



Preliminary Report on the Occurrence of Ocular Disorders among One-humped Camel (*Camelus dromedarius*) Raised at Al Butana Plain, Sudan

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ABSTRACT:

Sudan possess a large population of camels raised in different ecosystems, and used for both meat and milk production. Through, camel industry has substantial contribution in Sudan economy, camel diseases posse paramount economic loss for pastoral sector of the country. There are no systemic surveys that document the prevalence of eye infections among Sudanese camels. In the present cross sectional herd base study, the occurrence of ocular disorders among camels at Tamboul livestock market was carried out over a 12-month survey period from November 2017 to December 2018. The study was intended to diagnose different types of clinical ocular diseases and to correlate their occurrence according to season, age and gender of examined animals. The overall prevalence of ocular disorders was 11.25%. Identified eye affections were hypopyon uveitis (24.76%), corneal opacity (cataract) (19.05%), conjunctivitis (14.29%), keratitis (12.38%), Blepharitis (10.48%), rupture or absent of eyeballs (8.57%), glaucoma (3.81%) entropion (2.86%), corneal neoplasm (1.90%), dacryocystitis (0.95%) and staphyloma (0.95%). She camels were more susceptible to ocular diseases than male camels. Autumn season shows high incidence of ocular disorder followed by winter and summer seasons, respectively. The high incidence of ocular disorders was found among the age group 6-10 years (46.67%) and less among the age group 1-5 years (12.38%). Blindness was reported to occur in forty- eight cases (45.71%) among different causes of ocular disorders in this study. The highest occurrence rate observed for infected animals at the age between 6-10 years.

Keywords: one-humped camel; ocular; disorders; blindness, Sudan

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INTRODUCTION:

Sudan ranks second in the Arab world and second in Africa for camel

population. Camels in the Sudan are found in Eastern region; Butana plain and Red Sea hills, and in the Western

regions; Darfur and Kordofan (Eisa and Mustafa, 2011), the camel stock in Eastern region of Sudan comprise about 25.7% of the country camel population (Darosa, 2005). Camel is of significant socio-economic importance in many parts of the world, especially arid and semi-arid areas. Its milk constitutes an important component needed for human diet (Elhatmi *et al.*, 2007). Camels suffer from a wide range of ophthalmic infections, such as laceration of cornea, eyelids panophthalmos, corneal opacity and descemetocoele (Gahlot, 2012). Ocular affections in camels, like in most other livestock, can cause debilitating condition that can severely affect animal productivity. Occasionally, damage to the eye can be severe enough and may lead to blindness (Gilger, 2017).

The eye infection is more common in camels than other ruminants. The occurrence is high during rainy seasons. This could be related to traumatic effects resulted either from thorn of shrubs in pasture or due to irritation resulted by flies, ticks, mange infestations. Furthermore, concurrent contagious ecthyma may lead to eye injuries which get further complicated by bacterial infections (Kachhawah *et al.*, 2013). One humped camel frequently affected by corneal injury or ulcer. Less reported ocular cases were acute conjunctivitis, unclassified eye ball problem, blepharitis, chronic conjunctivitis and keratitis. Female animals appeared more susceptible for ocular problems (Ranjan *et al.*, 2016).

Meager information regarding occurrence of eye affections in camel in Sudan was exist. To best of our knowledge, this is the first systemic survey intended to report on the occurrence of eye diseases among one

humped camels in al Butana plain, Sudan.

MATERIALS AND METHODS:

Study area: The present investigation was done at Tamboul livestock market, one of the biggest markets for camels in Sudan, located in the Eastern region of Gezira State, 150 km from Khartoum, the capital of Sudan.

Study animals: Longitudinal cross-sectional herd-based study include nine hundred and thirty three camels, with variable health conditions sex and age, during winter, summer and autumn seasons from November 2017 to December 2018 were clinically examined for eye problems. 105 camels suffered from different ocular. These animals were recruited from different part of Sudan; Kassala, Darfur and Kordofan States. Camels clinically examined for eye problems and selected for this study comprised both riding and draught animals. As there was no previous study on camel eye affection in Sudan, the previous prevalence of eye disorders was adjusted to a summed that 50% of the camel population was infected, hence, sample size required was calculated based on the following formula

$$N = Z^2 pq/d^2$$

Where n= required sample size

Z= confidence level which equal to 1.96 at .05

Q=1-p

P=previous prevalence

$$N = 1.96 \times 1.96 \times 0.05 \times 1 - .05 / .05 \times .05 = 384$$

To decrease the error of randomization, the sample was increased twice and 933 animals were recruited in the study.

Clinical examination: Clinical examination of infected animals was based on Kelly (1984). Ocular examination, assisted by ophthalmoscopy, was carried out after

physical restraint of camels. The eyes were examined at day light for the presence of ocular discharge, congestion, conjunctival swellings and eyelid lesions. The anterior chamber, iris and lens were examined using ophthalmoscope according to (Stades *et al.*, 2007 and Gelatt *et al.*, 2013). Confirmations of malignant eye tumors were performed by histopathological

examination according to (Robert and Kenneth, 2002).

RESULTS:

Out of 933 camels examined for the presence of ocular disorders, 105 were found to be affected with the ocular disorder with overall prevalence of 11.25%. The breakdown of this prevalence according to type and sites of affection was shown in Table (1).

Table (1): Sites, number and incidence of eye infection for 105 camels

Sites Type of eye conditions	Right eye (No)	Left eye (No)	Total	Percentage %
Blepharitis	8	3	11	10.48
- Hordeolum (Stye)	1	0		
-Injury in eyelids or around	0	1		
-Tick infestation	6	2		
-Mites infestation	1	0		
Dacryocystitis	0	1	1	0.95
Entropion	1	2	3	2.86
Conjunctivitis	7	8	15	14.29
Keratitis	9	4	13	12.38
- Keratoconjunctivitis	5	3		
- Pigmentary keratitis	2	1		
- Ulcerative keratitis	2	0		
Cataract (corneal opacity)	8	12	20	19.05
Hypopyon uveitis	11	15	26	24.76
Corneal neoplasm	1	1	2	1.90
Staphyloma	1	0	1	0.95
Glaucoma	3	1	4	3.81
Rupture or absent of eyeballs	4	5	9	8.57
Total	53	52	105	100%

Description of eye disorders: Blepharitis was found 11 cases, most of cases were distributed with thickened eyelids, redness, edema, blepharospasm and epiphora due to tick infestation spreading over the periphery of the lower and/or upper eyelid, and injury around eyeball causes crust and erosion of eyelid. One case suffered hyperemia swelling and pain in upper eyelid margin known by hordeolum (stye). Also

thickening and crust in upper eyelid of right eye due to mites (*Sarcoptic* and *Psoroptic* mange) (Figure 1 a&b).

Dacryocystitis was found in one case in the left lacrimal sac of eye. This case showed chronic exudative, accumulation of pus and flies infestation in medial canthus. Three cases of entropion were found either upper or lower eyelids with signs of excessive watering lacrimation

and chronic corneal ulcer in affected

A



eyes (Figure 2 a&b).

B

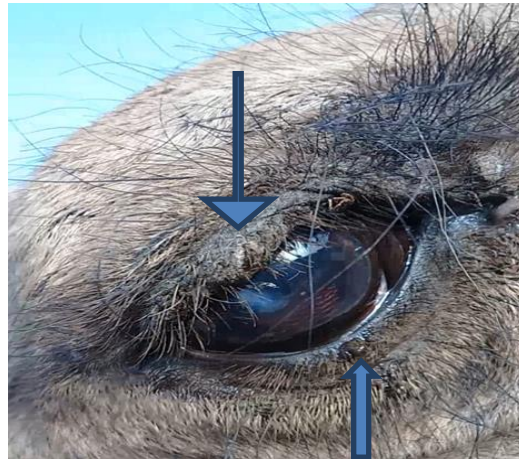


Figure (1): Blepharitis causes by tick infestation in upper and lower eyelids (A) and mange in upper eyelids note crust and tick in lower eyelids (B)

A



B



Figure (2): Entropion in upper eyelid (A) and in lower eyelid (B)

Fifteen cases of conjunctivitis; 10 cases were acute while 5 cases were chronic forms. The clinical signs were showed hyperemia, edematous, excessive lacrimation and either seromucoid or purulent ocular discharge (Figure 3 a & b).

The Keratitis was found in 13 cases; eight cases were diagnosed as keratoconjunctivitis. These cases were

characterized by all conjunctiva blood vessels; hyperemic, excessive ocular discharge, epiphora and corneal oedema (Figure 4).

Pigmentary keratitis causes by foreign bodies found in three cases that caused small pool of blood and reddish tinge at bottom of eye chambers, there were complete loss of vision among affected camels (Figure 5 a & b).



Figure (3): Acute conjunctivitis with hyperemia and edematous conjunctiva (chemosis) (A), and chronic conjunctivitis with chronic excessive lacrimation, note the seromucoid and purulent ocular discharge (B)



Figure (4): Kerato-conjunctivitis on right eye. Note excessive mucoid discharge, hyphemia and congestion of eye vessels

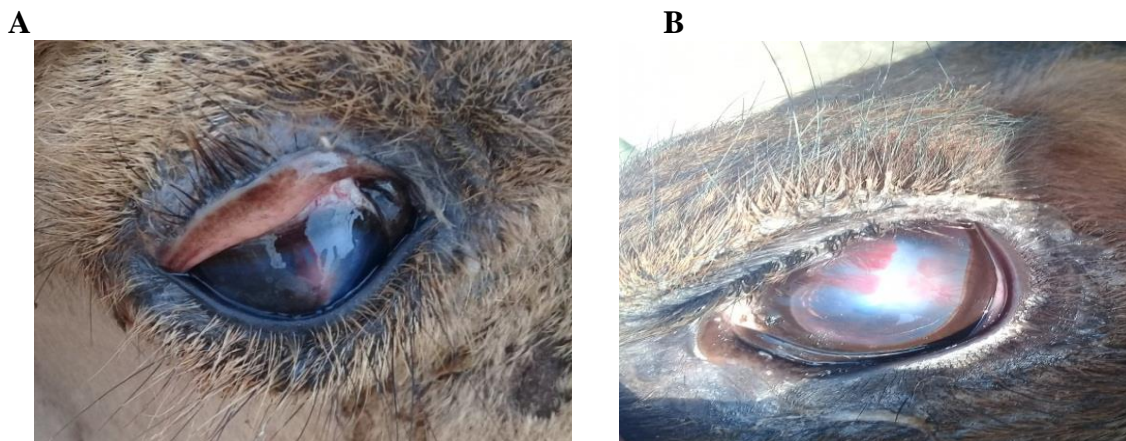


Figure (5): Blindness due to Pigmentary keratitis affecting both left and right eye

Two cases were found with corneal epithelial defect and sign of lacrimation

and photophobia; this diagnosed as ulcerative keratitis (Figure 6).

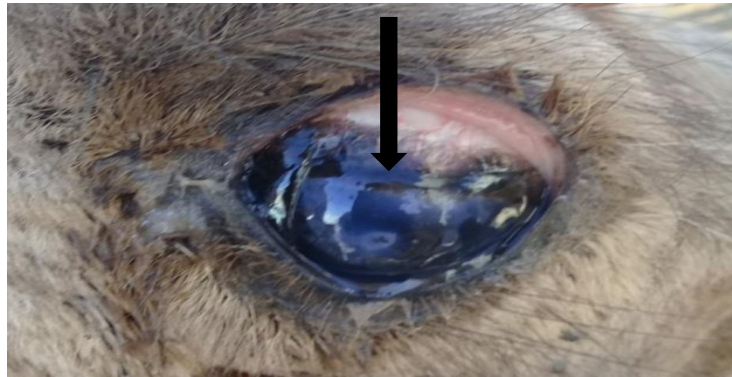


Figure (6): Ulcerative keratitis note deep corneal ulcer

Twenty cases were found affected by corneal opacity (cataract), the clinical signs were change color of lens to dark blue and corneal opacity with complete

defect response of pupil and eyelids and loosed vision in affected eyes (Figure 7 a &b).



Figure (7): Corneal opacity (cataract)

Staphyloma was diagnosed in one case characterized by dark to black bulge in layer of eye (Figure 8). Squamous cell carcinoma was found in two cases around corneal. The sign of lacrimation

due to irritation and excessive blepharospasm, also one case observed blood excreted from tumor and bloody discharge (Figure 9 a &b).

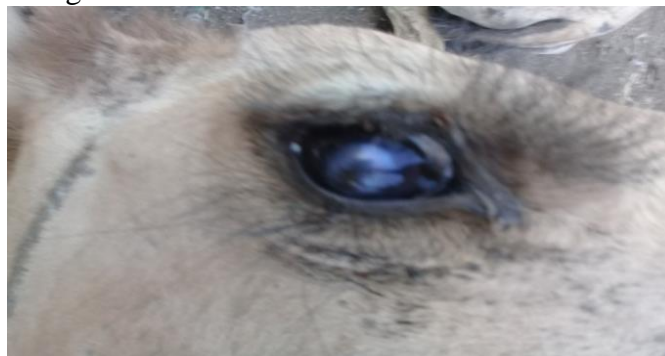


Figure (8): Staphyloma of right eye of infected camel. Note out pocketing of the fibrous tunica of episclera

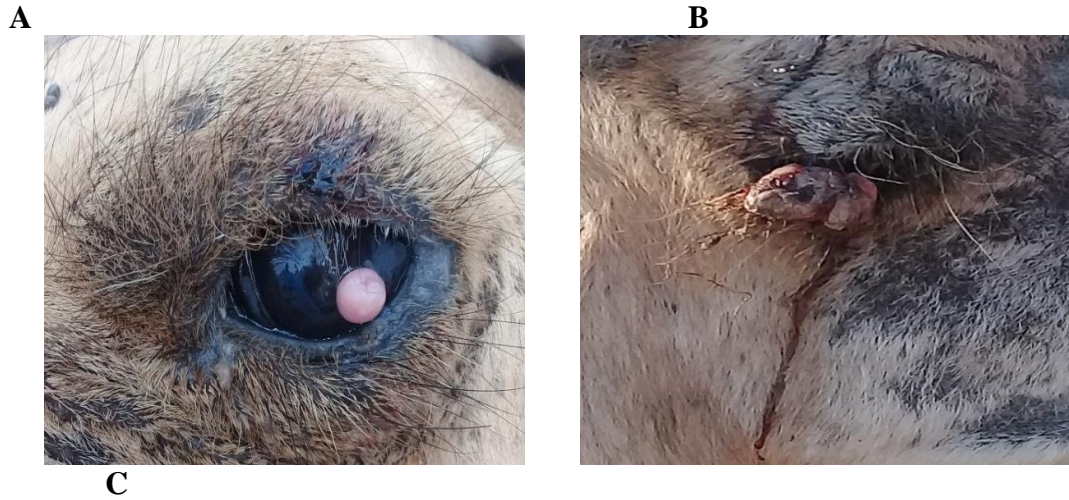


Figure (9): Squamous cell carcinoma observed around the cornea of left and right eyes (A&B) Note multi-keratinitis of squamous cells histopathological section stain H&E, $\times 10$ (C).

Twenty six cases showed malty spots of pus in anterior chamber of eyes without

any effect of the vision, they known as hypopyon uveitis (Figure 10 a & b).

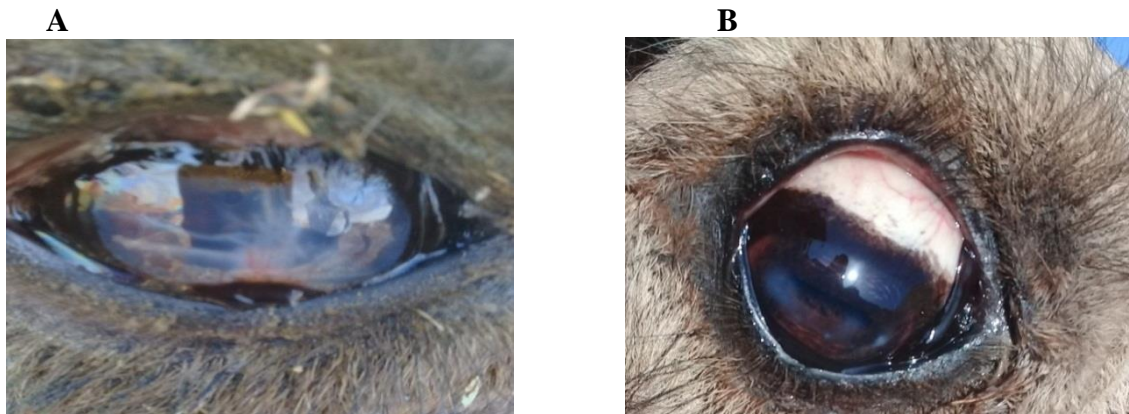


Figure (10): Hypopyon uveitis, note pus covering the uveal coat (A) and small spots of pus in iris (B)

Four cases of glaucoma characterized by redness of eye; large vessel injection of the episclera, and mild dilated of pupil, protruding eye ball and prominent (Buphthalmia) and change in optic nerve than normal when examined by

ophthalmoscope (Figure 11 a &b). Nine cases were examined for ocular disorders, there were rupture of the eyes without any signs of infection and abnormal discharges (Figure 12 a &b).



Figure (11): Buphthalmia and blindness reflecting occurrence of Glaucoma in right and left eye of infected camel

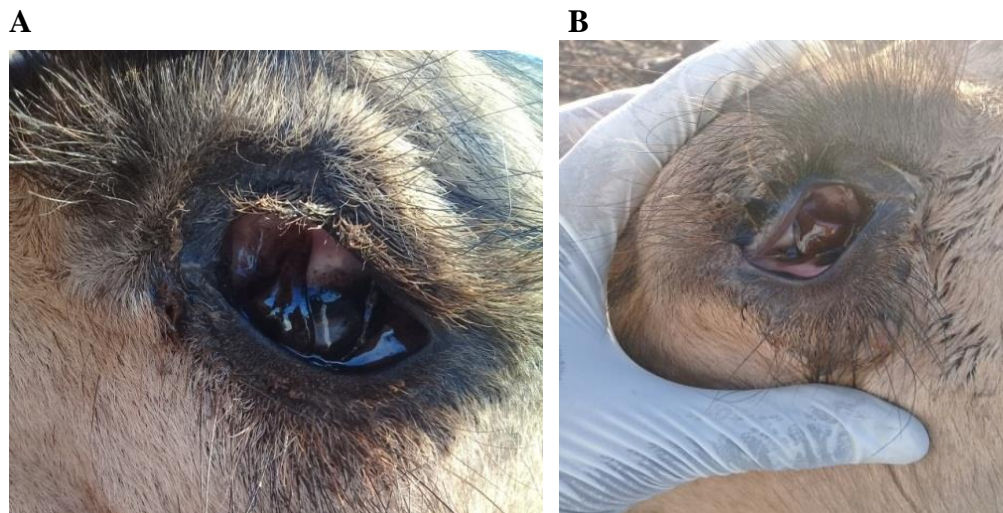


Figure (12): Blindness due to absent of the eyes without any signs of infection

Causal Factors for ocular disorder occurrence: According to the sex of affected animal ocular disorders were detected to affect more significantly females (11.73%) than male camels (5.56%) ($p < 0.05$). It was observed that forty-three cases of ocular disorders

were diagnosed during autumn season, thirty-four during winter season and twenty-eight cases were detected during summer season. The effect of season on the incidence of ocular disorders were not significant at ($p < 0.05$) (Figure 13).

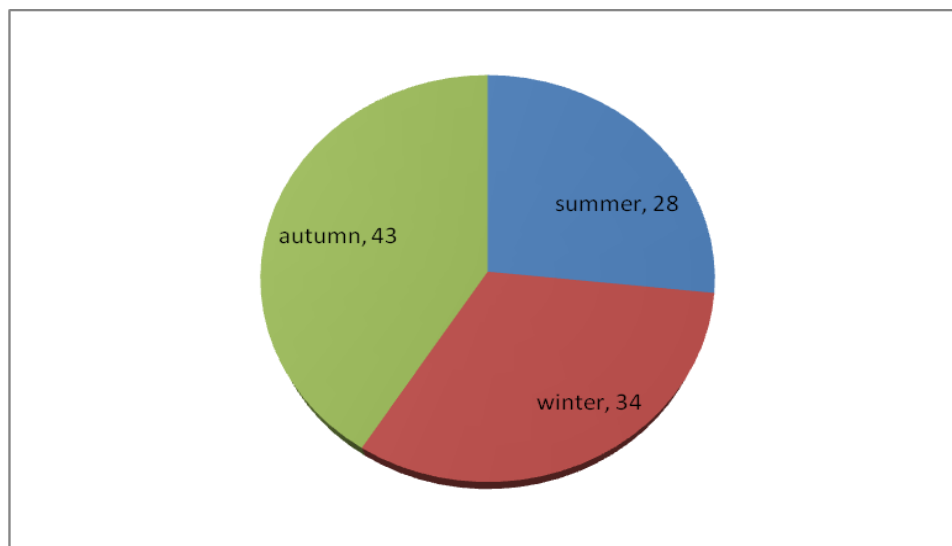


Figure (13): The effect of season on the ocular disorders

The age of camels affected with ocular disorders ranged from 1 to 18 years old. (12.38%) among the age group 1-5 years, the highest incidence rate was found among the age group 6-10 years

(46.67%), followed by (25.71%) of cases among the age group 11-15 years and finally (15.24%) of cases were recorded among the age group 16≤ years (Figure 14).

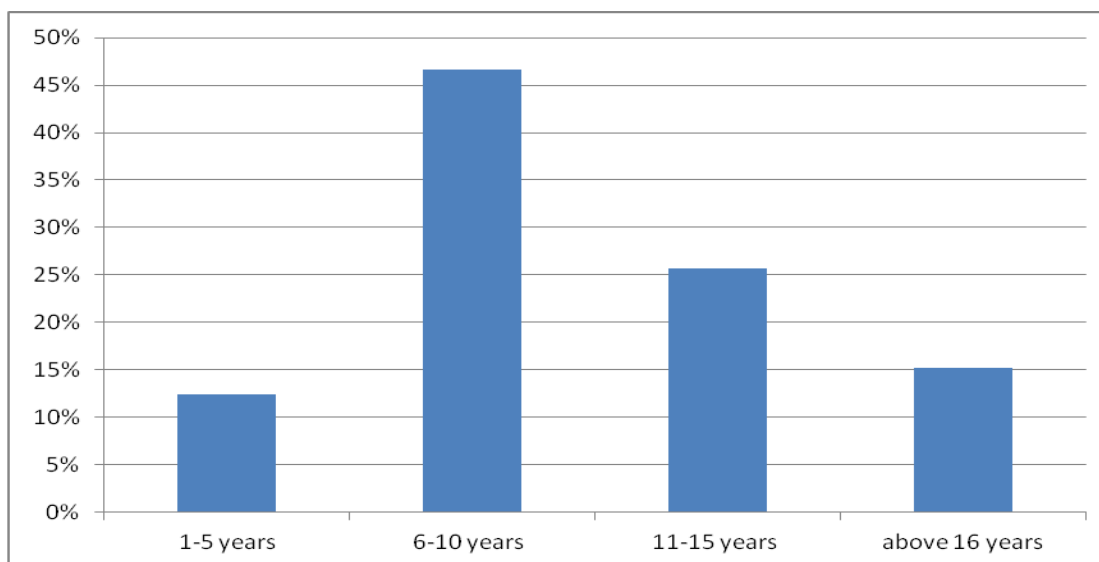


Figure (14): Frequency distribution of ocular infections among different of age groups of infected camels

The prevailing of blindness conditions, as a complication for eye infection, was recorded to affect animals among different age groups.

The frequency of its occurrence is highest among the age group 6-10 years

(50%), followed by the age group 11-15 years (27.08%), then the age group 16≤ years (14.58%). The lowest incidence of blindness from examined camels was found among the age group 1-5 years (8.33%) (Figure 15).

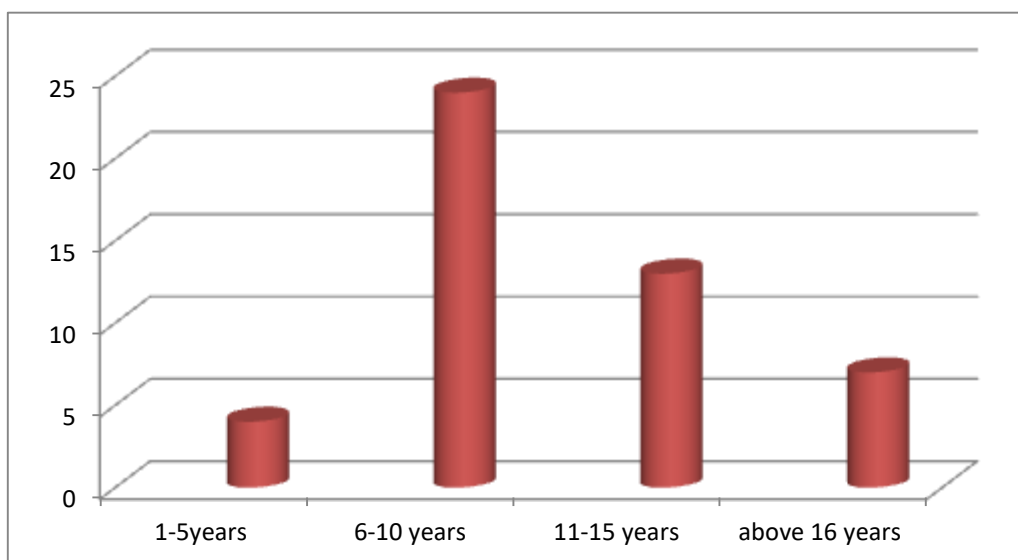


Figure (15): Frequency distribution of blindness among different age groups of infected camels

DISCUSSION:

Ocular affections are among the most widely spread and serious camel diseases that leads to blindness. The condition is frequently reported along other infectious conditions of the dromedary in Sudan. Eye infection causes paramount loss among the pastoral Sudanese communities. Hence, aggravating their suffering from poverty and social restlessness. The current cross-sectional herd based study was designed, to report for the first time, on the prevailing of ocular disorders among dromedary camels raised in Tamboul, Sudan

In this study, the overall prevalence of ocular disorders among camel was 11.25%, this rate is closely matched to the work reported by Fahmy *et al.*, (2003), they documented the occurrence of ocular diseases among camels in Egypt up to 10.4%. The prevalence in the present study was lower than the 19.6 % prevalence that reported by Ranjan and his colleagues. (2016) ; the 22.52% Kumar *et al.*, (2016). In Contrary to this study, Ismail (1987)

found 0.97% cases of camels have eye affection among various domestic animals.

The Blepharitis, is frequently reported among dromedary camels under investigation, it could be due to secondary affection of injury produced may be during grazing and/ dourness of herdsman or parasitic infestation by mites and ticks. The signs observed were similarly recorded in studies done by Fahmy *et al.*, (2003) and Ranjan *et al.*, (2016). Symptoms of hordeolum (stye) found in this study were similar to that reported in other animal's ocular disorders (Gelatt *et al.*,2013).

The conjunctivitis symptoms in the current study were similar to that recorded by Tamilmahan *et al.* (2013) in other domestic animals. The 10 acute and 5 chronic conjunctivitis cases reported in the present survey were found to be higher than reported by Ranjan *et al.*, (2016) who recorded four and two cases of acute and chronic conjunctivitis respectively.

The Hypopyon uveitis showed the highest incidence of ocular disorder diagnosed (24.76%) in this study, this

might be attributed to irritation by tick's infestation, hairs of eyelids or prickled by thorny trees in pasture that leads to secondary bacterial infection. The infection rate of corneal opacity (cataract) among dromedary camels at Tamboul was 19.05%, been next to Hypopyon uveitis in the present study, was in agreement with study done by Kumar *et al.*, (2016) who reported the corneal opacity had highest incidence followed closely by eye lids laceration. Keratitis (as kerato-conjunctivitis), hyphema and corneal ulcer were found to be lower than that reported by El-Tookhy and Tharwat (2012). Glaucoma was found in four cases with clinical signs similar to that described by El-Tookhy and Tharwat (2012) in dromedary camels and by Gilger (2017) in horses.

The frequency of female camels acquired ocular disorders appeared to be more than male camels, which may be due to the increased number of female camels observed in this study, this finding is in agreement with study reported by Ranjan *et al.*, (2016) and in contrast to the study done by Kumar *et al.*, (2016) who recorded the incidence of surgical affections of ocular region was high in male camels compared to female camels.

The highest numbers of ocular disorders in the present study were recorded in autumn season followed by winter season and then summer. These were in contrast to study of El-Tookhy and Tharwat (2012) who reported that highest incidence of ocular problem was found in winter season followed by summer season and rainy season.

During this study, the high incidence of ocular disorder was found among the age group 6-10 years followed by the age group 11-15 years. These are in

agreement with study by Ranjan *et al.* (2016) who recorded the high incidence of ocular affection found in the age group 10 years and above and increase incidence of ocular problems with age of the animal.

In the present study the blindness was found in 45.71% (84) cases, as a result of different causes of ocular disorders. This was similar with that reported by El-Tookhy and Tharwat (2012) who recorded the blindness was the highest problem affecting the posterior segment of the eye in dromedary camels. Rebhun *et al.*, (1988) described the ocular lesions included retinal detachment, optic disc necrosis, and hemorrhage causes blindness in affected llamas and alpacas. The incidence of blindness in present study was higher than that reported by Tenaw *et al.*, (2015) who found 4.44% (2) cases in Ethiopia, during ante-mortem examination.

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