



Prevalence of Hydatidosis in Cattle and Goats Slaughtered in Selected Abattoirs in Kaduna State, Nigeria.

Haruna James Samuel¹, Luka Sodangi Abdulkarim¹, Kogi Ezekiel¹, Yaro Clement Ameh², Dangana Solomon¹, Dasun Martin James³, Jantiku Hamman Joseph⁴.

¹Department of Biological Sciences, Ahmadu Bello University, Zaria, Kaduna State.

²Department of Animal and Environmental Biology, University of Uyo, Akwa Ibom State.

³Department of Microbiology, University of Jos, Plateau State.

⁴ Department of Biology, Air Force Institute of Technology, Kaduna, Kaduna State.

*jsamuelharuna@gmail.com;

Abstract

Livestock provide meat, milk and hides in all parts of the world which play an important role in improving the national economy of any nation. This study was conducted to determine the prevalence of hydatidosis in cattle and goats slaughtered in selected abattoirs in Kaduna State, Nigeria from February – December, 2022. Gross examination was carried out by visual inspection and palpation of viscera of 1,260 animals, comprising of 673 cattle and 587 goats in order to determine the prevalence, age and sex specific prevalence in cattle and goats. A total of 81(6.4%) out of 1260 animals of the study population harboured one or more cysts in liver and lungs. The overall prevalence in cattle and goats was 6.4%, the difference in prevalence rate among cattle (6.2%) and goats (6.6%) were not statistically significant ($P>0.05$). There was association of prevalence of hydatid cysts with goats ($OR=1.069$, 95% $CI=0.681-1.678$) but it was not significant. Age-specific prevalence in cattle was recorded in 5 years and above age group (6.9%) while among the goats, the highest prevalence was recorded in 3-4 years age group, ($OR=1.869$) but the association was not significant. Prevalence was significantly associated with cattle and goats in 3–4 years age group ($OR=1.133$, 95% $CI=0.677-1.896$). Difference in prevalence of hydatid cysts among the age group in cattle and goats was not statistically significant ($P>0.05$). Sex-specific prevalence revealed highest prevalence of hydatid cysts among female cattle (6.8%) and goats (8.7%). There was association between prevalence of cysts and female cattle ($OR=1.198$) and goats ($OR=1.845$), the association was not significant. The present study revealed that cattle and goats slaughtered in the selected abattoirs in Kaduna State, Nigeria harbor hydatid cysts that perpetuate the transmission of hydatidosis in the area thereby posing significant public health problem in livestock. Therefore, there is a need to find ways of limiting or eradicating this parasitic disease.

Keywords: Prevalence, Hydatidosis, Cattle, Goats, Kaduna State.

Introduction

Cystic echinococcosis, CE (also called Hydatidosis) is a parasitic disease caused by the larval stage (metacestode) of *Echinococcus granulosus* complex, which affects livestock, wildlife and humans (Raúl *et al.*, 2015). This parasitic disease with zoonotic potential presents an important public health problem and is also of major socio-economic importance in the wide world (Prathiush, *et*

al., 2008). Dogs are the primary definitive hosts for this parasite, with livestock acting as intermediate hosts and humans as aberrant intermediate hosts. The outcome of infection in livestock and humans is cyst development in the liver, lungs, or other organs (Budke *et al.*, 2006). Hydatid cysts that grow in the organs of the intermediate hosts and mature tapeworms that live in dog intestines are the two main causes of the disease. Clinical signs

typically develop as a result of this space-occupying lesion exerting pressure on surrounding tissues. Rupture of the cyst and spillage of the contents may cause anaphylactic shock and secondary CE (Harandi *et al.*, 2012). When viable hydatid cysts are consumed by the specific hosts and transform into adult worms, the life cycle is complete (Luka *et al.*, 2023). Humans can become infected during the disease's natural transmission from predators to domestic animals by ingesting *Echinococcus* eggs in contaminated food or water or by coming into close contact with dogs.

The distribution of *E. granulosus* is considered worldwide and occurs in several regions such as the Mediterranean, Asia, Africa, Australia, and South America (Budke *et al.*, 2006). Hydatidosis causes decreased livestock production and condemnation of offal containing hydatid cysts in slaughterhouses (Eckert and Deplazes, 2004; Azlaf and Dakkak, 2006; Zewdu *et al.*, 2010; Yakubu *et al.*, 2021 and Luka *et al.*, 2023). Hydatidosis is endemic in sheep and cattle raising areas worldwide. Domestic animals such as camels, cattle, goat, and sheep which live in close contact with dogs are implicated in transmission of the zoonotic diseases to human (Abriham, 2021). Hydatid cyst-infected visceral are purposefully left for consumption by humans and stray dogs in developing countries due to ineffective meat inspection at the time of slaughter and indiscriminate backyard slaughter practices. Ruminants also get infected by grazing on pasture that has been contaminated with stray dog faeces that contain eggs of the *Echinococcus* species (Schantz *et al.* 1995). The absence of proper meat inspection procedures and the presence of large stray dog population are thought to contribute significantly to the prevalence of the disease in Nigeria. The epidemiology and potential distribution of hydatidosis in Kaduna State, Nigeria has not been thoroughly investigated.

Hence, it is essential to obtain data concerning prevalence of the disease before contemplating any rational control programs. Therefore, the purpose of this study was to assess the prevalence of hydatidosis in cattle and goats at selected abattoirs of Kaduna State, Nigeria.

Material and Methods

Study Area

The study was conducted in Kaduna State, covering 10 Local Government Areas (L.G.A) out of 23 LGA that make up the State. Kaduna State is one of the highest livestock producers in the country (Bourn *et al.*, 1994). The LGA's were selected using the cluster sampling method for selection as follows: Lere (Saminaka); Makarfi; Giwa; Zaria (Zango); Igabi (Mando); Kaduna North (Kawo); Chikun (Tudun-Wada); Kachia (Kachia); Zango-Kataf (Zonkwa); Jama'a (Kafachan). Kaduna State is located in the North-West geopolitical zone of Nigeria, with the highest temperature of 38.3°C in the months of March and April and lowest temperature of 31.7°C in the months of August and September. Kaduna State has a total land area of 46,053 KM² with a population of 6,113,503 as of 2006 census (<http://citypopulation.de/php/nigeria-admin.php>).

Study population

The study population consisted of cattle and goats brought for slaughter in the selected abattoirs. The animal organs of interest were liver and lungs from infected animals. The approval was obtained from the ethical Board of Kaduna State Ministry of Health with reference number: (MOH\ADM\744\Vol.1\953) before the study commenced. Permission was also sought from officials of the selected abattoir.

Sample collection

Visits were made to the abattoirs from February 2022 to December 2022. Random

sampling method was used to collect samples from cattle and goats slaughtered in selected abattoirs. Cattle (673) and goats (587) slaughtered were grossly examined for hydatid cysts based on estimated age, sex, species and

organs infected. Prior to collection of samples, information were obtained on the presence or absence of stray dogs around the abattoir, general knowledge of the disease and hygiene of the abattoir.

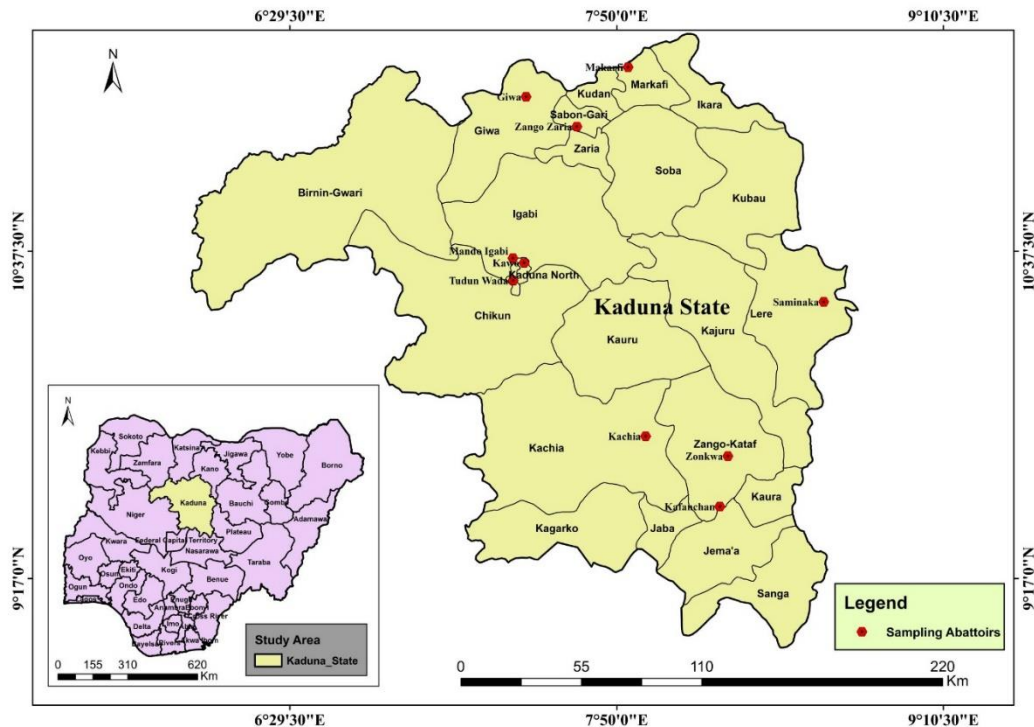


Figure 1: Sampling Sites in the selected LGA of Kaduna State.

Ante Mortem Examination

Before slaughter, ante mortem examination was performed, the age, sex and species of each individual animal was identified and recorded. The ages of the animals were estimated and were grouped as follows; 1 to 2 years, 3 to 4 years, and 5 years and above. It was difficult to precisely indicate the geographical origin of all animals slaughtered at the abattoir and relate the findings on hydatidosis to a particular locality. Nevertheless, the attempts made in this regard have disclosed that the majority of them were drawn from market-oriented areas.

Post Mortem Examination

Postmortem inspection procedure recommended by FAO (1994) was used during the study. Visceral organs, particularly the lungs and liver were inspected by visual, palpation and systematic incision of each organ for the presence of hydatid cysts. Hydatid cysts found were removed from the infected organs, preserved with 5% formalin in clean sample bottles with labels, and sent to the Parasitology and Entomology Research Laboratory, Department of Zoology, Ahmadu Bello University, Zaria for further analysis.

Data Analyses

Data obtained were analysed using descriptive statistics to summarize the prevalence and

relative percentage of hydatid cyst in cattle and goats in selected abattoirs. Chi-squared (χ^2) was used to determine significant difference of infection in relation to age and sex in infected cattle and goats. While the significance of associations of prevalence with the stated risk factor variables were determined using Odds Ratio (OR) analysis. Association of prevalence of infection with a risk factor was present if the OR value was greater than one (>1.0) and was absent if the OR value was less than one (<1.0). Association was significant when the lower limit of the 95% confidence interval of the OR was >1.0 and was not significant if it was <1.0 .

Results

Hydatid Cysts Prevalence in Cattle and Goats Slaughtered in Selected abattoirs in Kaduna State.

Of the 1,260 study animals examined, 673 cattle and 587 goats for prevalence of hydatid cysts, the overall prevalence of 81(6.4%) of the study population harbored one or more hydatid cysts in their liver, lungs, or both (liver and lungs) after being visually and palpably tested for the infection.

The magnitude of the disease between the two species 42(6.2%) cattle and 39(6.6%) goats examined for the prevalence of hydatid cysts was not significant ($P>0.05$) in the study area. There was association of prevalence of hydatidosis in goats (OR=1.069, 95% CI=0.681 -1.678) (Table1), but the association was not significant.

Table 1. Overall prevalence of hydatid cyst in cattle and goats slaughtered in selected abattoirs in Kaduna State, Nigeria.

Animal	Number Examined	Number Infected (%)	Chi-squared χ^2	p Value	Odds ratio (OR) (95% C.I.)
Cattle	673	42 (6.2)	0.085	0.771ns	0.935 (0.596 - 1.468)
Goats	587	39 (6.6)			1.069 (0.681- 1.678)
Total	1260	81 (6.4)			

Key: χ^2 =Chi-squared, OR=Odds Ratio, C.I=Confidence Interval at 95%, ns=not significant.

Prevalence of hydatid cysts in cattle and goats of different age groups

Higher prevalence was recorded in aged animals, the overall prevalence of hydatid cysts revealed that the increase in prevalence of hydatid cysts infection in cattle was directly proportional with age in which the five (5) years and above age group had highest prevalence (6.2%), while the least prevalence was recorded in 1-2 years age group (0%). Analysis of age-specific prevalence of hydatid cysts in cattle revealed an increase with increase in age of cattle. In goats, a similar increase with increase in age of goats, except in the 3 -4 years age group (9.6%) where the highest prevalence was recorded after which it reduced to (5.4%) in age group 5years and

above. However, no statistically significant ($P>0.05$) difference in prevalence among the age groups of cattle and goats examined from the study area (Table 2).

The results indicate that out of the 673 males and 587 females examined, the overall, hydatid cysts prevalence was higher in females (7.7%) than in males (5.3). Female cattle recorded higher prevalence (6.8%) than males (5.7%), while female goats had higher prevalence (8.7%) as compared to males (4.9%). Female cattle and goats slaughtered in the selected abattoirs of Kaduna State, were more likely to harbor the cysts than the males, however, no statistically significant difference ($P>0.05$) was observed between

the sex. Although there were association of prevalence to the female sex. However,

association was not significant (OR=1.469, 95% CI=0.934 – 2.311) (Table 3).

Table 2: Age-Specific Prevalence of Hydatid Cysts in Cattle and Goats Slaughtered in Kaduna State, Nigeria.

Age Groups	Number Examined	Number Positive	Chi-squared	P Value	Odds Ratio (OR) (95% C.I.)
Cattle					
1 to 2	-	-			-
3 to 4	122	4 (3.3)	2.234	0.135ns	0.458 (0.160 – 1.307)
5 and above	551	38 (6.9)			2.185 (0.765 – 6.242)
Total	673	42 (6.2)			
Goats					
1 to 2	1	0 (0.0)	3.628	0.163ns	-
3 to 4	177	17 (9.6)			1.869 (0.967 – 3.613)
5 and above	409	22 (5.4)			0.535 (0.277 – 1.034)
Total	587	39 (6.6)			
Overall					
1 to 2	1	0 (0.0)	0.295	0.863ns	-
3 to 4	299	21 (7.0)			1.133 (0.677 – 1.896)
5 and above	960	60 (6.2)			0.883 (0.527 – 1.477)
Total	1260	81 (6.4)			

Key: χ^2 =Chi-squared, OR=Odds Ratio, C.I=Confidence Interval at 95%, ns=not significant.

Table 3: Sex-Specific Prevalence of Hydatid Cysts in Cattle and Goats Slaughtered in Kaduna State, Nigeria.

Sex	Number Examined	Number Positive (%)	Chi-square	P Value	Odds Ratio (OR) (95% C.I.)
Cattle					
Male	349	20 (5.7)	0.322	0.570ns	0.834 (0.447 - 1.560)
Female	324	22 (6.8)			1.198 (0.641 – 2.240)
Total	673	42 (6.2)			
Goats					
Male	324	16 (4.9)	3.392	0.066ns	0.542 (0.280 - 1.049)
Female	263	23 (8.7)			1.845 (0.954 – 3.569)
Total	587	39 (6.6)			
Overall					
Male	673	36 (5.3)	2.798	0.094ns	0.681 (0.433 - 1.071)
Female	587	45 (7.7)			1.469 (0.934 – 2.311)
Total	1260	81 (6.4)			

Key: χ^2 =Chi-squared, OR=Odds Ratio, C.I=Confidence Interval at 95%, ns=not significant.

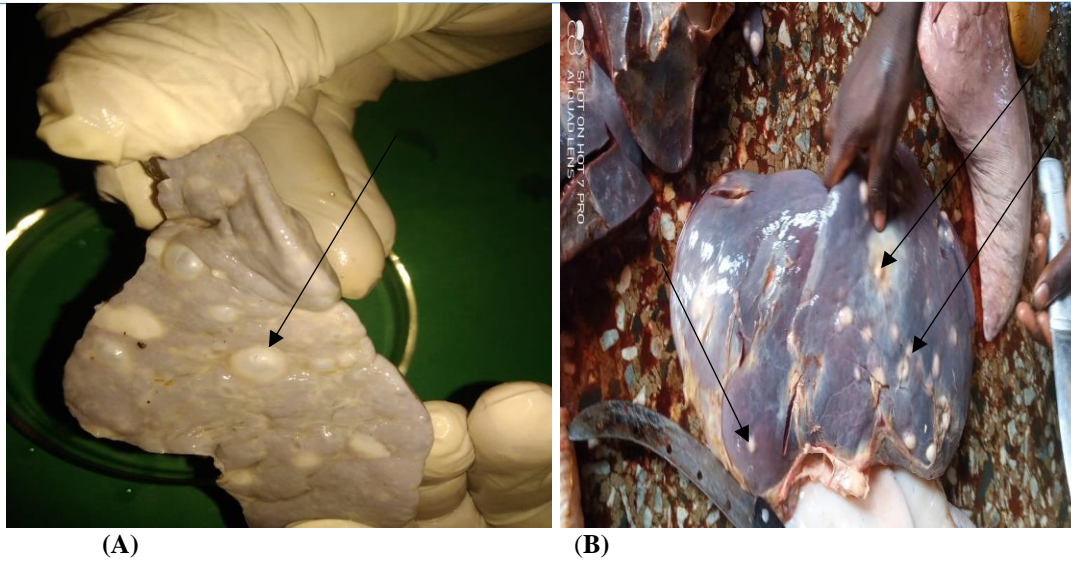


Figure 2: Calcified hydatid cysts in lungs of slaughtered goat (A) and in the liver of slaughtered cattle (B).



Figure 3: Collected fertile hydatid cysts in lungs of slaughtered goats (A) and liver of goats (B).

Discussion

All over the world there have been several cases of increasing hydatidosis in cattle and goats with respect to rates of prevalence and the prevalence may vary from country to

country or even within the country (Zewdu *et al.*, 2010). The disease is principally sustained by the parasite's life cycle between the carnivores and domestic species which poses challenges to the control and eradication of the

parasites (Abriham, 2021). In this study, the overall prevalence of hydatidosis was 6.4%. The prevalence of hydatidosis in livestock in this study correlates with previous works in Kano reported by Rabiou and Jegede (2010) in which 0.66% and 0.28% were recorded in cattle and goats respectively; Magaji *et al.* (2011) reported 0.07% and 0.03% in cattle and goats respectively in Sokoto, but slightly lower than 12.5% in Zaria, Kaduna by Luka and Adewumi, (2015b); 9.68% by Aziza and Tunuade (2018) in Kano state, Nigeria. On a general note, low, medium and high prevalence of hydatidosis have been recorded in different localities depending on the availability of the risk factors in the area. Prevalence was influenced by large dog population and presences of other wild canids, practice of home slaughter, abattoirs are not fenced, control measures, lack of awareness and education about the disease in the communities.

With regards to rate of infection of hydatidosis in different age groups of cattle and goats, the 5 years and above age group examined had higher prevalence and chances of being infected, while 1-2 years age group had the least prevalence although the difference among the age groups were statistically not significant ($P>0.005$). The difference in infection could be mainly due to longer exposure time to *E. granulosus*. This outcome is in agreement with the finding of Azlaf and Dakkak (2006), Zewdu, *et al.* (2010), Ohiolei *et al.* (2020) and Luka *et al.* (2023).

The sex-specific prevalence of hydatid cysts revealed that most of the infected cattle and goats were females. Females harbored more cysts than males, but the difference was not significant ($P>0.05$), which may be due to indiscriminate exposure of both sexes to the same risk factors in an extensive or semi-intensive management system (Craig *et al.* 2007c). Females that live longer are more likely to acquire infection over the years from

environment than males that get slaughtered at young (Aziza and Tunuade, 2018).

The variation in the prevalence of hydatidosis amongst cattle and goats may be associated not only with environmental factors such as cool temperature, high rainfall and shade, which increase the probability of eggs survival in the environment and favor the transmission of hydatidosis in livestock but also with control measures and breeding systems, number of dogs in each location, education level, religion and culture as well as economic status of the population. Apart from this, the number of stray dogs as well as wild carnivores is considerable and dogs are not dewormed at all. Indeed, the transmission of *Echinococcus granulosus* is favored by farmers who feed shepherd dogs with infected viscera, representing a source of risk for the human population. Therefore, dogs potentially infected with *E. granulosus* can contaminate the grazing pastures with feces containing eggs, contributing to the high prevalence of hydatidosis in livestock within these communities.

Conclusion

This study has been able to show hydatidosis is prevalent in the study area, the prevalence has shown increasing rate of hydatidosis in cattle and goats during the study period and are widely distributed across the state. The study showed higher prevalence was associated to aged animals, there was association between prevalence of cysts and female cattle and goats but the association was not significant. Further investigation into the basic local epidemiological factors enhancing the disease spread in the region to establish regional control strategy are recommended.

Reference

Abriham, A. T., (2021). Review on Hydatidosis, Its Epidemiology and Economic Importance in

- Ethiopia. *International Journal of Advanced Research in Biological Sciences*, 8(7): 126-137.
- Azlaf, R., and Dakkak, A. (2006). Epidemiological study of the cystic echinococcosis in Morocco. *Veterinary Parasitology*, 13:83- 93.
- Aziza, T., and Tunuade, I. O. (2018). Present status of hydatidosis in slaughtered animals in Kano city abattoirs North-Western Nigeria. *Bayero Journal of Pure and Applied Sciences*, 11(2): 225 -228.
- Bourn, D., Wint, W., Blend, R., and Wolley, E. (1994): Nigerian livestock Resource survey. *World Animal Review*, FAO 78(1): 49-58.
- Budke, C.M., Deplazes, P. and Torgerson, P.R., (2006). Global socioeconomic impact of cystic echinococcosis. *Emerging Infectious Diseases*, 12: 296-303.
- Craig, P.S., McManus, D.P., Lightowlers, M.W., Chabalgoity, J.A., Garcia, H.H., Gavidia, C.M., *et al.* (2007c). Prevention and control of cystic echinococcosis. *The Lancet of infectious Diseases*. 7, 385-394.
- Eckert, J. and Deplazes, P. (2004). Biological Epidemiological and Clinical Aspect of Echinococcosis: A Zoonosis of Increasing Concern. *Clinical Microbiology Review*, 17(1): 107-135.
- FAO (1994). "Guidelines for Echinococcosis, Surveillance, Prevention and Control". FAO. Rome, No. 29: 47.
- Harandi, M. F., Budke, C. M. and Rostami, S. (2012). The Monetary Burden of Cystic Echinococcosis in Iran. *PLoS. Neglected Tropical Disease*. 6(11): e1915.
- Luka, S. A. and Adewunmi, H. I. (2015b). Prevalence of hydatid cysts in goats slaughtered at Dogarawa abattoir, Zaria, Kaduna State. *Nigerian Journal of Scientific Research*, 14(2): 134-137.
- Luka, S. A., Kogi, E., Ndams, I. S., Kogi, A. C., Yaro, C. A., Yakubu, R., Kase, S.N., Bello, R., Yusuf, B., Haruna, J. S., Mohammed, A.T., Mohammed, S.J., Ibrahim, Z., Gwalaba, J. and Olajide, I.O. (2023). Prevalence of hydatid cyst in liver and lungs of cattle slaughtered in selected abattoirs in Northern Nigeria. *FUDMA Journal of Sciences*, 7(3): 93 -101. <http://doi.org/10.33003/FJS-2023-0703-1826.com>
- Magaji, A. A., Oboegbulem, S. I., Daneji, A. I., Garbage, H. S., Salihu, M. D., Junaidu, A. U. and Mohammed, A. A. *et al.* (2011). Inference of Hydatid cyst disease in food animals slaughtered at Sokoto Central abattoir, Sokoto State, Nigeria. *Veterinary World*, 4(5): 197-200.
- Ohiolei, J.A., Yan, H., Li, L., Zhu, G., Muku, R.J., Wu, Y., and Jia, W. (2020). Review of Cystic Echinococcosis in Nigeria: A story of Neglect. *ACTA Parasitology*, 65(1):1-10.
- Prathiush, P. R., D'Souza, P. E. and Gowda, A. K. J. (2008). Diagonosis of *Echinococcus granulosus* infection in dogs by a

- hr/>
- coproantigen sandwich ELISA. *Veterinarski Arhiv*, 78(4): 297-305.
- Rabiu, B.M. and Jegede, O.C. (2010). Incidence Study of Hydatidosis among Slaughtered Animals at Kano Abattoirs, Nigeria. *Biological and Environmental Science Journal for the Tropics*, 7(2): 39-41.
- Raul, M.R., Carlos, S.O., and Mar, S.L. (2015). Serological diagnosis and follow-up of human cystic echinococcosis: A new hope for the future. *Biomedical Research International*, (4)2:
- Schantz, P.M., Chai, J., Craig, P.S., Eckert, J., Jenkins, D.J., Macpherson, C.N.L., Thakur, A., (1995). Epidemiology and control of hydatid disease. In: Thompson, R.C.A., Lymbery, A.J. (Eds.), *Echinococcus and Hydatid Disease*, CAB International, Australia, 233- 331.
- Yakubu, R.A., Nock, I.H., Ndams, I.S., Luka, S.A., Yaro, C.A., Alkazmi, L., and Betiha, G.E. (2021). Detection of *Echinococcus granulosus sensu lato* cysts and seroprevalence of cystic echinococcosis in cattle and camels in Maiduguri Abattoir. *Journal of parasitic Diseases*, 46(5):15-22.
<http://doi:10.1007/5/2639-022-01508-z.com>
- Zewdu, E., Teshome, Y. and Makwoya, A. (2010). Bovine hydatidosis in Ambo Municipality Abattoirs. West Shoa. Ethiopia. *Ethiopia Veterinary Journal*, 14(1): 1-14.