



Prevalence and Viability of Hydatid Cysts in Bovine Slaughtered in Selected Abattoirs within Kaduna Metropolis, Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Aim: The study is aimed at determining the prevalence, cyst characteristics and viability of echinococcosis (hydatidosis) in cattle slaughtered at selected abattoir in Kaduna Metropolis.

Methodology: This was a cross sectional study carried out at Tudun-wada abattoir, Kakuri (Makera) abattoir, Kawo abattoir and Sabon-Tasha abattoir, all within Kaduna metropolis, from January to July, 2019.

Results: Out of the 160 cattle examined (40 from each abattoir), 21 (12.2 %) were found to harbor visible hydatid cysts. Significantly higher infection ($p < 0.05$) was detected in cattle with poor body conditions than animals with moderate and fat body condition score. No significant variation was observed with regards to sex of animals. Animals used were all adults. Cysts were found to be distributed in the lung, liver, kidney, spleen and heart as follows: 42.9%, 38.0%, 4.76%, 9.50% and 4.76% respectively. Out of 36 hydatid cysts examined, 17 (47.22%), 14 (38.88%) and 5 (13.88%) were found to be small, medium and large- sized respectively. Likewise, out of 36 cysts assessed, 18 (50%) were fertile, 4 (11.11%) sterile and 14 (38.8%) were calcified. Of the 18 fertile cysts subjected for viability test, 12 (27.7%) were viable while, 8(22.2%) were non-viable.

Conclusion: Despite the moderate magnitude of infection detected currently, there seems to be an existing socioeconomic situation favorable for hydatidosis and hence it remains one of the most important diseases warranting serious medical and veterinary attention.

Keywords: Echinococcosis; cysts; abattoir; fertile; viability; organs.

ABBREVIATIONS

NAHIS: National Animal Health Information System

SPSS: Statistical Product and Service Solutions

1. INTRODUCTION

Hydatidosis is a parasitic zoonotic disease caused by the metacestode of the tapeworm *Echinococcus* spp [1]. It is one of the limiting factors in food animal production and hampers the realization of adequate meat supply to meet the ever-increasing demand of animal protein by human population [2]. Three broad morphological forms of *Echinococcus* spp are recognized clinically; *Echinococcus granulosus* which causes cystic echinococcosis; *E. multilocularis* which causes alveolar echinococcosis and *E. oligarthrus* which causes polycystic echinococcosis. The definitive hosts of *E. granulosus* are the dogs while, the intermediate hosts are the domestic ungulates and man [3].

The adult hydatid worm which resides in the small intestine of a definitive host produces gravid proglottids, which release eggs that are passed out in faeces of the host (mostly dogs). The eggs are then ingested by an intermediate host (cattle). The eggs then hatch in the small intestine of the cattle, releasing an oncosphere that penetrates the intestinal wall. This moves through the circulatory system into organs such as lungs, liver, kidney, spleen and the heart where they develop into cyst which then slowly enlarges, creating protoscolices and daughter cyst [4,5]. Several research studies have reported the presence of hydatid cysts in different organs examined in slaughtered animals in abattoirs [6-15]. These cysts may be fertile or non-fertile, viable or sterile and calcified [6,16,13,14]. The prevalence of the hydatid cysts is also found to highly harboured in the lungs of most animal slaughtered than other organs [6,16,7,8-15].

Hydatidosis has a worldwide distribution, and causes considerable economic losses and public health problems in many countries including Nigeria and other pastoral range and areas of the world [17,18].

Lack of adequate control policy, uncontrolled movement, trading of animals, and their products and difficulties in early diagnosis enhance the distribution of the disease [19]. Infection is often

associated with economic losses due to livestock mortality, morbidity and organ and meat condemnation at the meat inspection. It also poses a serious threat to public health where close association exists between dogs, man and food animals [20]. Many tropical countries are hydatidosis endemic and this poses a threat to development. There is paucity of information on hydatidosis in domestic livestock in Nigeria and Kaduna. Most of the documented reports are based on postmortem findings from abattoirs, thus mitigating public health intervention measure in this regard.

The aim of this research is to determine the prevalence and viability of cystic hydatidosis in bovine slaughtered in four selected abattoirs within Kaduna metropolis.

2. MATERIALS AND METHODS

This study was conducted in four selected abattoirs within Kaduna metropolis: Tudun Wada (A), Kakuri (B), Sabon Tasha (C) and Kawo (D). The animals comprise of cattle slaughtered in the abattoirs. The information on the breed of the cattle, age, sex and body count score were obtained through the administration of questionnaires. Sample size was determined using the formula by Thrusfield for random sampling [21] as follows:

$$N = \frac{(1.96)^2 (p_{exp})(1-p_{exp})}{d^2}$$

Where

p_{exp} = Expected prevalence

N = Total number of sample size

D = Required precision

$$N = \frac{1.92^2(0.12 \times 1 - 0.12)}{0.05^2} = 162.3$$

However, to increase the precision of the study, a total of 160 was considered.

A cross-sectional study was conducted to evaluate the prevalence, organ distribution and characteristics of hydatid cysts in cattle slaughtered at Kaduna Metropolis abattoir.

A total of 160 cattle at slaughter point, that is 40 from each abattoir were randomly sampled and examined for the presence of the hydatid cysts. The sex and body score condition of adult

animals being slaughtered only were recorded. (The sentence to be reframed. A total of what isn't written and doesn't make a complete sense of it?). All organs (lungs, liver, heart, kidney and spleen) suspected to be harbouring hydatid cysts were labelled as partially or totally condemned and judged according to guideline on meat inspection for developing countries.

According to their size, hydatid cysts were then classified as small (<4cm), medium (4-8cm) and large (>8cm), depending on which organs they were recovered from. The fertility of each cyst was also determined. (This sentence to be dived into as it deals with different issues). All data obtained were subjected to statistical analysis using Chi Square. All value of (P<0.05) is considered significant at 95% confidence interval.

There should be section of Data analysis. This constitutes all tools used in the analysis of data obtained from the research.

3. RESULTS

3.1 Distribution of Cysts in Different Organs of the Cattle

The result of relative distribution of the cysts in different organs of the cattle is shown in Table 1. The relative prevalence of the cysts is more in the lungs 42.9% and the liver 38.0%. The least occurrence was in the heart and spleen with each having 4.76%.

In the Table 1, No positive isn't standard. It could be misinterpreted. It should have been No. of Positive or Number of Positive.

Each table to be followed by its summary of the results for ease of understanding and per international standard and the results section to be sub-numbered as per each parameter carried out.

Table 1. Relative distribution of cysts in different organs of the cattle from the four abattoirs

| Organ | No of positive (Positive no) | % Percentage |
|--------------|------------------------------|--------------|
| Lung | 9 | 42.9 |
| Liver | 8 | 38.0 |
| Spleen | 1 | 4.76 |
| Kidney | 2 | 9.50 |
| Heart | 1 | 4.76 |
| Total | 21 | 100 |

3.2 Status of Cysts from Different Organs of Cattle Examined in the Four Abattoirs

The status of cysts from different organs of the cattle slaughtered in four abattoirs is presented in Table 2. In the lungs, there were eight cases of fertile viable cysts, which represent 47.05%, non-viable were six, which represents 35.2%, two cases of sterile cysts, which represent 11.76% and one case of calcified cysts which represent 5.8%. Only one case of viable cysts in the liver occurred which represent 7.14%. No case of non-viable and sterile cyst was found in the liver. There were 13 calcified cases which represent 92.8%. While 33.3 % of the cases are in the kidney. In the spleen and heart, one case each of non-viable and sterile occurred respectively.

3.3 Occurrence of Infection with Regards to Body Condition and Sex of Cattle

Analysis of the occurrence of infection with regards to body condition and sex was done by using proportions and chi-square test. Sex did not show significant difference with regard to cyst detection (P>0.05), since only few females were examined compared to males, but body condition showed significant difference (P<0.05) with the lean which were few in number showing higher infection (Table 3).

3.4 Distribution of Organ and Size of Cyst in Cattle Examined in the Four Abattoirs

Majority of cysts were found in the lungs and are medium with few small and large sizes, while majority found in the liver were small in size (Table 4).

Table 2. Status of cysts in different organs of the cattle slaughtered in the four abattoirs

| Organs | No. of cysts examined | Viable cysts (%) | Non-viable cysts (%) | Sterile cysts (%) | Calcified cysts (%) |
|--------------|-----------------------|------------------|----------------------|-------------------|---------------------|
| Lung | 17 | 8(47.05) | 6(35.2) | 2(11.76) | 1(5.8) |
| Liver | 14 | 1(7.14) | - | - | 13(92.8) |
| Kidney | 03 | 1(33.3) | 1(33.3) | 1(33.3) | - |
| Spleen | 01 | - | 1(100) | - | - |
| Heart | 01 | - | - | 1(100) | - |
| Total | 36 | 10(27.8) | 8(22.22) | 4(11.11) | 14(38.9) |

Table 3. Analysis of the occurrence of infection with regards to body condition and sex in cattle slaughtered at the four abattoirs

| Variables | No. examined | | | | No. of infection | | | | Prevalence (%) | | | |
|-----------------------------|--------------|-----------|-----------|-----------|------------------|----------|----------|----------|----------------|-------------|------------|-------------|
| | A | B | C | D | A | B | C | D | A | B | C | D |
| Sex | | | | | | | | | | | | |
| Male | 36 | 31 | 33 | 30 | 4 | 5 | 3 | 5 | 10.0 | 12.5 | 7.5 | 12.5 |
| Female | 4 | 9 | 7 | 10 | 1 | 2 | - | 1 | 2.5 | 5.0 | -- | 2.5 |
| Total | 40 | 40 | 40 | 40 | 5 | 7 | 3 | 6 | 12.5 | 17.5 | 7.5 | 15.0 |
| Body condition score | | | | | | | | | | | | |
| Fat | 22 | 19 | 29 | 27 | 1 | 2 | - | 1 | 2.5 | 5.0 | -- | 2.5 |
| Medium | 14 | 17 | 10 | 9 | 2 | 1 | 2 | 1 | 5.0 | 2.5 | 5.0 | 2.5 |
| Lean | 4 | 4 | 1 | 4 | 2 | 4 | 1 | 4 | 5.0 | 10.0 | 2.5 | 10.0 |
| Total | 40 | 40 | 40 | 40 | 5 | 7 | 3 | 6 | 12.5 | 17.5 | 7.5 | 15.0 |

Table 4. Distribution of size and organ of hydatid cyst in cattle examined in all four abattoirs

| Cyst type | Lung | Liver | Spleen | Kidney | Heart |
|--------------|--------------------|--------------------|------------------|------------------|------------------|
| Small | 4 (23.5%) | 12 (70.5%) | ----- | 1 (5.8%) | ----- |
| Medium | 9 (64.28%) | 2 (14.28%) | 1 (7.14%) | 1 (7.14%) | 1 (7.14%) |
| Large | 4 (80%) | ----- | 1 (20%) | 1 (20%) | ----- |
| Total | 17 (47.22%) | 14 (38.89%) | 3 (8.33%) | 3 (8.33%) | 1 (2.78%) |

4. DISCUSSION

The overall prevalence of hydatidosis of 12.2% in this study is closer to the 15.4% reported by [22], 10.5% by [11], 13.61% by [12] and 10.4% by [13], although the number of cattle examined by each researcher differs. However, there was higher findings of 20.5% reported in Kano by [23] and 24.3% reported from southwest Nigeria by [24], 23.18% by [6], 52% by [16] and 52.5% by [7]. Differences in the culture, social activity, animal husbandry systems, lack of proper removal of infectious carcasses and the attitude to dogs in the different region could be factors that contributed to the variations in the prevalence in different areas of the country. The higher prevalence of cysts in the lungs (42.9%) and the liver (38.88%) in this study agree with the work of several researchers from different parts of the world especially Ethiopia where several works have been reported [25,26,6,16,7-15] who observed hydatid cysts in the domestic

animals and the lungs to harbour the highest hydatid cysts. This could be due to possession of great capillaries which is usually encountered by the migrating *Echinococcus* oncosphere which adopt the portal vein route, and primarily negotiate hepatic and pulmonary filtering system sequentially before any other peripheral organ is involved. It is also possible that the hexacanth embryo can enter the lymphatic circulation and be carried through the thoracic duct to the lungs in such a way that the lungs may be infected before the liver. The fertile cyst of 50% observed in this study is in agreement with the study by [20] and those of [16] but differs with that of [14] from Italy who reported 50% sterility and 24.1% fertility of the cyst. In this study there is higher fertility rate observed in the lungs than in the liver, this may also be due to the softer consistency of the lung tissues [20]. This higher fertility rate highlights the hazard that these animals perpetuate in the cycle of hydatidosis. There are more viable cysts in the lungs than in the

other organs. A greater frequency of medium-sized and large-sized cysts was found in the lung than the liver which harboured a large number of small-sized and calcified cysts. The reason for the higher percentage of medium and large - sized cysts in the lungs may be due to the softer consistency of the lung, while the higher number of calcified cysts in the liver could be attributed to relatively higher reticuloendothelial cells and abundant connective tissue reaction of the organ. More infection were found in male than female cattle, but this could be due to the fact that more male were examined in the study.

From this study, hydatidosis is an important disease of cattle in Kaduna metropolis and its surroundings, which may be causing substantial losses due to condemnation of organs and weight loss in the infected livestock. Much attention and resources should be channeled to research in order to curtail the mode of transmission of this parasite from definitive host to intermediate hosts and vice-versa.

5. CONCLUSION

The findings of this study shows that hydatidosis is widespread and viable in the cattle slaughtered in the four abattoirs. The observed fertile cysts in the organs examined suggests that cattle as a reservoir host plays a vital role in the life cycle of cystic echinococcosis and may present potential risks of transmission to other intermediate hosts as well as the human population in close proximity.

Therefore, it is recommended that affected organs should be disposed off properly as well as educating the community about its health implications.

Health workers should be empowered to enlighten the abattoirs operation on the claim of hydatidosis transmission. They should also increase inspection visits and monitoring of abattoirs activities to avoid illegal consumption of hydatid infected organs. Anti-helminthic drugs should be made available to the bovine farmers in order to eliminate the parasites.

ETHICAL APPROVAL

The management of experiment, Animal care and handling were approved by the Department of Biological Sciences, Nigerian Defence Academy Kaduna.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Magaji AA, Oboegulem SI, Daneji AI, Garba HS, Salihu MD, Junaidu AU. Incidence of hydatid cyst disease in farm animals slaughtered at Sokoto central abattoir, Sokoto state, Nigeria. *Vet. World*. 2011;4(5):197-200.
2. Ogunsan EA, Umar IO, Bannor TT, Majyagbe KA. Hydatidosis in slaughtered camels in Sokoto state Nigerian. *Nigerian Vet. J*. 2000;21:1-9.
3. Luka SA, Ajogi I, Nock I, Kudi C, Umorh J. Evaluation of enzyme linked immunosorbent assay (ELISA) and western blotting for the immunodiagnosis of hydatid diseases in sheep and goats. *Internet J. Vet. Med*. 2009;5(2):3-5.
4. Schantz PM. Parasitic zoonosis in perspective. *Int. J. Parasitol*. 1990;(2): 165-166.
5. Biu AA, Abagwe SA. Prevalence of hydatidosis amongst food animals in semi-arid North-Eastern Nigeria. *Bioscience Research Community*. 2002;14(1):85-91.
6. Melese Teklay, Yeshitila Amede, Zelalem Nigusie and Abebe Fromsa. Bovine hydatidosis, prevalence and economic significance at adirait municipal abattoir, Northern Ethiopia. *Advances in Biological Research* 2017;11(3):109-115.
7. Mekuria Mandefro, Birhanu Tilahun, Yehualashet Bayu, Tesfaheywe Zeryehum. Prevalence of bovine hydatidosis and its economic importance in adama municipal abattoir, Eastern Ethiopia. *Ethiopian Veterinary Journal*. 2019;23(1): 24-41.
8. Negash k, Beyene D, Kumsa B. Cystic echinococcosis in cattle slaughtered at shashenne municipal abattoir, South Central Oromia, Ethiopia: Prevalence, Cyst distribution and fertility. *Transaction of the Royal Society of Tropical Medicine and Hygiene*. 2013;107:229-234.
9. Abebe A, Beyene D, Kumsa B. Cystic echinococcosis in cattle slaughtered at gondar elfora export abattoir, Northern Ethiopia. *Journal of Parasitic Diseases*. 2013;107:229-234.

10. Bersissa Kumsa. Cystic *Echinococcosis* in slaughtered cattle at addis ababa abattoir enterprise, Ethiopia. *Veterinary Animal Science*. 2019;7.
DOI: 10.1016/j.vas.2019.100050
11. Layla Omran Elmajdoub, Wahab A Rahman. Prevalence of hydatid cysts in slaughtered animals from different areas of Libya. *Open Journal of Veterinary Medicine*. 2015;05(01):1-0.
12. A Melaku, B Lukas, B Bogale. Cyst Viability, Organ distribution and financial losses due to hydatidosis in cattle slaughtered at dessie municipal abattoir North-Eastern Ethiopia. *Veterinary World*. 2012;5(4):213-218.
13. Tesfaye Belachew, Mekdes Abay, Tesheme Gunse. Bovine hydatid cyst: Prevalence, characteristic, public health and economic importance at adama abattoir central Ethiopia. *International Journal of Veterinary Science Research*; 2019.
ISSN: 2640-7604
14. Anastasia Founta, Spyridon Chlionakiis, Konstantina Antoniadou Sotiriadou, Maria Koidou, Vasileios Bampidis. Prevalence of hydatidosis and Fertility of hydatid cysts in food animals in Northern Greece. *Veterinaria Italiana*. 2016;52(2):123-7.
15. Nebyou Moje, Adugna Degeta. Prevalence, Cyst viability, organ distribution and financial losses due to hydatidosis in cattle slaughtered at nekemte municipal abattoir, Western Ethiopia. *Journal of Veterinary Medicine and Animal Health*. 2014;6(11):280-288.
16. Getachew Gedeno Guduro, Angerson Hadushn Desta. Cyst viability and economic significance of hydatidosis in Southern Ethiopia. *Journal of Parasitology Research*; 2019.
Available:https://doi.org/10.1155/2019/2038628
17. Tijjani AO, Musa HI, Atsanda NN, Mamman B. Prevalence of hydatidosis in sheep and goats slaughtered at damaturu abattoir, Yobe state Nigeria. *Nigerian Vet. J*. 2010;31(1):71-75.
18. Jenkins JD. Hydatidosis; A zoonosis of unrecognized increasing importance. *J. Med. Microbiol*. 1998;47:282-282.
19. National Animal Health Information System (NAHIS). *Echinococcosis*. Animal Health Australia; 2004.
Available:http://www.aahc.com.au/nahis/disease/dislist.as
20. Kebege N, Mitiku A, Tilahun G. Hydatidosis of slaughtered animals in bahir dar abattoir north-western Ethiopia. *Trop. Anim. Health Prod*. 2009;4:43-50.
21. Thrusfield MV. *Veterinary Epidemiology*, (3rd Edition). Wilery. 2005;584.
22. Dada BJO. Taeniasis, cysticercosis and echinococcosis/hydatidosis in Nigeria: III-prevalence of bovine and porcine cysticercosis, and hydatid cyst infection based on joint examination of slaughtered food animals. *J. Helminthology*. 1980;54: 293-297.
23. Luka SA, Ajogi I, Nock IH, Umoh JU, Kudi AC. Serodiagnosis of hydatidosis in camels slaughtered in Kano abattoir, northern Nigeria. *Pan-African J. Series*. 2011;39:1.
24. Oyedutan AA, Temitope UK, Emmanuel CU. *Echinococcus granulosus* prevalence in dogs in Southwest Nigeria. *J. Parasitol. Res*. 2014;2014.
25. Njoroge EM, Mbithi PM, Gathum JM, Zeyhle E (2002). A study of cystic echinococcosis in slaughter animals in three selected areas of northern Turkana Kenya. *Veterinary Parasitology* 2002;104 (1):85-89.
26. Eckert J, Gotstein B, Health D, Liu FJ. Prevention of echinococcosis in humans and safety percussion. In: WHO/OIE Manuel on Echinococcosis in humans and animals; a public health problem of global concern. Eckert J, Gemmell MA, Meslin FX, Pawlowski ZS. (Editors). World Organization for animal Health, Paris, Price. 2001;238-247.

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