Prevalence, economic impact analysis and viability of Hydatid cysts in Bovine slaughtered in selected abattoirs within Kaduna metropolis, Nigeria.

Abstract

A cross sectional study aimed at determining the prevalence, cyst characteristics and estimating the financial loss due to cystic echinococcosis (hydatidosis) in cattle slaughtered at Tudun-wada abattoir, Kakuri (Makera) abattoir, Kawo abattoir and Sabon–Tasha abattoir, all within Kaduna metropolis, was carried out from January to July, 2019. 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 moderate body conditions than animals with forward and fat body condition score. No significant variation was observed with regards to sex of animals. 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 sized, medium-sized 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. Moreover, assessment of annual economic loss due to bovine hydatidosis in Kaduna metropolis from organ condemnation and carcass weight loss was estimated at 17,862,348 (NGN). Despite the moderate magnitude of infection detected currently, there seems to be an existing socio economic 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: NGN: Nigerian Naira; **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* are recognized clinically; *Echinococcus granulosus* which causes cystic Echinococcosis; *E. multilocularis* which causes alveolar Echinococcosis and *E. oligarthrus* which cause 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 feces 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 oncosphore that penetrates the intestinal wall and 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]. 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 [6] [7].

Lack of adequate control policy, uncontrolled movement, trading of animals and their product and difficulties in early diagnosis enhance the distribution of the disease [8]. Infection is often associated with economic losses due to livestock mortality, morbidity, and organ and meat condemnation at meat inspection. It also poses a serious threat to public health where close association exists between dogs, man and food animals [9]. Many tropical countries are hydatidosis endemic and this poses a threat to development. There is paucity of information on hydatidosis in domestic livestock and 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 of cystic hydatidosis in bovine slaughtered in four selected abattoirs within Kaduna metropolis.

2. Materials and methods

This study was conducted in four selected abattoir within Kaduna metropolis: Tudun Wada, Kakuri, Sabon Tasha and Kawo. The animals comprise of cows slaughtered in the abattoirs. The information on the breed of the cow, age, sex and body count score were obtained through the administration of questionnaires. Sample size was determined using the formula of [10] as follows: N= $\frac{(1.96)^2\ (pexp)(-pexp)}{d^2}$

Where Pexp = expected prevalence

N= Total number of sample size

D = Required precision.

A total of 160 that is 40 from each abattoir were randomly sampled and examined for the presence of the hydatid cysts. All organs harboring hydatid cysts were 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). The cysts was considered fertile when the protoscolices were present and seen as white dots on the germinal epithelium, direct and indirect losses were considered in the determination of economic loss due to hydatidosis. The direct loss was calculated based on condemned organs (lungs, liver, heat, spleen and kidney) and the indirect loss was obtained on the basis of live weight reduction due to hydatidosis. All data obtained were subjected to statistical analysis using SPSS and Chi Square. All value of ($P<0.05$) is considered significant.

3. Results

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 followed by the liver with 42.9% and 38.0% respectively. The least occurrence was in the heart and spleen with 4.76% each.

The status of cysts from different organs of the cattle slaughtered in the 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%. All the cases occurred at 33.3 % in the kidney with the exception of the calcified. In the spleen and heart, one case each of non-viable and sterile occurred respectively.

The economic loss due to *Echinococcus* infestation was estimated to be N17, 862,348. This was as a result of organ condemnation and weight loss by animal. In this study a total of 17 lungs averaging 1.2kg; 14 livers with average of 3.5kg; three kidneys with an average of 0.6kg and one heart with an average of 0.7kg were discarded due to infestation with hydatid cysts. These constitute a loss to the farmers as the average cost of 1kg of meat in the market was N1350.00.

Table 1: Relative distribution of cysts in different organs of the cattle

Organ	No positive	% Percentage
Lung	9	42.9
Liver	8	38.0
Spleen	1	4.76
Kidney	2	9.50
Heart	1	4.76
Total	21	100

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)

4. Discussion

The prevalence of hydatidosis of 12.2% in this study is closer to the 15.4% reported by [11]. However lower than the findings of 20.5% reported in Kano by [12] and 24.3% reported from southwest Nigeria by [13]. Differences in culture, social activity, animal husbandry system, lack of proper removal of infectious carcasses and attitude to dogs in different region could be factors that contributed to the variation in prevalence in different areas of the country. The higher prevalence of cysts in lungs and liver in this study agree with the work of [14] and [15] who observed hydatid cysts in domestic animals. 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 [9]. This higher fertility rate highlights the hazard that these animals perpetuate in the cycle of hydatidosis when slaughtered and the raw offal fed to dogs and other wild carnivores. The economic loss of N17, 862,348 due to hydatidosis is enormous and could be curtailed to boost the profit merging farmer.

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

5. Conclusion

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 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.

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