



Epidemiological Study Of Bovine Trypanosomosis In Wenbera District, Metekal Zone Of Benishagul Gumuz Regional State, Western Ethiopia

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Abstract: Cross-sectional study was conducted in Wanbera district of Benishangul-Gumuz Regional State, Western Ethiopia from February, 2019 to April 2019 to assess the prevalence of bovine trypanosomosis and association risk factors. During this survey, blood samples of 384 randomly selected cattle (*Bos indicus*) were examined using Buffy coat techniques. The packed cell volume (PCV) value of each animal was measured using hematocrit reader. Descriptive statistics was held to analyze the findings using STATA version 14.0 software packages. Chi square test was used to determine the association between different risk factors (age, sex, Body condition and location) and trypanosomosis infection. Out of 384 cattle examined, 8(2.08%) were found positive for trypanosomosis. The highest prevalence was revealed in Bagondy village 4 (50%) followed by Muz village 3(37.5%) and the lowest was recorded in Zamatiya village 1(12.5%). *Trypanosome congolense* (75%) was the most dominant trypanosome species identified followed by *T. vivax* (25%). The mean packed cell volume (PCV) value of infected animals was 17.92%±3.356 for trypanosome positive animals and 27.22%±2.748 for non-infected animals. Similarly, the highest prevalence (87.5%) of trypanosomosis infection was registered in animals with poor body condition score. Statistically significant difference was seen among ages and Body condition scores of animals (P <0.05) whereas difference in sex and villages had no influence on trypanosomosis infections (P > 0.05).

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Key words: Cross-section, PCV, survey, Trypanosome

Introduction

Trypanosomosis is a disease of paramount important both to human and livestock that causes negative impact on food production and economic growth in many parts of the world, particularly in Sub-Saharan Africa [1, 2, and 3]. It is caused by unicellular parasites (Trypanosomes) found in blood and others tissues of vertebrates animals and other wild life [2, 3]. Bovine trypanosomosis is a major animal disease constraint to livestock production in sub-Saharan Africa. It is estimated that 46 million cattle are at risk of contracting African animal trypanosomosis in sub-Saharan Africa [4]. Trypanosomosis is a parasitic disease caused by species of flagellated protozoa belonging to the genus Trypanosome which inhabit the blood plasma, various body tissues and fluids of vertebrate host. The disease is transmitted cyclically by tsetse flies (*Glossina* species), and none cyclically by other biting flies [5]. This parasite restricts animal production, besides causing economic losses through growth restriction, abortion, anemia, treatment cost, and death of the affected animals [6]. Trypanosomosis

induces loss of body condition in pregnant animals leading to birth of offspring's, with low birth weights fetal and neonatal losses, besides production losses in lactating animals. The consequences of trypanosomosis are less severe in better-nourished animals but good nutrition does not by itself provide protection. Adequate energy, protein and vitamin nutrition enhances the ability of trypanosome-infected animals to withstand the adverse effects of infection [7]. The most important trypanosome species affecting livestock in Ethiopia are *Trypanosoma congolense*, *Trypanosome vivax*, and *Trypanosome brucei* in cattle, sheep and goats, *Trypanosome evansi* in camels and *Trypanosome equiperdium* in horses [8].

The influence of tsetse on African agriculture through the transmission of trypanosomosis continues to be a major constraint to the development of national economies and their achievement of self sufficiency in basic food production. The general distribution of tsetse flies is determined principally by climate and

influenced by altitude, vegetation, and presence of suitable host animals [9]. *Tsetse flies* in Ethiopia are confined to southern and western regions between longitude of 33^o and 38^o East and latitude of 5^o and 12^o North which is accounted to about 200,000 (Km)². Tsetse infested areas lies in the low lands and also in the river valleys of Blue Nile, Baro Akobo, Didessa, Ghibe and Omo. Benishangul-Gumuz is one of the five regions of Ethiopia infested by more than one species of tsetse flies [10]. Five species of *Glossina* (*Glossina morsitans submorsitans*, *G. Pallidipes*, *G. tachinoides*, *G. f. fuscipes* and *G. longipennis*) have been registered in Ethiopia [11]. Apart from the cyclical transmission of trypanosomosis by *Glossina* species, it is highly considered that mechanical transmission is a potential threat to livestock production and productivity in some parts of Ethiopia [8].

In Benishangul-Gumuz regional state, four *Glossina* species namely, *G. tachinoides*, *G. morsitans submorsitans*, *G. pallidipes* and *G. fuscipes* are found [11]. Wanbera is one of the twenty districts of the Benishangul Gumuz regional State with a serious problem of trypanosomosis. Controlling this economically important disease has number of benefits to improve the livelihood of the poor people of the district through increasing milk yield, meat, surplus capital from the sale of livestock and livestock products and improving the availability of draft power

(oxen). Although the disease is one of the major obstacles of livestock production in the district, there is no study conducted to know prevalence and situation of the disease to culminate its impact on livestock. Therefore, the objective of the present study is aimed to determine the prevalence and associated risk factors of bovine trypanosomosis so that suggests the possible control measures of the disease in the district.

2. Materials And Methods

2.1. Description of the Study Area

The study was conducted in Wanbera district of Benishangul-Gumuz Regional State, Western Ethiopia from February, 2019 to April 2019 to assess the prevalence of bovine trypanosomosis and associated risk factors. Wanbera district has a total area of 2820 km, which has tsetse born Trypanosomosis belt area, characterized by high land, mid-land low land plane with altitude range of 580-2731 m.a.s.l. and average temperature of 16 °C-32°C. The average annual rain fall is 900-1700mm. The current study was carried out in three randomly selected peasant associations of the district namely, Bagondy, Muz and Zamatiya. The major Agricultural activity in the area is mixed farming system, whereby crops are cultivated abundantly and different species of livestock are kept. The total livestock population of the district is estimated at 20,785 cattle.

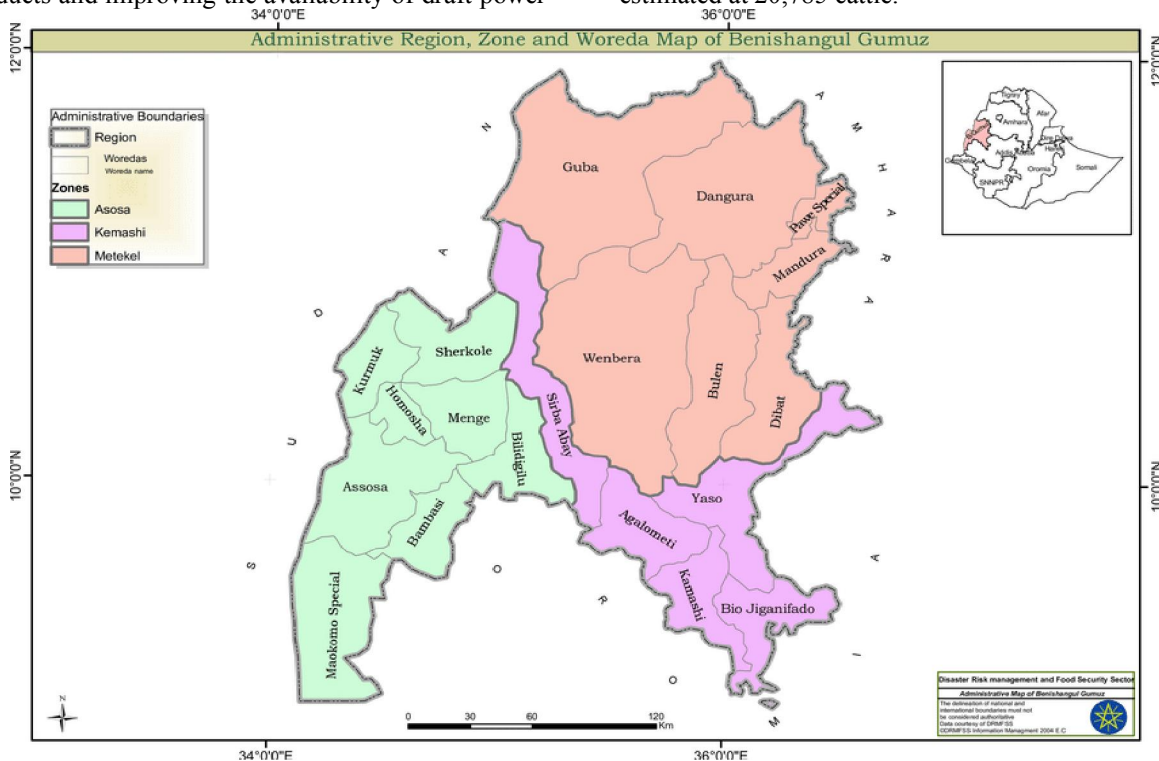


Fig 1: Map of Benishangul Gumuz region, Source: (www.google.com)

2.2. Study Design and Study Animals

Cross sectional study design was implemented to zebu cattle (*Bos-indicus*), which are mainly kept under an extensive husbandry system grazing communally owned pasture land throughout the year. Study animals were herded together during the day time and returned to their individual owner's farmstead every evening. The body condition of each of the study animal was scored as good, medium and poor [12]. Similarly, their age was determined based on DeLahunta and Habel [13] principles as young (<2 years), matured (2-5 years) and adult (> 5 years).

2.3. Sampling and Sample Size Determination

A blood was collected from a total of 384 randomly selected cattle from 3 Peasant associations proportionally based on number of cattle they owned. Simple random sampling technique was employed. The sample size was determined by using 95% level of confidence interval and expected prevalence of 50% trypanosomosis with desired absolute precision of 5% [13]. The formula used is shown below:

$$N = (1.96) \text{ pep} (1 - \text{Pexp}) / d^2$$

Where: N= required sample size

Pexp= expected prevalence

d =desired absolute precision

2.4. Collection of Blood Sample

Blood samples were collected from ear vein using a sterile lancet into a pair of heparinized capillary tubes (75x1.2mm) from each of the randomly selected cattle. Each tube was sealed with crystal seal on one end [15]. Then the blood samples were centrifuged at high speed (12,000 rpm) for 5 min. Finally the packed cell volume (PCV) values were read by micro hematocrit reader, which can be adjusted individually for the length of the blood column in each tube, to get a value indication on the presence, absence and degree of anemia [16]. After centrifugation, the capillary tube were cut down using diamond pointed pen 1mm below the Buffy coat to include the upper most layers of the red blood cells and 3mm above to include the plasma so that the contents will be gently expressed on to a slide, mixed and covered with a cover slip (22 x 22mm). The preparation were then be examined fewer than 10X eye piece in combination with a 40X objective microscopes to get optimum view allowing large visual field and sufficient magnification for easy

identification of trypanosomes and for their morphological features after Giemsa staining under 100X objective will be used [16, 17].

2.5. Data Management and Analysis

After collected data were coded and entered into Microsoft Excel spread sheet and transferred to STATA version 14.0 software packages. Data was analyzed used descriptive statistics and Chi square test was employed to determine the association between trypanosomosis and different independent variables (location, sex, age and body condition score). The prevalence of bovine trypanosome infection was calculated as the number of positive animal examined to the total population at risk.

3. Results

3.1. Parasitological Findings

Of 384 cattle examined, 8 (2.08%) were found positive for trypanosomes. The Trypanosome species identified were *T. congolense* and *T. vivax*. The highest prevalence was recorded in Bagondy 4(50%) followed by Muz 3(37.5%) and the lowest was recorded in Zamatiya 1(12.5%) villages (Table 1). From a total of 8(2.08%) cattle infected with Trypanosomosis, 5(62.5%) were infected with *T. condolence* and 3(37.5%) were with *T. vivax*. Female animals were more infected 6 (75%) than male animals 2(25%). However, statistically there was no significant difference across sex (P>0.05) (Table 2).

Out of 384 cattle, 20 were <2 years old, 174 were 2-7 years old and 100 were > 7 years old. From < 2 years old 2 (25%) animals were positive, from 2-7 years old 4(50%) animals were positive and from >7 years old 2(25%) animals were positive for the trypanosomosis. There was statistically significant different between age groups of the animals (P <0.05). From the total of 384 animals examined 30 were good, 274 were medium while 80 were with poor body condition scores. Out of total animals examined 2(25%) had medium body conditions and 6(75%) had poor body condition scores and statistically there was significant difference among body condition (P <0.05) (Table 2).

3.2. Hematological Findings

The mean Packed Cell Volume (PCV) value for aparasitemic (non-infected) animals was 26.52±2.79 and mean PCV value of the parasitemic (infected) animals was 17.02±34.98. (Table 3)

Table 1: Trypanosomosis prevalence in relation to location

PA	No. animalexamined	Tc positive animals	Tv negativanimals	Prevalence (%)	χ^2	P-value
Bagondy	235	4	2	75	0.8834	0.643
Muz	127	2		25		
Zamatiya	22			0		

Tc-Trypanosomae congolenses, Tv-Trypanosomae vivax, PA- Peasant association

Table 2: Prevalence of bovine Trypanosomosis in relation to risk factors

Variables	No. of animals examined	No. Of animals infected	Prevalence (%)	χ^2	(P-value)
Sex					
Males	300	6	75	0.0467	0.829
Females	84	2	25		
Age					
<2	20	2	12.5	8.5416	0.014
2-7	320	4	75		
>7	44	2	12.5		
Body condition					
Good	30	0	0	22.0342	0.000
Medium	274	1	25		
Poor	80	7	75		

Table 3: Mean PCV Values of infected and Non-infected animals

Condition	Number of animals	PCV Value (%)±std. Deviation	χ^2	P-value
Infected	8	17.92%±3.356	10.6425	0.001
Non infected	376	27.22%±2.748		

4. Discussion

This study was aimed to investigate the prevalence of bovine trypanosomosis and associated risk factors. The overall prevalence of trypanosome infection in the study area was 2.08%. This finding was low when compared with the findings of Getachew and Asmamaw [18] in Mandura district of the Benishangul-Gumuz regional state, Western Ethiopia, who reported 13.30% prevalence of cattle trypanosomosis. Similarly, Bayisa and Getachew [19] reported 11.70% bovine trypanosomosis and associated risks in cattle population of Dangur district of Benishangul-Gumuz regional state, Western Ethiopia and, Zelalam *et al* [20] reported 16.10% Prevalence of Bovine Trypanosomosis and Associated Risks in Mao Komo District of Benishagul gumuz Regional State. The current finding was also lower than the previous findings of Bayisa *et al*. [21] who reported 22.38% of prevalence in Assosa district of the Benishagul-Gumuz regional state, and Mulaw *et al*. [22] whose result indicated 28.10% prevalence of trypanosomes affecting bovine in tsetse infested Assosa district. The difference in the prevalence of trypanosomosis in the previous and the current findings might be due to the difference in agro ecology and the difference in seasons in the study period. In addition the difference may be due to the increasing application of deltamethrin 1% spot on to prevent the biting of tsetse fly.

The current finding indicated that *T. condolence* (68.75%) was the most dominant species to cause infection followed by *T. vivax* (31.25%). This result was nearly the same with the report of Abraham and Zeryehun who conducted their study on prevalence of bovine trypanosomosis in selected sites of Arba Minch district, Southern Ethiopia, whose result showed the

proportion of *T. congolense* 61.4% [23]. Other study conducted in Dale Wabera district of Kellem Wollega Zone, Western Ethiopia Biyazen *et al*. [24] also revealed the proportion of *T. congolense* 63.64% during their work on prevalence of trypanosomosis. Moreover, the result of present study was nearly the same with report of Mulaw *et al*. [22] who found the proportion *T. congolense* 66.7%. A higher proportion infection rate of *T. congolense* might be attributable to the presence of high number of *technoid species* of tsetse fly in the area than other biting flies. It could also be due to the possible development of better immune response to *T. vivax* by infected animals as cited by Leak *et al*. [25].

Previous reports indicated that *T. congolense* and *T. vivax* are the most prevalent trypanosomes that infect cattle in tsetse infested and tsetse free areas of Ethiopia respectively [26, 25]. Studies carried out by Leak *et al*. [26] And Rowland *et al* [27] indicated that *T. vivax* is highly susceptible to treatment while the problem of drug resistance is higher in *T. congolense*. The effect of different risk factors such as sex and study sites on prevalence of bovine trypanosomosis was studied and statistically insignificant ($P>0.05$), while body condition, age groups and PCV values were found to be statistically significant ($p<0.05$).

This result was in agreement with previous reports of Mulaw *et al*. [22] whose result indicated that sex and study sites did not show statistically significant association with trypanosomosis infection; It was also in consistent with the previous work of Asmamaw and Mengistu [28] in the neighboring district (Bambasi) whose result revealed that no statistically significant association was observed among study sites and sex groups; however, in contrast to the present result their finding showed that

no statistically significance association was seen between age categories of study animals.

Moreover, the current finding was in agreement with study conducted by Lelisa *et al.* [29] whose finding revealed no significant association with regard to sex group and study sites. The present finding was also in consistent with the previous work of Yehunie *et al.* [30] in that their finding indicated that there was statistically significant association between body condition score of study animals. The mean PCV values of infected animals were lower 17.92 ± 4.76 than that of non-infected animals 27.22 ± 2.748 . This result was in alignment with previous works of Asmamaw and Mengistu [28], Lelisa *et al.* [29] and Gameda [31] whose PCV values and trypanosome infection of studying coincide with the present result.

5. Conclusion

The only identified *trypanosomae* species were *T.congolenses* and *T.vivax*, in which *T.congolenses* was the most dominant species identified. Those trypanosomosis positive animals had lower PCV values, 17.92 ± 3.356 , compared with animals free from trypanosomosis, 27.22 ± 2.748 PCV values. The resent establishment of *tsetse fly* investigation and control center in the region might reduce the expected prevalence of trypanosomosis, although the district lies within the *tsetse* belt area.

References

- Taylor, K.A., 1998. Immune response of cattle to African *trypanosomosis*: protective or pathogenic. *Inf. J. parasitological*. 28: 219-240.
- Uilenberg, G., 1998. A field guide for diagnosis of treatment and prevention of African Animal *Trypanosomosis*. FAO corporate Document Repository. ISBN: 92: 510-42381.
- Tesfaye, M., 2002. Report of *Trypanosomae* infection rate in G.M. Mortals and G. tachiods in Didessa valley from July 29 to September 26/2002, Bedelle.
- Nonga, H. E and Kamarage, D. M., 2009. Prevalence of *Bovine Trypanosomosis* in Morogoro, Tanzania, *Pakistan Journal of Nutrition*. Vol 8. No (3). pp 208 – 213.
- Tadesse, A, Hadgu, E, Berhanu, M, Abebe, R and Mekuria, S., 2011. Mechanical Transmitted *Bovine Trypanosomae* in Tslemty woreda western Tigray, North Ethiopia, *Agricultural Journa*, Vol 6. No (1), pp 10 –13.
- Batista, J. S, Rodrigues, C. M. F, Olinda, R. G, Silva, T. M. F, Vale, R. G, Camara. A. C. L, Reboucas. R. E. S, Bezerra, F. S. B, Garcia, H. A and Teixeira, M. M. G., 2012. Highly debilitating natural *Trypanosoma vivax* infection in Brazilian calves: epidemiology, pathology and Probable transplacental transmission, *Parasitol. Res.* Vol 110. pp 73 – 80.
- Rowlands G.J, Mulatu W.S, Nagda M, Dolan R.B, and d'Ieteren G.D.M., 1995. "Genetic variation in packed red cell volume and frequency of parasitaemia in East African Zebu cattle exposed to drug-resistant *trypanosomae*," *Livestock Production Science*, vol. 43, no. 1, pp. 75–84.
- Abebe G., 2005. Current situation of *Trypanosomosis*: review article on *Trypanosomosis* in Ethiopia. *J Biol Sci* 4: 75-121.
- Leak S.G., 1999. *Tsetse biology and ecology: The role in the epidemiology and control of trypanosomosis*. CAB International. Wallingford (UK), pp. 152-210.
- Keno M., 2005. The current situation of *tsetse* and *trypanosomosis* in Ethiopia, Ministry of Agriculture and Rural Development, Veterinary service department, in proceeding of 28th meeting of International Scientific Council for *Trypanosomosis* Research and Control.
- ARVDSMSL, 2015. Assosa Regional Veterinary Diagnostic, Surveillance, Monitoring and Study Laboratory; laboratory annual report, P.O.Box: 326, Assosa, Ethiopia.
- Nicholson, M.J. and M.H. Butterworth, 1986. A guide to condition scoring of zebu cattle ICCA, Addis Ababa, Ethiopia.
- De-Lahunta, A. and R.E. Habel, 1986. Teeth. *Applied veterinary anatomy*. USA. W.B. saunders. Company, pp: 4-16.
- Thrusfield, M., 2005. *Veterinary Epidemiology* 3rded Black well science Ltd, pp: 233-250.
- Murray, M., P.K. Murray and W.I.M. Mcintyre, 1977. An improved parasitological technique for the diagnosis of African *trypanosomosis*, *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 71: 325-326.
- Uilenberge, G., 1998. A field guide for diagnosis, treatment and prevention of African animal *Trypanosomosis*. Adopted from the original edition by Boyt W.P. FAO, Rome, pp: 43-135.
- Murray, M., J.C.M. Trail, D.A. Turner and Y. Wissocq, 1983. *Livestock productivity and trypanotolerance*, Network training manual International Livestock Centre for Africa (ILCA), Addis Ababa.
- Getachew, D. and A. Asmamaw, 2016. Epidemiology of Cattle *Trypanosomosis* and Associated Anemia in Mandura District. *Nat Sci* 2016, 14(5):85-90]. ISSN 1545-0740 (print); ISSN 2375-7167 (online). <http://www.sciencepub.net/nature.12.dio:10.7537/marsnsj14051612>.

19. Bayisa, K. and D. Getachew, 2016. *Trypanosomosis* and its Associated Risks in Cattle Population of Dangur District of Benishangul-Gumuz Regional State, Western Ethiopia. *European Journal of Applied Sciences* 7 (6): 291-296, 2015 ISSN 2079-2077 © IDOSI Publications, 2015 DOI: 10.5829/idosi.ejas.2015.7.6.101185.
20. W. Zelalam, E. Biranu, T. Dawit, K. Tashome, G. Kebede and I. Nuraddis, 2017. A Study on Prevalence of Bovine Trypanosomosis and Associated Risks in Mao Komo Special District of the Benishagul-gumuz Regional State, Western Ethiopia. *European Journal of Biological Sciences* 9 (2): 85-92, 2017 ISSN 2079-2085 © IDOSI Publications, 2017 DOI: 10.5829/idosi.ejbs.2017.85.92.
21. Bayisa, K., D. Getachew and T. Tadele, 2015. *Bovine Trypanosomosis* in Asossa District, Benishangul-Gumuz Regional State, Western Ethiopia: Prevalence and Associated Risk Factors, *European Journal of Applied Sciences*, 7(4): 171-175, 2015, DOI: 10.5829/idosi.ejas.2015.7.4.101128.
22. Mulaw, S., M. Addis and A. Fromsa, 2011. Study on the Prevalence of Major *Trypanosomes* Affecting Bovine in *Tsetse* Infested Asossa District of Benishangul-Gumuz Regional State, Western Ethiopia. *Global Veterinarian*, 7(4): 330-336.
23. Abraham, Z.A. and T. Zeryehun, 2012. Prevalence of *Bovine Trypanosomosis* in Selected District of Arba Minch, Snnpr, Southern Ethiopia, *Global Veterinarian*, 8(2): 168-173, 2012, DOI: 10.5829/idosi.gv.2012.8.2.61312.
24. Biyazen, H., R. Duguma and M. Asaye, 2014. *Trypanosomosis*, Its Risk Factors, and Anaemia in Cattle Population of Dale Wabera District of Kellem Wollega Zone, Western Ethiopia, *J. of Vet. Medicine*.
25. Leak, S.G.A., W. Mulatu, E. Authie, G.D.M. D'Ieteren and A.S. Peregrine, 1993. Epidemiology of *bovine trypanosomosis* in the Gibe valley, Southern Ethiopia. Tsetse challenge and its relationship to trypanosome prevalence in cattle. *Acta Tropica*, 53: 1221-1234.
26. Leak, S.G.A., 1999. *Tsetse* biology and ecology: The role in the epidemiology and control of trypanosomosis. CAB International. Wallingford, UK, CABI Publishing and ILRI, pp: 152-210.
27. Rowlands, G.J., W.S. Mulatu, M. Nagda, R.B. Dolan and G.D.M. d'Ieteren, 1995. "Genetic variation in packed red cell volume and frequency of parasitaemia in East African Zebu cattle exposed to drug-resistant trypanosomes," *Livestock Production Science*, vol.43, no. 1: pp. 75-84.
28. Asmamaw, A. and G. Mengistu, 2016. Across sectional Study on Bovine Trypanosomosis and Apparent Vector density in Bambasi District of Benishangul-Gumuz Regional State, Western Ethiopia. Prevalence and Vector density, *Researcher*, 2016, 8(7):32-39]. ISSN1553-9865 (print); ISSN 2163-8950(online).<http://www.sciencepub.net/researcher.5>. doi:10.7537/marsrsj080716.05.
29. Lelisa, K., D. Damena, M. Kedir and T. Feyera, 2015. Prevalence of *Bovine Trypanosomosis* and Apparent Density of Tsetse and Other Biting Flies in Mandura District, Northwest Ethiopia. *J Veterinary Sci. Technol*, 6: 229. doi:10.4172/2157-7579.1000229.
30. Yehunie, B., T. Wudu, Y.Y. Nuria and A. Sefinew, 2012. Prevalence of *bovine trypanosomosis* in Wemberma district of West Gojjam zone, North West Ethiopia. *Vet. J.*, 16(2): 41-48.
31. Gameda, F., 2015. Prevalence of *Bovine Trypanosomosis* in and around Nekemte Areas, East Wollega Zone, Ethiopia. *Open Access Library Journal*, 2: e1521. [http:// dx.doi.org/10.4236/oalib.1101521](http://dx.doi.org/10.4236/oalib.1101521).

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