

## Prevalence and associated risk factors of ophthalmic problems of working donkeys (*Equus asinus*) in Mekelle, Northern Ethiopia

Teklay K.<sup>1</sup>, Habtom K.B.,<sup>1\*</sup>, Yohannes H.W.,<sup>1</sup> Berhe M.M., Netsanet B.G.<sup>1</sup> and Muuz, G.<sup>1</sup>

<sup>1</sup>College of Veterinary Sciences, Mekelle University, Tigary, Northern Ethiopia.

\*Corresponding author: [habtomkb@yahoo.com](mailto:habtomkb@yahoo.com)), Phone number: +251914706767;

**Target audience:** donkey owners, veterinarians, epidemiologists, animal science experts, researchers, local and regional planning experts and policy makers.

### Abstract

A cross-sectional study was conducted from December 2017 to March 2018 aimed at determining the prevalence and associated risk factors of ophthalmic problems of working donkeys in Mekelle, Northern Ethiopia. Study animals were selected by random sampling method to obtain the primary data in the form of direct physical examination and history was obtained from the owner of each examined donkey at the same time. Descriptive statistics was employed to summarize the data and uni-variant logistic regression was used to quantify the degree of association between ophthalmic problems and identified risk factors. Accordingly, out of the total 384 examined, 181 were found to be positive for ophthalmic problems with an overall prevalence of 47.14%. In this study, a statistical significant difference ( $P < 0.05$ ) were found among age groups and sexes. Female donkeys (63.01%) were 2.08 (OR=2.08; 95% CI: 1.105, 3.942) times more likely to have ophthalmic problems compared to male donkeys (44.97%). Donkeys with age category of >10 years (62.07%) and 6-10 years (49.6%) were 3.34 (OR=3.34; 95% CI: 2.002, 5.578) and 2.01 (OR=2.01; 95% CI: 1.225, 3.296) times more likely to have ophthalmic problems as compared to the age group of <6 years (32.87%) old, respectively. Ophthalmic problems are relatively higher in the right eye (41.44%) than the left (39.78%). Higher percentages were observed due to conjunctival defect (29.28%), followed by general lesion of eyelid (26.52%) and corneal defects (13.26%). The possible causes were diseases (62.98%) and mechanical damages (37.02%). In conclusion, the prevalence of ophthalmic problems in the study area is very high. Therefore, better management practices and awareness creation among donkey owners is highly recommended.

**Key words:** Mekelle; Ophthalmic problems; Prevalence; Risk Factors; Working Donkeys.

### Description of Problem

Working donkey of Ethiopia traces its ancestry to the wild asses found in Egypt, the Sudan, Somalia and Ethiopia, namely *Equus asinus africanus* and *Equus asinus somalicus* (1). Ethiopia has about four million working donkeys or 32 % of all the working donkeys in Africa and 10 % of the world population. Although working donkeys are found in all the ecological zones of the country (arid to mountain), majority of the working donkeys

are found in the central high lands of the country including Arsi, Showa and also Northern parts of Ethiopia, with highest density being in Arsi followed by Tigray and Showa. According to the agricultural sample survey conducted during 2005/2006, the number of donkeys and mules in Tigray Region are estimated to be 387,390 and 7,900, respectively (2). There is one working donkey for every one household in the community. This ratio may reach up to three working

donkeys per every five households in the rural community (3).

Despite the increase in mechanization throughout the world, working donkeys are still well deserving of the name ‘beasts of burden’. They have an important role to play in transport of people and goods in arid and semi-arid areas and where roads are poor or non-existent linked (4). Working Donkeys often are involved in more multipurpose activities than horses. They transport goods to and from markets, farms, and shops, traveling long distances. They also pull carts carrying heavy loads 3 to 4 times their body weight. They work from 4 to 12 hours per day, depending on the season and type of work. The increasing human population, demands for transport of goods to and from far, remote areas, and construction activities around towns are making donkeys highly demanded animals (5).

Animals are “sentient beings” that experience states such as pain, suffering and satisfaction, thus they are reckoned as having fine condition of welfare whenever they are in good physical shape and health, secure, providing with sufficient feed, allowed to exercise natural activities and being afflicted with throbbing, trepidation and misery. Avoidance and management of pain and anguish in animals are commonly considered as ethical necessities in scientific researches and teaching. Hence, high-quality animal welfare entails appropriate disease prevention and veterinary cure, suitable sanctuary, management, nourishment, gentle handling (6). Despite their use, the husbandry practices of working donkeys are poor. They are cruelly treated, made to work overtime without adequate feed or health care. Some hobbling methods cause discomfort and impose ophthalmic problems (7, 8, 9).

Ophthalmic problem in equids is the serious consequence of inadequate initial treatment due, in part, to the character of their inflammatory response. Most of the

differences between donkey and horse are in their nature. Donkeys are more tolerant, so may not present ocular disease in its early stages because of their muted pain response. First examination may reveal a more severe or chronic problem. Sedation is less frequently needed because of the reserved nature of the donkey aids examination and treatment. However, their strong palpebral muscles make blocking the frontal nerve an essential part of examining a painful eye ocular disease represented 5% of cases presenting for non-routine problems to the veterinary clinics of Society for Protection of Animals Abroad (10).

A similar percentage, 5.4 % of donkeys presented with ocular disease to donkey sanctuary clinics (11), with the most common pathologies being medial canthal wounds due to habronemiasis and fly strike, conjunctivitis and corneal ulcers, scars and opacities generally attributed to trauma. As studies clarify the magnitude of this problem which are ophthalmic problems that would be useful for designing strategies to help and improve working donkeys health and welfare (5). However, there is limited evidence on the status and magnitude of ophthalmic problems in working donkeys in the study area in particular and Tigray region in general. Hence, this study was aimed to determine the prevalence of ophthalmic problems and to identify risk factors associated with the occurrence of ophthalmic problems in working donkeys in Mekelle.

## **Materials and Methods**

### **Study area**

The study was conducted in Mekelle where the Donkey Sanctuary Ethiopia of Tigray project operates. The town contains seven sub cities (Kedamay weyane, Semien, Hadnet, Hawelti, Adihaki, Ayider and Quiha) which are also divided in to sub division of different kebelles and ketena. Mekelle is found in Longitude 13 degree 29’N and 39 degree

28°E. Mekelle is an urban centre and the capital of Tigray Region. The town covers an area of about 53 square kilometres, with an estimated population of about 310,000 inhabitants. It is located 783 kilometres North of Addis Ababa between altitudes of 2000-2200 m.a.s.l and the average rain fall and

temperature ranges from 150-250 mm and 17-21 °C, respectively. Its rainy season occur mainly between June and September, although a short rainy season do occur on March and April (12, 13). The study area includes Quiha and the central down town of Mekelle.

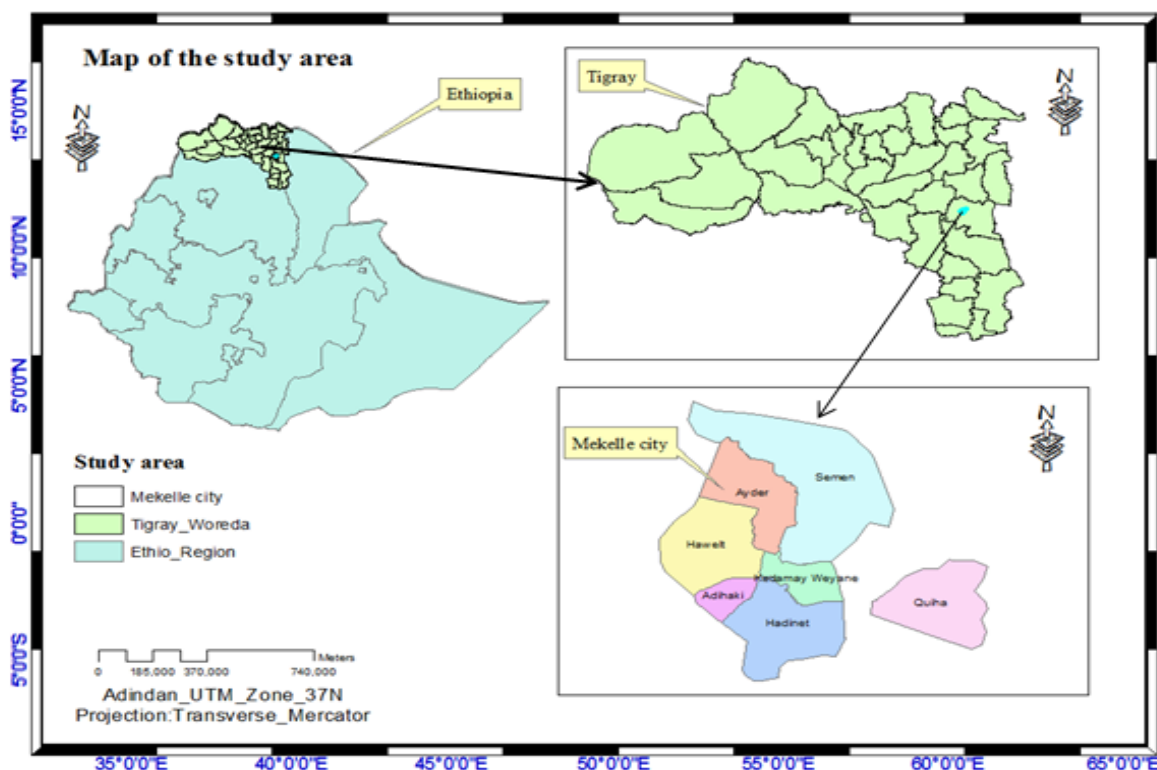


Figure 1: Mekelle City administration (Extracted from ArcGIS, 2012)

### Study population

Both sex and all age groups of working donkeys found in Mekelle and brought to Mekelle veterinary clinics during the study period were the study animals. Age is categorized as; less than 6 years, 6-10 years and greater than 10 years of age, as described elsewhere by (15).

### Study design

A cross-sectional study was conducted to determine the prevalence of ophthalmic

problems and identify associated risk factors in working donkeys in the study area.

### Sampling Technique and Sample Size Determination

The study animals were selected by random sampling method to obtain the primary data in the form of direct physical examination and history was obtained from the owner of each examined donkey at the same time. The required sample size for this study was calculated using the formula by (16), by

considering 50% of expected prevalence, 95% confidence level and 0.05 absolute precision.

$$n = 1.96^2 \times P_{exp} (1 - P_{exp}) / d^2$$

Where: n= required sample size

P exp = expected prevalence

d = desired absolute precision (usually 0.05)

Accordingly, a total of 384 animals were examined in this study.

### Data collection strategy

#### Ophthalmological examination

History was obtained from the owner of each examined donkey prior to physical examination. A direct physical examination of the eyes of the working donkeys was carried out to diagnosis presence or absence of ophthalmic problems. The physical examination was done by using catheterization, fluorescein test as well as visualization and palpation of each eye of working donkeys. Every detail findings of the physical examinations were recorded in a format prepared for this specific activity.

#### Data analysis

The collected data were entered in to Microsoft excel and analyzed using STATA version 11 statistical software. Descriptive statistics was employed to summarize the data and expressed in terms of frequency and percentage. Uni-variant logistic regression was used to quantify the degree of association between ophthalmic problems and identified risk factors and expressed as odds ratio and 95% confidence interval. For all analysis 5% was used as cut-off point for significance difference.

### Results

The occurrences of ophthalmic problems of working donkeys with associated risk

factors are shown in table 1. Out of the total 384 examined working donkeys, 181 of them were examined to be positive for any of ophthalmic problems and with an overall prevalence of 47.14% of ophthalmic problems. The results revealed that conjunctival defects (29.28%), was higher followed by major lesion of the eyelid (26.52%) and corneal defects 13.26% were found to be higher. Considering the potential causes of the ophthalmic problems, 62.98% and 37.02% of the ophthalmic problems were considered as a result of disease and mechanical damages, respectively. Among the all the working donkeys with ophthalmic problems, 13.26% were found to be blind (Table 1).

The logistic regression analysis result with respect to the sex and age of donkeys are presented in table 2. Considering the identified risk factors, slightly higher ophthalmic problems were found on the right eye (41.44%) of the working donkey as compare to the left eye (39.78%). Majority of the examined donkeys were females and old animals with prevalence rate of 63.04% and 62.07%, respectively. Female working donkeys were found to be 2.08 times more likely to have ophthalmic problems compared to male working donkey. The difference in the percentage of ophthalmic problems between sexes was found to be statistically significant (OR=2.08; 95% CI: 1.105, 3.942). Likewise, donkeys in the age category of >10 years and 6-10 years old were 3.34 and 2.01 times more likely to have ophthalmic problem as compared to working donkeys in the age group of <6years old, respectively with a statistical significant difference (OR=3.34; 95% CI: 2.002, 5.578) for <10 years and OR=2.01; 95% CI: 1.225, 3.296) for 6-10 years old).

**Table 1:** Occurrence of ophthalmic problems of working donkeys with associated risk factors

Variables	Frequency (n)	Percentage (%)
Sex		
Male	338	88.02
Female	46	11.98
Age		
<6 years	143	37.24
6-10 years	125	32.55
>10 years	116	30.21
Side of affected eye		
Right	75	41.44
Left	72	39.78
Both	34	18.78
Cause of eye problems		
Mechanical	67	37.02
Disease	114	62.98
Status of affected eye		
No Blind	157	86.74
Blind	24	13.26
Type of lesion		
Conjunctival defects	53	29.28
Corneal defects	24	13.26
Loss of vision	12	6.63
Ocular discharge	44	24.31
Major lesion of eyelid	48	26.52

**Table 2:** Logistic regression analysis result with respect to the sex and age

Variable	Total examined donkeys	Positive N (%)	Odds Ratio (95%,CI)	P-value
<b>Sex</b>				
Male	338	152(44.97)	1	-
Female	46	29(63.04)	2.08(1.105, 3.942)	0.023
<b>Age</b>				
<6years	143	47(32.87)	1	-
6-10years	125	62(49.60)	2.01(1.225, 3.296)	0.006
>10years	116	72(62.07)	3.34(2.002, 5.578)	0.000

## Discussion

High prevalence (47.14%) of ophthalmic problems was found among working donkeys of the study area. The result of this study is in agreement with the findings of Salim (17) who reported 45% ophthalmic problems in working donkeys in and Around Batu Town, East Shoa,

Central Ethiopia. Mekuria *et al.* (7) reported 44.23% prevalence of ophthalmic problems at Hawasa Southern part of Ethiopia. However, these results are higher than the prevalence of ocular abnormalities reported by Scantlebury (10) who reported prevalence rate of 23.5% in Oromia and Amhara regions of Ethiopia.

Prevalence of eye problems reported by Ashinde *et al.* (18) was 9.4% in and around Hawassa, and Getachew *et al.* (11), reported very low prevalence rate of 5.4 % ocular disease in donkeys presented at Donkey Sanctuary clinic on Debre Zeit, Ethiopia. In contrary to the results of the present study, higher prevalence of eye abnormality (82.1%) was observed in a study conducted by Björkengren (19) in Addis Ababa and Ambo, Ethiopia. The differences observed might be due to differences in agro-ecological, equine healthcare and equine management status.

Higher percentage of ophthalmic problems was found among female (63.04%) working donkeys as compared to male (44.97%) working donkeys. The reason for the higher prevalence may be due to the differences in sample size, body conformation, more physiological stresses on female donkeys, less strength than male donkeys during working times which increase the frequency of beaten by owners, and their less capacity to defend themselves from injury. Solomon *et al.* (20) reported that there are more frequencies of trauma due to beating of animals by their owners when they try to accelerate the speed of the donkeys. However, adequate previous research findings are not available to compare the findings of this study, in relation to the risk factors.

This study revealed that the ophthalmic problems were found to be significantly different among the different age groups. Higher percentage of ophthalmic problem was seen in old age (62.76%) working donkeys compared to young age (37.24%). Donkeys in the age category of >10 years and 6-10 years old were 3.34 and 2.01 times more likely to have ophthalmic problem as compared to working donkeys in the age group of <6years old, respectively. The results of the current study is consistent with the findings of Cutler (21) who reported an increased age and increased duration of ownership were

associated with increased risk of ocular abnormalities. This might be due to increased exposure to risk factors over the working lifetime of the donkey. The other reason is that most of the ophthalmic problems had the chronic nature as reported by Dohoo *et al.* (22).

It was observed that ophthalmic problems were found to occur in both sides of the eye of working donkeys. However, the proportion of right eye (41.44%) ophthalmic problems was relatively higher than the left eye (39.78%). The results of present study is in agreement with the findings of Scantlebury (10) who reported that the prevalence of eye disease in equine was significantly higher in the right eye (44.9%) compared with the left (31.5%). This variation might be due to the reason that whip injury was identified as the reason that whips used by predominantly right-handed donkey cart drivers.

Conjunctival defects 29.28% followed by general lesion of eyelid 26.52%, ocular discharge 24.31%, corneal defect 13.26% and loss of vision 6.63% was found to be higher. Similar to this study, other findings have also encountered different proportion of eye problems; Niraj *et al.* (23) reported 19.3% lacrimation and loss of vision in Mekelle, Tamirat *et al.* (24) found 20.9% of eye problem or ocular discharge in Wolaita Soddo Zuria District, Southern Ethiopia and Sameeh *et al.* (25) reported 4% of eye problems in Jordan. These variations might be attributed to differences in topographical nature and misuse; low level of donkey health care, keeping characteristics of the donkey in management and husbandry practices including environmental factors.

Out of the total donkeys with ophthalmic problems, 13.26% were reported to be blind. This is comparable with the report of Scantlebury (10) who reported 17% of the blindness. The blindness might be as a result of disease, surface trauma such as ill-fitting or

poorly repaired harness and blinkers, foreign bodies or injuries arising from a whip. The results of this study showed that the major cause of ophthalmic problem in donkey was due to the diseases i.e. 62.98% and only 37.02% occurred as a result of mechanical damage. The results obtained in this study is comparable with the reports from other researchers such as Reichmann *et al.* (26) in Brazil who reported 36% of ocular lesions caused by mechanical damage. This might be due to poor management practices of donkey owners or users, that most of them did not provide shelters for their donkeys at their homes and working places. This exposes the donkeys to sun, rain, insect bites which could be a cause for the general ophthalmic problems. Equines may slip and fall on muddy, dusty particles or rough grounds. Moreover, microorganisms and parasites may damage the eyes of donkeys and deposit their larvae, especially in a humid weather.

### Conclusion and applications

1. Higher overall prevalence of ophthalmic problems was found in working donkeys in the study area.
2. Among the ophthalmic problems, conjunctival defects, major lesion of eyelid and corneal defects were the major ones.
3. Diseases were found to be the major potential causes of ophthalmic problems.
4. Ophthalmic problems increases as the age of working donkeys increase.
5. Female working donkeys were found to be highly affected by ophthalmic problems compared to males.
6. Right eye was found to have more ophthalmic injures as compared to its counterpart.

Based on the above conclusive points, the following application strategies are forwarded:

1. Better management practices like harness

design and equipment to reduce the risk of ophthalmic problems should be introduced.

2. Vaccination and treatment options should be available to reduce the diseases-induced ophthalmic problems.
3. Awareness creation among the owners and users are important to alleviate the traumatic injuries of eye of working donkeys.

### References

1. Alemu, G., Azage, T and Alemu, Y (1997). Donkeys, people and Development: research needs of donkey utilization in Ethiopia, in: Fielding, D. and Starkey, P. (Eds). Donkeys, People and Developmenta resource book in the Animal Traction Network for Eastern and Southern Africa (ATNESA), ACP, EU Technical Centre for Agricultural and Rural Cooperation (CTA).
2. CSA (2006). Central statistical Authority (CSA) of Ethiopia. Agricultural sample survey Statistical Bulletin, 97:98-193.
3. DSN (2011). Donkey sanctuary notes (DSN) to the consolidated financial statements year ended 31 December, 2011.
4. Lola, W and Suzanne, R (2008). The dependence of humans on working equines: the challenges in using donkeys for work in Africa, in: Starkey P, Kaumbutho P (Eds). A resource book in the Animal Traction Network for Eastern and Southern Africa (ATNESA), ACP-EU Technical Centre for Agricultural and Rural Cooperation (CTA).
5. Probhakar, B.P., Dutt, T., Patel, M., Kamal, R., Bharti, V and, Sahu, S (2013). Assessment of pack animal welfare in and around Bareilly city of India. *Veterinary World*, 6(6):332-336.
6. Mihreteab, B., Bashahun, G., Mulualem, T., Wondimu, N., Desta, G., Tigist, M., Alemneh, T and Daniel, M (2013).

- Assessment of human aspect regarding the welfare of cart horses: perspective of Jimma town, south west Ethiopia. *Research Journal of Veterinary Sciences*, 6(1):1-12.
7. Mekuria, S., Mulachew, M and Abebe, R (2013). Management practices and welfare problems encountered on working equids in Hawassa town, Southern Ethiopia. *Journal of Veterinary Medicine and Animal Health*, 5:243-250.
  8. Sumbria, D., Singla, L.D., Kumar, S., Sharma, A., Dhayia, R and Setia, R.K (2016). Spatial distribution, risk factors and haematobiochemical alterations associated with *Theileria equi* infected equines of Punjab diagnosed by indirect ELISA and nested PCR. *Acta Tropica*, 155:104-112.
  9. Mohammed, A.A., Sharma, A., Saied, M.A., Osman, O.H., Al-Balawi, M.H., Salih, D.A and Singla, L.D (2017). Lack of evidence for infection of camels with tick-borne diseases in Riyadh region, Saudi Arabia. *Sudan Journal of Veterinary Research*, 32:39-40.
  10. Scantlebury, C.E (2013). Ocular disease in working horses in Ethiopia: a cross-sectional study. School of Veterinary Science University of Liverpool, Leahurst Campus Neston Wirra LCH647TE, UK. *Journal of the British Veterinary Association*, 172-199.
  11. Getachew, M., Feseha, G., Trawford, A.F., Bojia, E., Alemayehu, F and Amare, B (2002). Some common clinical cases and interventions at the donkey health and welfare project donkey sanctuary, DebreZeit, Ethiopia. *Proceedings of the 4th International Colloquium on Working Equines*, Eds Pearson A., Fielding D. and Tabbaa, D., Hama, Syria, Pp 96-10.
  12. Bureau of planning and economic development (2015). *Atlas of Tigray*, Bureau of Planning and economic development, national regional state of Tigray, Mekelle, Pp 3-24.
  13. TBARD (2014). *Regional Animal Health Program Strategy Document: Tigray Bureau of Agriculture and National Resource Organization (BANRO)*. Tigray, Ethiopia.
  14. MCA (2012): Mekelle city administration, extracted from ArcGIS, 2012, Mekelle, Tigray, Ethiopia.
  15. Crane, M (1997). *The professional hand book of the Donkey*, 3rd ed. Whittet Books LTD, W140By, London, Pp 29.
  16. Thrusfield, M (2005). *Veterinary Epidemiology*, third edition Blackwell Science Oxford, UK, Pp 183.
  17. Salim, U., Haimanot, D., Tadele, K., Tilahun, Z and Girma, K (2015). Health and Welfare Related Assessment of Working Equine in and Around Batu Town, East Shoa, Ethiopia. *Natural and Science*, 13(10):1-8.
  18. Ashinde, A., Gashaw, A and Abdela, N (2017). Health and welfare status of donkeys in and around Hawassa Town, Southern Ethiopia. *Journal of Veterinary Medicine and Animal Health*, 9(11): 300-312.
  19. Björkengren, J (2016). Assessment of donkeys' welfare in Addis Ababa and Ambo, Ethiopia. Degree project in animal science. Swedish University of Agricultural Sciences. Faculty of Veterinary Medicine and Animal Science. Uppsala. Sweden.
  20. Solomon, M., Matusala, M and Rahmeto, A (2013). Management practices and welfare problems encountered on working equids in Hawassa town, Southern Ethiopia Hawassa University Department of Veterinary Medicine, Hawassa Ethiopia. DVM Thesis.
  21. Cutler, T.J (2004). Corneal epithelial disease. *Veterinary Clinics of North America. Equine Practice*, 20:319-343.



22. Dohoo, I., Martin, W and Stryhn, H (2009). Introduction to observational studies In: Veterinary Epidemiologic Research. 2nd ed. Prince Edward Island, Canada: VER Inc. Pp 151-166.
23. Niraj, K., Fisseha, K., Shishay, N and Hagos, Y (2014). Welfare Assessment of Working Donkeys in Mekelle City, Ethiopia Mekelle University, College of Veterinary Medicine Donkey Sanctuary Trust Ethiopia, Mekelle Project. *Global Veterinaria*, 12(3):314-319.
24. Tamirat, H., Mulisa, M., Ayalew, N and Teka, F (2015). Assessment on Working Donkey Welfare Issue in Wolaita Soddo Zuria District, Southern Ethiopia. Jigjiga University, College of Veterinary Medicine, Jigjiga, Ethiopia. *Global Veterinaria*, 14(6):867-875.
25. Sameeh, M., Dirar, M., Zain, H and Sarah, F (2014). Equine diseases and welfare in Jordan: A retrospective study (1261 cases). *Jordan Journal of Agricultural Science*, 10(3):21-24.
26. Reichmann, P., Dearo, A and Rodriguesj, T (2008). Occurrence of ophthalmologic diseases in horses used for urban cart hauling in Londrina, P.R, and Brazil. *Ciencia Rural*, 38:2525-2528.