & sclera for all the ruminants.

4.3.2 Schirmer Tear Test (STT): was performed in all the cases with the normal range of STT values ranged venture 10 – 25mm/min

4.3.3 Culture and ABST: sterile samples were collected and sent for ABST and culture. Appropriate antibiotics were selected based on results to treat extra ocular affections.

4.3.4 Fluorescein Dye Test (FDT): was performed to diagnose the corneal ulcers in (2) cases.

4.4 EXTRA OCULAR AFFECTIONS AND THEIR TREATMENT

4.4.1 Eyelid affections

Eyelid affections (18) in which Eyelid tumours (5) followed by blepharitis (4), entropion (3), papilloma (2), eyelid laceration (1), eyelid ocular myiasis (1),

ectropion (1) and periocular dermatitis (1) were recorded and treatment was shown in Table 8.

4.4.2 Conjunctiva affections

Conjunctiva affections (43), in which subconjunctival abscess (13) followed by chemosis (5), conjunctival tumours (5) conjunctival haematoma (3), acute conjunctivitis (3), purulent conjunctivitis (3), conjunctival foreign body (2), conjunctival laceration (2), ephiphora (2), ocular myiasis (1), coenurus cyst (1), pterygium (1), pallor of conjunctiva (1), conjunctival dermoid (1) were recorded and treatment was shown in Table 9.

4.4.3 Third Eyelid affections

Third eyelid affections (11), in which third eyelid tumours (2) followed by third eyelid abscess (3), cherry eye (2), third eyelid melanoma (2) third eyelid laceration (1) and massive third eyelid tumour with destruction of eye (1) were recorded and treatment was shown in Table 10.

4.4.4 Cornea & Sclera affections

In Cornea & Sclera affections (26), in which corneal opacity (6) followed by corneal tumours (3), corneal ulcer (2), corneal dermoid (2), corneal epithelial inclusion cyst (2), pink eye (2), corneal foreign body (1), heterochromia eye with episcleritis (1), panophthalmitis (1), corneal melanoma (1), pannus (1), scleral melanoma (1), pthisis bulbi (1), scleral limbal tumour (1) and massive ocular abscess with destruction of vital structures of eye (1) were recorded and treatment was shown in Table 11.

Table: 8 EYELID AFFECTIONS AND TREATMENT

S.No	Anatomical Location	Affections	Treatment
1	Eyelids (18)	Blepharitis	HICOOL eye drops and NSAIDS eye drops
		Eyelid papilloma	Surgical excision of papilloma
		Eyelid tumours involving with eye ball	Enucleation
		Eyelid laceration	Suturing the lacerated wound and applied ONEMOX - DM eye drops
		Eyelid ocular myiasis	Removal of maggots and ZOBRA eye drops and Systemic antibiotics
		Ectropion	Surgical correction
		Entropion	Surgical correction
		Periocular dermatitis	Applied Chloramphenicol with hydrocortisone acetate eye ointment (CD)

Table: 9 CONJUNCTIVAL AFFECTIONS AND TREATMENT

S.No	Anatomical Location	Affections	Treatment	Result
1	Conjunctiva (43)	Acute conjunctivitis	ZOBRA eyedrops & Chloromycetin aplicaps	In all cases were healed without any complications
		Pterygium	Surgical excision	
		Epiphora	ZOBRA eye drops	
		Conjunctival ocular myiasis	Removal of maggots and ZOBRA eye drops and Systemic antibiotics	
		Subconjunctival haematoma	Drainage and Systemic antibiotics	
		Chemosis	ZOBRA eye drops	
		Conjunctival laceration	Suturing and Systemic antibiotics	
		Conjunctival Foreign body	Surgical removal of foreign body	
		Purulent conjunctivitis	ZOBRA eye drops & Chloromycetin aplicaps and Systemic antibiotics	
		Pallar of conjunctiva	None	
		Ocular coenurus cyst	Surgical removal of cyst applied Chloramphenicol with hydrocortisone acetate eye ointment & Systemic antibiotics	
		Subconjunctival abscess	Drainage , ONEMOX- DM eye drops and Systemic antibiotics	
		Conjunctival dermoid	Surgical removal	
		Conjunctival tumour	Enucleation	

Table: 10 THIRD EYELID AFFECTIONS AND TREATMENT

S.No	Anatomical Location	Affections	Treatment	Result
1	Third eyelid (11)	Third Eyelid abscess	Drainage and CD ointment and Systemic antibiotics	In all cases were healed without any complications
		Third Eyelid laceration	Suturing	
		Third Eyelid melanoma	None	
		Cherry eye	Surgical removal	
		Third Eyelid tumour	Surgical removal	
		Massive Third Eyelid tumour with destruction of eye	Enucleation	

Table: 11 CORNEA & SCLERA AFFECTIONS AND TREATMENT

S.No	Anatomical Location	Affections	Treatment	Result
1	Cornea & Sclera	Corneal melanoma	Surgical removal	In all cases were healed without any complications
		Pthisis bulbi	None	
		Pannus	NSAIDS, ZOBRA eye drops and Systemic antibiotics	
		Corneal tumours	Enucleation	
		Scleral melanoma	None	
		Heterochromia eye with episcleritis	NSAIDS eye drops	
		Corneal dermoid	Surgical removal	
		Sclera limbal tumour	None	
		Corneal opacity	ZOBRA eye drops and Systemic antibiotics	
		Pink eye	None	
		Corneal ulcer	Temporary tarsorrhaphy	
		Panophthalmitis	Evisceration	
		Corneal Foreign body	Surgical removal	
		Epithelial inclusion cyst	Opened the cyst & HICOOL gel & Systemic antibiotics	
Massive ocular abscess with destruction of vital structures of eye	Enucleation			

4.5 OUTCOME OF MEDICAL MANAGEMENT AND SURGURY

4.5.1 Abscess

4.5.1.1 Subconjunctival abscess in a Cattle Calf (OS): Drainage the abscess with No.11 BP blade and povidone iodine seton was inserted and applied, ONEMOX- DM eye drops and Systemic antibiotics like Ceftriaxone @ 10 mg/kg b.wt.IM given which showed complete recovery on 9th postoperative day (Plate 105 a,b,c,d).

4.5.1.2 Subconjunctival abscess in a Buffalo calf (OS): (Plate 115 & 116).

4.5.1.3 Subconjunctival abscess in a Buffalo calf (OS): Aspirated the pus and Amoxicillin @ 10 mg/kg b.wt. IM was given and which showed complete recovery on 8th postoperative day (Plate 112 a, b, c, d, e and f).

4.5.1.4 Third eyelid abscess in a Buffalo calf (OS): Drainage and Systemic antibiotics and which completely recovered on 10th postoperative day (Plate 127 & 128).

4.5.1.5 Third eyelid abscess in a Goat (OS): Drainage and ZOBRA eye drops and completely recovered on 5th postoperative day (Plate 131 & 132).

4.5.1.6 Complicated Subconjunctival abscess in a Buffalo calf (OD): Drainage the abscess with No.11 BP blade and applied, ZOBRA eye drops and HICOOL gel with Ceftriaxone @ 10 mg/kg b.wt. and Meloxicam @ 0.5 mg/kg b.wt. IM was given and which showed complete recovery on 9th postoperative day (Plate 121 a, b, c, d).

4.5.2 Haematoma

4.5.2.1 Subconjunctival haematoma in a Cow (OS): opened the hematoma and Systemic antibiotics like Amoxicillin-cloxacillin @ 10 mg/kg b.wt.

IM was given and which showed complete recovery on 7th postoperative day (Plate 110 & 111).

4.5.2.2 Subconjunctival haematoma in a Buffalo calf (OD): opened the hematoma and applied ZOBRA eye drops was given and which showed complete recovery on 12th postoperative day (Plate 119 & 120).

4.5.3 Chemosis

4.5.3.1 Chemosis in a Cow (OS): Subconjunctival injection of Gentamicin and Prednisolone 1ml into the site upto 3 days and which showed complete recovery on 6th postoperative day (Plate 108 & 109).

4.5.3.2 Chemosis in a Buffalo (OD): Flurbiprofen eye drops was used and which showed complete recovery on 9th postoperative day (Plate 117 & 118).

4.5.4 Tumours

4.5.4.1 Subconjunctival Tumour in a Cow (OS): Surgical removal of tumour and Systemic antibiotics like Amoxicillin @ 10 mg/kg b.wt. and Melonex @ 0.5 mg/kg b.wt. IM was given and which showed complete recovery on 12th postoperative day (Plate 106 & 107).

4.5.4.2 Third eyelid Tumour in a Cow (OD): Surgical excision of tumour mass and Systemic antibiotics like Amoxicillin @ 10 mg/kg b.wt. IM and topical CD ointment was applied and which showed complete recovery on 15th postoperative day (Plate 124 a, b, c, d).

4.5.4.3 Third eyelid Tumour in a Cow (OS): Surgical excision of tumour mass and topical CD ointment and HICOOL gel was applied and which showed complete recovery on 6th postoperative day (Plate 125 & 126).

4.5.4.4 Third eyelid Tumour in a buffalo calf (OD): Surgical excision of tumour mass and topical Chloromycetin aplicaps and HICOOL gel was applied and which showed complete recovery on 13th postoperative day (Plate 129 & 130).

4.5.5 Acute Conjunctivitis (OD): ONEMOX-DM eye drops was given and which showed complete recovery on 7th postoperative day (Plate 113 & 114).

4.5.6 Enucleation

4.5.6.1 Enucleation in a Buffalo calf (OS):

Enucleation was performed as per procedure mentioned in the materials and methods (Plate 122 & 123) .Due to presence of ocular tumour, permanent tarsorrhaphy was carried out in the present case. Complete recovery was observed on 15th postoperative day.

4.5.6.2 Enucleation in a Cow (OS):

Enucleation was performed as per procedure mentioned in the materials and methods (Plate 133 a, b, c, d, e). On histopathological examination it was revealed as squamous cell carcinoma (Plate 133 f).

4.5.7 Ocular Coenurus cyst

A 6 months old female kid was presented to the Department of Veterinary Surgery and Radiology, College of Veterinary Science, Proddatur with a history of enlargement of swelling in and surrounding the right (OD) eye and head pressing against the wall for the past one month. General and detailed ophthalmic examination was performed and it revealed that negative menace, no blinking reflex, no discharge, normal sclera, cornea and PLR and enlargement of palpebral conjunctiva, third eyelid, peri ocular and peri orbital swelling in the OD. Hematology and serum biochemical parameters were normal and during fine needle aspiration about 1 ml of clear transparent fluid was removed, which gave clue about cyst in sub conjunctiva. Under local infiltration with 2% Lignocaine

Hel, incising the conjunctiva, the white fluid filled cyst was removed. It was a flabby ovoid structure with many white nodules visible through a very thin wall. On morphological examination, cyst was identified as coenurus cyst. Topical CD ointment and HICOOL gel was applied with Ceftriaxone @ 10 mg/kg b.wt. and Melonex @ 0.5 mg/kg b.wt. IM was given and which showed complete recovery on 21st post operative day (Plate 134 a, b, c, d, e and f).



**Plate:105 a Subconjunctival abscess
in a Calf (OS)**



Plate:105 b Intra operative nick incision



**Plate: 105 c Pus discharge after
incision**



Plate:105 d Post operative 9th day (OS)



**Plate: 106 Subconjunctival tumour
in a Cow (OS)**



Plate:107 Post operative 12th day (OS)



Plate:108 Chemosis in a Cow(OS)



Plate:109 Post operative 6th day (OS)



Plate:110 Subconjunctival haematoma in a Cow (OS)



Plate:111 Post operative 9th day (OS)



Plate:112 Acute conjunctivitis in a bullock (OD)



Plate:113 Post operative 7th day (OD)



Plate:114 Subconjunctival abscess in a Buffalo calf (OS)



Plate:115 Post operative 12th day (OS)



Plate:116 Chemosis in a Buffalo (OD)



Plate: 117 Post operative 9th day (OD)



Plate:118 Subconjunctival haematoma in a Buffalo calf (OD)



Plate:119 Post operative 12th day (OD)



Plate:120 a Subconjunctival abscess in Buffalo calf (OS)



Plate:120 b Aspiration



Plate:120 c Pus observed



Plate:120 d Post operative 2nd day



Plate:120 e Post operative 3rd day



Plate:120 f Post operative 8th day (OS)



Plate:121 a Complicated subconjunctival abscess in a Buffalo calf (OD)



Plate:121 b Post operative 2nd day



Plate:121 c Post operative 3rd day



Plate:121 d Post operative 9th day (OD)



Plate:122 Conjunctival tumour in a Buffalo calf (OS)



Plate:123 Post operative 15th day (OD)



Plate:124 a Third Eyelid tumour in a Cow (OD)



Plate:124 b Intra operative



Plate:124 c Excised mass



Plate:124 d Post operative 15th day (OD)



Plate:125 Third Eyelid tumour in a Cow (OS)



Plate:126 Post operative 6th day (OS)



Plate:127 Third Eyelid abscess in Buffalo calf (OD)



Plate:128 Post operative 10th day (OD)



Plate:129 Third Eyelid tumour in a Buffalo calf (OD)



Plate:130 Post operative 13th day (OD)



Plate:131 Third Eyelid abscess in a Goat (OS)



Plate:132 Post operative 5th day (OS)



Plate:133 a Ocular tumour in a Cow (OS)



Plate:133 b Intra operative



Plate:133 c Excised mass



Plate:133 d Permanent tarsorrhaphy with small opening for seton



Plate:133 e Post operative 25th day (OS)

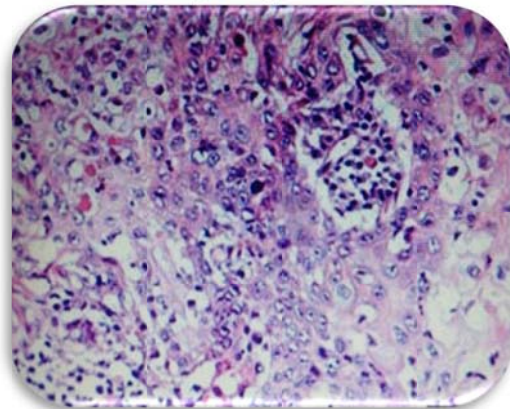


Plate:133 f Histopathology of Squamous Cell Carcinoma of Eye (OS)



Plate:134 a Ocular coenurus cyst in a Kid (OD)



Plate:134 b Fine needle aspiration



Plate:134 c Cyst observed through incision



Plate:134 d Coenurus cyst



Plate:134 e Applied CD ointment



Plate:134 f Post operative 21st day (OD)

Discussion

CHAPTER – V

DISCUSSION

The total of 1286 surgical cases with extra ocular affections of ruminants were presented to the Department of Veterinary Surgery and Radiology, Department of Veterinary Clinical Complex, College of Veterinary Science, Proddatur and Department of Veterinary Surgery and Radiology, College of Veterinary Science, Tirupati over a period of 12 months from October 2016 to September 2017 formed the materials for the study. In which Cattle, followed by Buffaloes, Sheeps and Goats reported extra ocular affections, diagnosed by general, clinical and ophthalmological examination in ruminants. Arafat *et al.* (2016) however reported an incidence rate of 1.93 per cent (2743) ocular affections in farm and companion animals over a period of 12 months and Balagopalan *et al.* (2016) reported an incidence of 3.02 per cent (128) ocular affections in cattle over a period of two years. The incidence reported in this study differs from findings of Vani *et al.* (2016), where 3.80 per cent of cases presented over a period of three years were found to suffer from ocular affections in bovines. The differences in the rates of incidence could be attributed to the differences in species, location and seasonality of the study.

The highest incidence was recorded in cattle, followed by buffaloes, sheep and goats. The findings differed from a similar study by Arafat *et al.* (2016) who reported higher incidence in canines followed by bovine, equine and caprine where as Tamilmahan *et al.* (2013) reported higher incidence in canines, followed by equines, cattle, buffaloes, caprines, equine, felines and lab animals. Similar observations of ocular affections were also reported by Pratap *et al.* (2005) who reported higher percentage of ocular affections in canine, followed by bovine and equine. Vani *et al.* (2016) reported an incidence of ocular conditions in cattle and buffaloes. The differences in the rates of incidence could be attributed to the differences in species, location and also study period.

With respect to the gender the higher incidence was noticed in females compared to males. Among females higher occurrence was recorded of goats

followed by sheep, buffaloes and cattle. Among males higher occurrence was recorded in cattle, buffaloes, sheep and goat. The findings are in agreement with the highest Balagopalan *et al.* (2016). On the contrary Arafat *et al.* (2016) recorded higher occurrence in males compared to females. Higher occurrence was recorded in males of canines and equines and females of bovines and caprines. Tamilmahan *et al.* (2013) also recorded high incidence of ocular diseases in male than female animals. On the contrast they reported the above authors higher incidence in males of canines and equines compared to females where as in cattle, buffaloes and caprines females showed high incidence compared to males. The obvious reason could be that males of canines as pets and males of equines species for draft purpose are preferred over females, whereas females of milk producing animals such as bovines, ovines and caprines are preferred over males.

With respect to the anatomical location, higher rates of extra ocular affections in ruminants were recorded in conjunctiva followed by cornea and sclera, eyelids and third eyelid. The findings are in accordance with similar study reported by Gharagozlou *et al.* (2007), Mosbah (2008) and Balagopalan *et al.* (2016) in cattle.

Among various eyelid affections highest no of cases were eyelid tumours followed by blepharitis (inflammation of eyelids), entropion (inward deviation of eyelids), papilloma (papillomatous growth), eyelid laceration (laceration of eyelid), eyelid myiasis (maggots observed in eyelids), ectropion (outward deviation of eyelids) and periocular dermatitis (inflammation of skin around the orbit). These results are in agreement with Vani *et al.* (2016) who reported higher incidence of Blepharitis followed by Traumatic lacerations of upper eye lids and lower eyelids. Eyelid lacerations should be repaired promptly to prevent lid deformities, infections and exposure induced damage to cornea (Lassaline, 2003). Trauma, punctured wounds on eyelids, conjunctiva foreign bodies like pollen grains, thorns or any sharp objects initially results in inflammation followed by abscess, fibrosis etc. In the present study the traumatic lacerations were sutured under local

anesthesia. Wounds were treated locally by applying antiseptic and antibiotic ointments. Papillomatous growths and benign growths were excised surgically.

Conjunctiva and cornea are the major sites for ophthalmic diseases which needs attention during ophthalmological examination (Town Send 2008). In cattle incidence of squamous cell carcinoma was reported to be more on conjunctiva and cornea. Among various conjunctival affections, highest percentage of cases were subconjunctival abscess (pus observed) followed by chemosis (edema of conjunctiva), conjunctival tumours (mass observed on conjunctiva), conjunctival haematoma (accumulation of blood), acute conjunctivitis (inflammation of conjunctiva), purulent conjunctivitis (pus observed), conjunctival foreign body (foreign material in conjunctiva), conjunctival laceration (laceration of conjunctiva), epiphora (excessive secretion of tears), ocular myiasis (maggots observed), coenurus cyst (cyst observed), pterygium (growth of conjunctiva towards cornea), pallor of conjunctiva (paleness of conjunctiva) and conjunctival dermoid (hair like growth on conjunctiva). These findings were contrary to the observations or findings of Vani *et al.* (2016) who recorded highest percentage of conjunctivitis followed by subconjunctival abscess and pterygium in cattle.

Among Third eyelid affections, highest percentages of cases were tumours (abnormal growth on Third eyelid), followed by abscess cherry eye (prolapse of third eyelid), melanoma and laceration. Vani *et al.* (2016) reported few number of cases in her study.

Congenital abnormalities like dermoids do occur in ruminants which are thought to be genetically transmitted are due to autosomal recessive of polygenic inheritance. In the present study dermoid was found on cornea. Whereas the common seat of predilection is limbus, third eyelid, canthus, eyelid and conjunctiva. The findings are agreement with findings of Town Send 2008.

In cornea & sclera affections, highest percentage of cases were corneal opacity followed by corneal tumours (abnormal growth of on cornea), corneal ulcer (open sore on cornea), corneal dermoid (hair like tissues), corneal epithelial inclusion cyst (cyst observed), pink eye (redness of conjunctiva), corneal foreign body (foreign material in cornea), heterochromia eye with episcleritis (inflammation of sclera), panophthalmitis (inflammation of all coats of eye), corneal melanoma, pannus (neovascularisation of cornea), scleral melanoma, pthisis bulbi (shrinkage of eyeball), scleral limbal tumour (growth on sclera) and massive ocular abscess with destruction of vital structures of eye (destruction of eye). The findings were in accordance with findings of Prashad and Joshi (1980), Osmani *et al.* (2000), Tamilmahan *et al.* (2013), and Vani *et al.* (2016) and these results in contrast to the observations of Miller (2001) and Arafat *et al.* (2016) who reported corneal ulcer as a common condition in companion animal practice. The main reason of corneal opacity in contrast to other eye disorders was mainly due to poor management of commonly occurring external trauma, parasites, violence and foreign bodies (Pratap *et al.* 2005).

The age group of 1 to 5 years had the highest incidence followed by 0 to 1 year age group and over 5 years of age. This finding was in accordance with that of Balagopalan *et al.* (2016) where majority of the animals were aged less than 5 years were calves. Ophthalmic diseases increase with age in horses and ponies (Town Send 2008). This differs from findings of Arafat *et al.* (2016) who found that the higher incidence of ocular affections in younger age group of all species. The age group of 0 to 3 years was most affected, whereas 3 - 6 years old Equines were affected more. This is contrary to the observations or findings of Tamilmahan *et al.* (2013) who reported an increased incidence with age greater than 5 years. Prashad and Joshi (1980) have reported higher incidence in young grazing animals. Movement of animals makes them more prone to traumatic injuries. The specific reasons for increased incidence in aged animals might be attributed to senility and degenerative changes (Town Send 2008).

Among eye affections, left eye (OS) showed higher incidence than right eye (OD) and both eyes (OU). This result was in agreement with that of Balagopalan *et al.* (2016) and Tamilmahan *et al.* (2013) that these animals suffered from systemic diseases, malnutrition and poor management.

The STT is the method most commonly used to evaluate aqueous tear production. The test was performed by restraining the animals prior to other ocular medications and stains (Oliver *et al.* 2008). In the present study conditions related to dryness of eye could not be found.

ABST and Culture was done to identify the antibiotics of choice. Based on the results of Culture and ABST, ceftriaxone and amoxicillin showed the sensitivity in the samples and the same drugs were used to treat the cases. ciprofloxacin and gentamycin were resistant to the samples collected. Appropriate use of antibacterial agent gave complete and satisfactory recovery.

Fluorescein dye test was done to assess the integrity of the corneal epithelium and also conjunctival defects. It has reportedly been used in measurement of intra ocular pressure with Halberg applanation tonometers (Townsend 2008). Though two cases were diagnosed there were treated symptomatically.

Among eyelid affections eyelid tumours were common followed by blepharitis, entropion, papilloma, eyelid laceration, eyelid ocular myiasis, ectropion and periocular dermatitis. This results in agreement with Vani *et al.* (2016). In the present study tumours conditions of eyelids and papillomatous growths were recorded. All the tumours are benign and excised surgically. Inflammation of eyelids (blepharitis) was recorded in few cases out of which few were bacterial and few were mycotic, which were treated according to the etiological agents. Entropion was recorded in few cases with congenital origin and the cases were treated by surgical intervention as per the modified Hotz –Celsus procedure. Eyelid lacerations due to trauma were treated with suturing. Periocular

dermatitis conditions were recorded in the present study and these were attributed to unhygienic management conditions at rural areas. Town Send (2008) observed similar results as noticed in the present study.

Among conjunctiva affections subconjunctival abscess were common followed by chemosis, conjunctival tumours, conjunctival haematoma, acute conjunctivitis, purulent conjunctivitis, conjunctival foreign body, conjunctival laceration, ephiphora, ocular myiasis, coenurus cyst, pterygium, pallor of conjunctiva, conjunctival dermoid. This was contrary to the observations or findings of Vani *et al.* (2016).

In the present study we recorded third eyelid affections where as eyelid tumours were more in number followed by eyelid abscess, cherry eye melanoma, eyelid laceration and massive eyelid tumour with destruction of eye.

In Cornea & Sclera affections incidence of corneal opacity was more followed by corneal tumours, corneal ulcer, corneal dermoid, corneal epithelial inclusion cyst, pink eye, corneal foreign body, heterochromia eye with episcleritis, panophthalmitis, corneal melanoma, pannus, scleral melanoma, pthisis bulbi, scleral limbal tumour and massive ocular abscess with destruction of vital structures of eye. Phthisis bulbi (shrinking of globe) was the end result in Sheep of perforating corneal wounds. This may be due to evacuation of ocular contents following corneal perforation. Similar results were reported by Rebhun *et al.* (1995). The findings in accordance with similar study were done by Prashad and Joshi (1980), Osmani *et al.* (2000), Tamilmahan *et al.* (2013), Vani *et al.* (2016) and these results in contrast to the observations of Miller (2001) and Arafat *et al.* (2016).

Abscess conditions were treated by incision and drainage procedure. Following evacuation of purulent material, irrigating the cavity with mild potassium permanganate or betadine solution and insertion of medicated seton gave promising results. Systemic antibiotic treatment, local dressings and topical

antibacterial medicaments proved to be useful in successful recovery within 9-10 days in the present study.

Hematoma conditions observed in the study were treated by incision and drainage procedure. The blood clots and other tissues were removed.

Chemosis is the edema of conjunctiva were observed in a cow and buffalo. And it was successfully treated with combinations of antibiotic and steroidal and non steroidal anti-inflammatory drugs. Reasons for this condition might be attributed to inflammation and trauma (Town Send 2008).

Conjunctivitis cases observed in the present study were treated with antibiotic ophthalmic drops which showed recovery. The above observations in accordance with similar study were done by Prashad and Joshi (1980), Osmani *et al.* (2000), Tamilmahan *et al.* (2013), Vani *et al.* (2016), Balagopalan *et al.* (2016), and these results in contrast to the observations of Miller (2001) and Arafat *et al.* (2016).

Extra ocular neoplastic conditions were differentiated from other space occupying lesions. Once the conditions were diagnosed as benign or malignant on cytological examination surgical excision was followed in few cases. Enucleation and Evisceration of orbits under local anesthetic techniques were carried out to remove neoplastic growths along with surrounding structures to prevent spread. Permanent tarsorrhaphy was done to prevent external infection. Since there is no chemotherapy or radiation therapy the cases were treated surgically.

Enucleation was performed as per standard manner to treat ocular tumours and permanent tarsorrhaphy was done

Indications for enucleation in this study were neoplasms where intraocular surgery is not feasible by treatment. Enucleation is a common procedure in bovine practice but peer-reviewed literature regarding enucleation in cattle is scarce

(Samad *et al.* 2002; Irby, 2004; Schulz and Anderson, 2010; and Rahman *et al.* 2012). In cattle enucleation procedure is typically referred to as exenteration (Slatter, 2008 and Irby, 2004).

Congenital cysts are reported in sheep and goats at bulbar conjunctiva (Town Send 2008). They appear as soft fluctuating swellings. In the present study case of coenurus cyst was recorded. Surgical removal of ocular coenurus cyst in kid was performed and success in this study. This finding was similar to that of Islam *et al.* (2006) recorded in goat. The cysts often persisted throughout the life of an animal. The life cycle would be completed when the final host, dog or wild canid, ate an infected part of sheep (Taylor *et al.* 2007). The scolices were separated from cyst, processed and examined under microscope. An anterior cone shaped rostellum surrounded with two layers of hooks and four rounded suckers were observed (Bowman, 2009). Surgical treatment of *coenurosis* does not always result in a good outcome (Soulsby, 1982).

The present study revealed many extra ocular conditions of clinical significance requiring proper diagnosis and treatment. Detailed ophthalmological examination differentiated various ocular conditions. Further studies are to be conducted to probe into various intra ocular clinical conditions in ruminants.

Summary

CHAPTER – VI

SUMMARY

- The present work was carried out to study etiopathogenesis, diagnosis and management of extra ocular diseases in ruminants.
- All cases presented to the Department of Veterinary Surgery and Radiology, Department of Veterinary Clinical Complex, College of Veterinary Science, Proddatur and Department of Veterinary Surgery and Radiology, College of Veterinary Science, Tirupati over a period of 12 months from October 2016 to September 2017 were screened for extra ocular affections in ruminants.
- Selected cases were bilateral/unilateral extra ocular affections i.e. eyelids, Conjunctiva, third eyelid and cornea and sclera diseases in ruminants diagnosed by detailed ophthalmic examination i.e Schirmer tear test, Fluorescein dye test, Rose Bengal test and IOP measurement.
- Out of a total of 1286 surgical cases, 98 cases were extra ocular (7.62 %) in which cattle 38 (2.95 %) followed by buffaloes 31 (2.41 %), sheep 17 (1.32 %) and goats 12 (0.93 %).
- Highest incidence was noticed in cattle (38.77 %). Where in females (63.27 %) and males (36.73 %).
- Anatomical location wise distribution of extra ocular affections showed highest incidence in conjunctiva (43.90 %).
- Among various eyelid affections (18), highest percentage was eyelid tumours (27.78 %).

- Among various conjunctiva affections (43), highest percentage was subconjunctival abscess (30.23 %).
- Highest percentage of incidence was third eyelid tumours (27.27 %) in third eyelid affections.
- In cornea & sclera affections (26), highest percentage was corneal opacity (23.07 %).
- The age group of 1 to 5 years had the highest incidence of 52.04 per cent. Highest incidence was recorded in left eye (OS) 48.98 per cent than right eye (OD).
- In eyelid affections i.e eyelid tumours, blepharitis, entropion, papilloma, eyelid laceration, eyelid ocular myiasis, ectropion and periocular dermatitis were recorded.
- In conjunctiva affections i.e, subconjunctival abscess chemosi, conjunctival tumour, conjunctival haematoma, acute conjunctivitis, purulent conjunctivitis, conjunctival foreign body, conjunctival laceration, ephiphora, ocular myiasis, coenurus cyst, pterygium, pallar of conjunctiva, conjunctival dermoid were recorded.
- In third eyelid affections, i.e third eyelid tumours, third eyelid abscess, cherry eye, third eyelid melanoma, third eyelid laceration and massive third eyelid tumour with destruction of eye were recorded.
- In Cornea & Sclera affections i.e corneal opacity, corneal tumours (3), corneal ulcer, corneal dermoid, corneal epithelial inclusion cyst, pink eye, corneal foreign body, heterochromia eye with episcleritis, panophthalmitis, corneal melanoma, pannus, scleral melanoma, pthisis bulbi, scleral limbal

tumour and massive ocular abscess with destruction of vital structures of eye were recorded.

- Subconjunctival abscess, subconjunctival haematoma, chemosis, acute conjunctivitis, third eyelid tumours and ocular coenurus cyst were recorded and detailed medical management and surgical procedure was reported.

- From the results of the study it could be concluded that management of extra ocular affections is possible in ruminants by physical examination, detailed ophthalmic examination, pre operative preparation of the patient, to adopt appropriate medical and surgical management or to assure best results.

Literature Cited

LITERATURE CITED

- Abdullah, F.F.J., Adamu, L., Osman, A.Y., Haron, A.W. and Saharee, A.A (2013). Clinical Management of stage III infectious bovine keratoconjunctivitis associated with *Staphylococcus aureus* in a dairy cow: a case report. *J. Agri. Vet. Sci.* 4: 69-73.
- Ahmed, A.F and Hassanein, K.M.A (2012). Ovine and caprine cutaneous and ocular neoplasms. *Small Ruminants. Res.* 106: 189-200.
- Ajit Kumar and Madhurendra Bachan (2016). Therapeutic Management of Thelaziasis in Goats. *Intas Polivet Vol.* 17 (II): 451.
- Alam, M.M. and Rahman, M.M. (2012). A three years retrospective study on the nature and cause of ocular dermoids in crossbred calves. *Open Vet. J.* 2: 10-14.
- Ali, M.M., Sadan M.A, and Ibrahim A (2015). Ocular field surgery in ruminants. *International Journal of Veterinary Medicine:* pp 1-8.
- 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. *Clinica Veterinaria* 10: 34-36.
- Angelos, J.A., Spinks, P.Q., Ball, L.M. and George, L. (2007). *Moraxella bovoculi* sp. Isolated from calves with infectious bovine keratoconjunctivitis. *Int. J. Syst. Evol. Microbio.* 57: 789-95.
- Arafat I, Gupta A.K, Bhadwal M.S, and Soodan J.S (2016). Occurrence of Ocular Affections in Farm and Companion Animals. *Intas Polivet, Vol.* 17 (II): 336-338.
- Arnab Kr Majje, Chandreyee Sen and Parswanath Mondal. (2016). Surgical Management of Non-Invasive Bulbar Conjunctival Tumor in a Cow. *Intas Polivet Vol.* 17 (II): 488
- Atulya M, Ethiraj K. R, and Jesil Mathew.A (2011). Treatment of Corneal Opacity in Caprines with Autohaemotherapy. *Pharmacology online* 3: 1-2
- Balagopalan T.P, Aruljothi N., Alphonse R.M.D and Ramesh Kumar B (2016), Ocular Affections in Cattle - A Clinical Retrospective Study. *Intas Polivet Vol.* 17 (II): 345-347

- Barkyoumb. S. D and, Leipold, H.W. (1984). Nature and Cause of Bilateral Ocular Dermoids in Hereford Cattle. *Vet. Pathol.* 21: 316-24.
- Barner, R.D. (1952). A study of *Moraxella bovis* and its relation to bovine keratitis. *Am J Vet Res.* 132-144.
- Bheemappa, A., Shivaprakash, B.V., Dilipkumar, D., Sugana, R. and Usturge, S.M. (2013). Comparison of superficial keratectomy with BCG vaccine for treatment of initial stages of eye cancer in bullocks. *M.V.Sc Thesis, KVAFSU, Bidar.*
- Bhume, R. I., Bhokre, A. P, Panchbhai, V. S. (1992). Observations on ocular squamous cell carcinoma in cattle. *Indian Vet. J.* 69, 361-362.
- Bowmann, D.D. (2009). Georgi's Parasitology for Veterinarians, 9th edn. Saunders Elsevier, St Louis. P 35-38
- Boydell, P. (1991). 'Fine needle aspiration biopsy in the diagnosis of exophthalmos. *J. Small Anim. Pract.* 32: 542-546.
- Chakrabarti, A. (1996). A survey of eye diseases of cattle in Tripura state (India). *Sri Lanka Vet. J.* 41: 17-19.
- Chakrabarti, A., Kumar, P., Chandran, P.C., Dey, A., and .Dayal, S. (2014). Prevalence of eye diseases of cattle in Bihar, India. *Journal of Animal Health and Product* 2 (2): 25 – 27.
- Cook, S. C. (1999). Ocular embryology and congenital malformations. *VeterinaryOphthalmology.* 3rd ed. Philadelphia: Lippincott, Williams & Wilkins, Pp.3-30.
- Deas D.W. (1959). A note hereditary opacity of the cornea in British Friesian cattle. *Vet. Rec.*, 71, 619-620.
- Devi, S., Patel, A.M., Kumbhar, R.B., and Jadhav, K.M, (2016). Therapeutic Management of Corneal Ulcer with Hyphema in Bovines A Report of 3 Crossbreds. *Intas Polivet* (2016) Vol. 17 (II): 386-388
- Dhana Lakshmi N, Saibaba M and Phaneendra M.S.S.V, (2016), Clinical Management of Eyeworm Infestation - A Study in 2 Cows. *Intas Polivet Vol.* 17 (II): 457-458.

- Djungu, D.F.L., Retnani, E.D. and Ridwan, Y. (2014). *Thelazia rhodesii* infection in cattle in Kupang district. *Tropical Biomedicine* 31: 444-52.
- Donnelly, K.S., Pearce, J.W., Giuliano, E.A. and Fry, P. R. (2014). Surgical correction of congenital entropion in related Boer goat kids using a combination of Hotz-Celsus and lateral eyelid wedge resection procedure. *Vet. Ophthalmology*. 17: 443-447.
- Dubielzig, R. R. (2002). Tumors of the Eye. In: *Tumors in Domestic Animals*. (Meuten, D. J., Ed.). *Iowa State Press, Ames, Iowa*, pp. 51-54.
- Dubielzig, R..R., Ketring, K.L., McLellan, G.J. and Albert, D.M. (2010). Non-surgical trauma, In: *Veterinary Ocular Pathology - A Comparative Review*. Elsevier, p. 81-114.
- Edwards, J. F. (2002). Three cases of ovarian epidermoid cysts in cattle. *Vet. Pathol.* 39: 744-746.
- Fazili, M.R., Buchoo, B. A., and Bhattacharyya, H.K. (2010). Successful management of a delayed case of a corneal foreign body in a cow. *Turk. J. Vet. Anim. Sci.* 34: 295-98.
- Fubini, S. and Ducharme, N. (2004). Farm Animal Surgery. *Saunders, Elsevier, USA*. P 24-27
- Gaham, H., Masztalerz, F.W.A., John, J.L.J., Koten, J.W. and Oter, W.D. (2006). Treatment of bovine and equine ocular squamous cell carcinoma by radio frequency hyperthermia. *Am. J. Vet. Med. Assoc.* 177:55-61.
- Gahlot TK, Dudi PR, Sharma CK, Bishnoi P, and Purohit S (2007). Surgeries of head and neck region of dromedary camel in India. In: Proceedings of the *International Camel Conference, Rajasthan*, (Recent trends in Camelids research and Future strategies for saving Camels, India), 171-175.
- Gelatt, K.N. and Williams, L.W. (1985). Food Animal Ophthalmology. *Textbook of Veterinary Ophthalmology*, Edited by Gelatt, K.N., 2nd Edition, Lea & Febiger, Philadelphia, p. 622-623.
- Gelatt, K. N. and Wolf, E.D. (1988). The special sense organs, Text Book of Large Animal Surgery. Williams and Wilkins, *Baltimore*.

- Gelatt K (1991): Bilateral corneal dermoids and distichiasis in a dog. *Veterinary Medicine, Small Animal Clinician* 66, 658–659.
- George, L., Mihalyi, J., Edmondson, A., Daigneault, J., Kagonyera, G., Willits, N, and Lucas, M. (1988). Topically applied furazolidone or parenterally administered oxytetracycline for treatment of infectious bovine keratoconjunctivitis. *J. Am. Vet. Med. Assoc.* 192: 1415-1422.
- Gerry Watt and Ballarat (2006). Eye cancer in cattle. *Agri. Note*. P. 1-2
- Gharagozlou MJ, Hekmati P, and Ashrafihelan J (2007). A clinical and histopathological study of ocular neoplasms in dairy cattle. *Veterinarski Arhiv*, 77 (5): 409-426.
- Gilger, B., Bentley, E. and Ollivier, F. (2007). Diseases and surgery of the canine cornea and sclera. In: Gelatt K, (eds). *Veterinary Ophthalmology. 4th Edn., Blackwell Publishing*; p. 690-752.
- Goldschmidt, M.H. and Hendrick, M.J. (2002). Tumors of skin and soft tissues. Meuten D.J. (ed.) *Tumors of Domestic Animals, 4th edition*. 38-41
- Golubovic, S. Z., Latkovic, Z., and Horvatic-Obradovic, M. (1995). Surgical treatment of large corneal dermoid. *Doc. Ophthalmol.* 91:25-32.
- Hillyer, L., Jackson, A., Quinn, G. and Day, M. (2003). Epidermal (infundibular) and dermoid cysts in the dorsal midline of a three-year-old thorough bred-cross gelding. *Vet. Dermatol* 14: 205-209.
- Hollingsworth, S.R. (2003). Corneal surgical techniques. *Clin. Tech. Small Anim. Pract.* 18: 161-67.
- Irby, N.L. (2004). Surgical Diseases of the Eye in Farm Animals. In: *Farm Animal Surgery, Saunders, St. Louis, USA*, Pp 429-459.
- Ismail, S. F. (1993). Ocular dermoids in some farm animals. *Assiut Vet. Med. J.* 30:212-217.
- Islam, S., Kalita, D., Bhuyan, D., Rahman, T., and Saleque, A. (2006). Ocular coenurosis in goat. *Journal of veterinary parasitology*, 20(1): 53-55
- Ivany, J.M. (2004). Farm Animal Anesthesia. In: Fubini S, Ducharme NG (eds). *Farm Animal Surgery, Saunders, St. Louis, USA*, p. 97-112.

- Jahangirbasha D, Shivaprakash B.V, Dilipkumar D and Bhagvantappa B (2016), Superficial Keratectomy and Silver Nitrate Application for Management of Corneal or Limbal Neoplasms in Bullocks. *Intas Polivet Vol. 17 (II): 480-485.*
- Jena B, Ahmed A, and Pagrut NK (2015). Successful Management of Upper Eyelid Laceration in a Dromedary Camel (*Camelus dromidarius*). *Advances in Animal and Veterinary Sciences. 3(4): 133-135.*
- Joyce, J.R. (1981). Diseases of ocular structures. In: J.L. Howard (Editor), *Current Veterinary Therapy*. W.B. Saunders, *Philadelphia, PA*, 1053 pp.
- Killinger, A. (1977). Economic impact of infectious bovine keratoconjunctivitis in beef calves. *Vet Med Small Anim Clin Agric Pract. p. 618-620.*
- Kilic, N., Toplu, N. and Epikmen, E.T. (2012). Surgical Treatment of Corneal Large Dermoid in a Simmental Calf. *Acta Scientiae Veterinariae, 40: 1041.*
- Lassaline, M.E. (2003). Emergency treatment of ocular trauma. In: *Vety. Ophthalmology* P. 51-56
- Lia, R.P., Traversa, D., Agostini, A. and Otranto, D. (2004). Field efficacy of moxidectin 1 percent against *Thelazia callipeda* in naturally infected dogs. *Vet. Rec. 154 : 143-145.*
- Macasai, M.S. (2011). Surgical Management and Rehabilitation of Anterior Segment Trauma. In: *Cornea*. Ed. Krachmer J.H., Mannis, J.M. and Holland E.J, 3rd Edn., Mosby, *Elsevier Inc.* p. 1655-69.
- Manjunath S.P, Dhanalakshmi H, Placid E.D'Souza, Chandregowda C.T and Veena M (2016). Prevalence and Management of Eyeworms in Cattle. *Intas Polivet Vol. 17 (II): 452-454.*
- Menditti, D., Laino, L., Ferrara, N. and Baldi, A. (2008). Dermoid cyst of the mandible: a case report. *Cases J. 1:1-3.*
- Martins, T.B, Claudio S.L., and Barros (2014) Fifty years in the blink of an eye: Aretrospective study of ocular and periocular lesions in domestic animals. *Pesq. Vet. Bras. 34(12):1215-1222.*

- Miller, W.W. (2001). Evaluation and management of corneal ulceration: A systematic Approach. *Clin. Techn. Small Anim. Pract.* 16: 51-57.
- Miller, P.E. (2008). Uvea. Slatter's Fundamentals of Veterinary Ophthalmology. 4th Edition, Saunders, *Elsevier Publishers*, p 203-29.
- Mosbah, E. (2008). Surgical management of some ocular affections in domestic animals. *Suez Canal Vet. Med. J.* 13: 601-624.
- Moore, P.A. (2003). Diagnosis and management of chronic corneal epithelial defects (Indolent corneal ulcerations). *Clin. Tech. Small Anim. Pract.* 18: 168-177.
- Moore, C.P. and Whitely, R.D. (1984). Ophthalmic diseases of small domestic ruminants. *Vet. Clinics of North America: Large Animal Pract.* 6:641-65.
- Munoz, E., Leiva, M., Naranjo, C. and Peña T. (2007). Retrobulbar dermoid cyst in a horse: a case report. *Vet. Ophthalmol.* 10: 394-397.
- Olliver F J, Plummer C E, and Barrie K P (2008). Ophthalmic examination and diagnostics in test book of essentials of veterinary ophthalmology by Krick N Gellat 2nd Edition Wiley-Blackwell Publication P. 16-18.
- Osmani, T., Hassain, M .A., Rahman,M. M., and Alam,M .R (2000) Corneal opacity in Cattle. *Bangladesh Vet*, 17:42–5.
- Otranto, D. and Dutto, M. (2008). Human thelaziasis Europe. *Emerging Infectious Diseases* 14: 647-49.
- Otranto, D. and Traversa, D. (2005). Thelazia eyeworm An original endo and ectoparasitic nematode. *Trends Parasitol.* 21: 1-4.
- Panchbhai, V.S., Kulkarni, P.E. and Deshpande, B.B. (1987). Some observations on ocular growths in cattle. *Indian Vet. J.* 64: 29-32.
- Pandey, S.K., Bhargava, M., Chandrapuria, V.P. and Tiwari, S.K. (1989). A note on the incidence of ocular tumors in bovine. *Indian Vet. J.* 10: 161-163.
- Pandey, S.S., Bharti, B., Patidar, A. and Shukla, N. (2011). Surgical correction of corneal dermoid in a cross bred calf. *Veterinary Practitioner* 12:1:-33.
- Payne, R.J., Lean, M.S. and Greet, T.R. (2009). Third eyelid resection as a treatment for suspected squamous cell carcinoma in 24 horses. *Vet. Rec.* 165: 740-743.

- Prakash S, Kumaresan A and Selvaraju M (2016), Therapeutic Management of Eye Worm Infestation - A Report of 3 Bovines. *Intas Polivet Vol. 17 (II): 455-456.*
- Prashad, J. and Joshi, S.V. (1980). Studies of clinicopathics of grazing animals in tropics corneal opacity syndrome. Recommended under different geographical location. *Indian Vet J. 57: 810-815.*
- Pratap, K., Amarpal., Aithal, H. P., Hoque, M., KinjavdekarP., and Pawde, A. M. (2003) Survey of eye disorders in domestic animals. *Indian J Anim Sci, 75:33-34.*
- Rahman, M.A., Islam, M.A., Talukder, A.K., Parvin, M.S. and Islam, M.T. (2012). Clinical diseases of ruminants recorded at the Patuakhali science and technology University veterinary clinic. *Bang. J. Vet. Med. 10: 63-73.*
- Ravi Kumar P, Devi Prasad V, Bhagya Raju D, Makkena Sreenu and Sailaja B (2016) Repair of extensive eyelid laceration with exposed lacrimal gland in buffalo – a report of two cases. *International Journal of Science, Environment and Technology, Vol. 5, No 4, 1946 – 1951.*
- Rebhun, W.C., Guard, C. and Richards, C.M. (1995). Ocular diseases In Dairy Cattle. Williams & Wilkins, Baltimore, Philadelphia, Hong Kong, London, Munich, Sydney, Tokyo. p.443.
- Sakul H, and Kellom T.R (1996). Heritability of entropion in several US sheep breeds. *Small Ruminant Research. 23 187- 190.*
- Samad, M.A. (2002). Observations of clinical diseases in ruminants at the Bangladesh Agricultural University, Veterinary Clinic. *Bangladesh Veterinary Journal 35: 93-120*
- Sarangom, S.B., Baburaj, N.K., D Sa, T.E. and Venugopal, S.K. (2012). Surgical repair of corneal laceration complicated by iris inclusion in a dog. *Vet. World. 5: 631-633.*
- Sastry, G.A. and Rama Rao, P. (2005). *Veterinary Pathology. 7th Edition. p. 247-248 and 524.*
- Schulz KL, and Anderson DE (2010). Bovine enucleation: A retrospective study of 53 cases (1998-2006). *Can Vet J, 51, 611-614.*

- Shen, J., Gasser, R.B., Chu, D., Wang, Z., Yuan, X., Cantacessi, C. and Otranto, D. (2006). Human thelaziosis - A neglected parasitic disease of the eye. *The J. Parasitol.* 92: 872-875.
- Sheila M.C (2005). Test book on Notes on veterinary ophthalmology, 1st Edn., *Blackwell*. P; 79-82
- Shields, J. A., Laibson, P. R., Augsburger J. J., and Michon, C. A. (1986). Central corneal dermoid: a clinicopathologic correlation and review of the literature. *Can. J. Ophthalmol.* 21(1):23-26.
- Slatter, D. (2003). Textbook of Small Animal Surgery, 3rd Edn., *Saunders Publications*, p.1310.
- Slatter, D. (2008). Textbook of Small Animal Surgery, 4th Edn., *Saunders Publications*, p.1310.
- Snowder, G.D., Van Vleck, L.D., Cundiff, L.V. and Benneth, G.L. (2005). Genetic and environmental factors associated with incidence of infectious bovine keratoconjunctivitis in preweaned beef calves. *J. Anim. Sci.* 83: 507-18.
- Soulsby, E.J.L. (1982). Helminths, Arthropods and Protozoa of Domesticated Animals. 7th ed., Baillière Tindall, London. p. 123-25.
- Sunandhadevi S, Arun Nehru P and Muniyappan N (2016). Clinical Management of Infectious Bovine Keratoconjunctivitis in a Cow. *Intas Polivet Vol.* 17 (II): 366-367.
- Tamilmahan, P., Zama, M. M. S., Pathak, R., Muneeswaran, N. S. and Karthik, K. (2013). A retrospective study of ocular occurrences in domestic animals: 799 cases. *Vet. World* 6: 274-76.
- Taylor M.A., Coop, R.L. and Wall, R.L. (2007). Veterinary Parasitology. 3rd Edn. Oxford, UK: Blackwell Publishing. p. 96-98.
- Town Send W.M (2008). Food and fiber producing animal ophthalmology in text book of Essentials of veterinary ophthalmology Edited by Kirk N. Gelatt 2nd Edition Wiley-Blackwell. P 381-388.

- Udehiya R.K, Verma P, Mahajan S.K and Mohindroo J (2016). Surgical Repair of Traumatic Corneal Laceration in a Cow. *Intas Polivet Vol. 17 (II)*: 389-390.
- Vani G, Dhana Lakshmi N, Saibaba M, Veena P and Mallikarjuna Rao Ch (2016), A Retrospective Study on Ocular Affections in Bovines. *Intas Polivet Vol. 17 (II)*: 339-344.
- Vidya Sagar P, Raghunath M and Sailaja B (2016). Surgical Management of Entropion by Modified Hotz Celsus Technique in a Cow. *Intas Polivet Vol. 17 (II)*: 424-425.
- Whittaker, C. Thomas J (2003). Ophthalmology in animals and production. In Gelatt, K.N. *Ophthalmology veterinary. Manole: Barueri, , p.377-412.*
- Wilcock, B.P. (1993). The eye and ear. In: *Pathology of Domestic Animals*, 4th edn, Academic Press, Diego, p. 512-15.
- Williams, D.L., Barrie, K. and Evans, T.F. (2002). *Veterinary Ocular Emergency*. 1st Edn., Butterworth/Heinemann, New Delhi, p. 60-62.
- Xue, C., Tian, N. and Huang, Z. (2007). *Thelazia callipaeda* in human vitreous. *Can J Ophthalmol.* 42: 884-885.
- Yeruham I, Perl S, and Liberboim M. (2002). Ocular dermoid in dairy cattle - 12 years survey. *Revue de Medecine Vétérinaire.* 153(2): 91-92.