

Original Research Article

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Infection Rate and Biochemical Profile of *Cysticercus tenuicollis* in Goats in and around Bareilly Region, India

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ABSTRACT

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The present study was undertaken to find the infection rate of *Cysticercus tenuicollis* in goats slaughtered at Bareilly slaughter house. The chemical and biochemical profile of thirty five randomly collected *C. tenuicollis* cysts was determined including calcium, phosphorus, glucose, creatinine, triglyceride and activities of two enzymes ALT and AST. Out of a total of 382 goat carcasses examined, 88 (23.01%) were found harbouring *C. tenuicollis*, with 86.36% in abdominal cavity attached to omentum and mesentery, 11.36% to outer surface of liver and 2.26% diaphragm. The concentration of calcium (21.95mmol/L), phosphorus (0.978mmol/L), glucose (2.675mmol/L), triglyceride (1.021mmol/L), creatinine (67.84), cholesterol (0.224mmol/l) and AST (6.1U/L), ALT (7.92U/L) were reported. The present study suggests cysticercosis is still prevalent in Bareilly region with considerable economic losses to livestock owners.

Introduction

The larval stage of the cestode *Taenia hydatigena* (family Taeniidae), *Cysticercus tenuicollis* is found in a wide range of intermediate hosts including domestic ruminants, pigs and humans (Kaufmann *et al.*, 1996; Oryan *et al.*, 2012). Definitive hosts include carnivores harbour adult *Taenia hydatigena* in the small intestine after acquiring infection on feeding *C. tenuicollis* contaminated offal while as intermediate host acquires infection by ingesting eggs or even tapeworms during grazing or food contamination (Murell *et al.*, 2005). The

oncosphere penetrates small intestine after hatching from eggs in small intestine and gets way into the blood circulation. The oncospheres are carried in the blood to the liver in which they migrate for about 4 weeks before they emerge on the surface of this organ and attach to the peritoneum. Within a further 4 weeks each develops into the large metacestode, *Cysticercus tenuicollis* (Taylor *et al.*, 2007). Migration of a large number of oncospheres to the liver parenchyma and consequent development into cysticerci may lead to destruction of hepatic cells causing hemorrhagic tracts, eosinophilia infiltration and severe inflammation resulting in acute

atraumatic hepatitis (Pathak *et al.*, 1982). The metacestode may serve as a predisposing cause to black disease as well as acts a contributory agent of peritonitis (D.C. Blood *et al.*, 1989). Mature *C. tenuicollis* has a smooth inner surface and contains only a single invaginated scolex. The larva *C. tenuicollis* is found attached to different visceral organs such as omentum, intestinal mesentery, serous surface of liver, spleen, diaphragm, lung, kidney, heart and unusual location have also been described (Payan-Carreira *et al.*, 2008). Condemnation of edible organs like liver causes considerable losses to meat industry (Wondimu *et al.*, 2011). It is also a direct nutritional loss to humans as well since liver is a rich source of vitamin A and glycogen.

Present study was carried to determine biochemical profile of *Cysticercus tenuicollis* which include glucose, triglyceride, cholesterol, calcium, phosphorus, creatinine and enzymes SGPT, SGOT. Analysis of cyst fluid is important since it plays an important role in metabolism, physiology and immunology of parasite and its interaction with host. Furthermore it can give an indication about variation in isolates of different regions.

Materials and Methods

Screening of animals for cyst

In our present study, a total of 382 carcasses were examined after routine slaughter in small animal slaughter house Bareilly from august to January 2015. 88 goat carcasses were found to be positive for cysticercosis among which 12 carcasses were positive for both hydatidosis and cysticercosis. The infection rate was 23.04% for cysticercosis. *C. tenuicollis* cysts were collected from omentum, intestinal mesentery, liver and diaphragm of infected carcasses of goats slaughtered at the Bareilly

slaughter house. The cysts were confirmed to be *C. tenuicollis* based on morphology, predilection site, size etc. Cysts were put in sterile cold container and transferred to parasitology lab IVRI for further processing.

Processing of cysts

The surface of cyst was cleaned with 70% alcohol. Fluid from each sample was aspirated using sterile syringe and transferred to clean test tubes. The fluid was centrifuged at 10000 rpm at 4 °C for 15 minutes (Skeurman and Hillard, 1996). Supernatant of each cyst was stored separately at -20 till further use.

Biochemical analysis of *C. tenuicollis* fluid

The supernatants were analyzed for some important biochemical constituents such as glucose, calcium, phosphorus, creatinine, triglycerides, cholesterol and enzyme SGPT and SGOT using Ruby plus clinical analyser (Snijders, Netherland) following manufacturer's instructions.

Results and Discussion

Chemical analysis

Fluid from 35 randomly collected cysts from carcasses after post mortem were collected, processed and later examined by auto analyser for the presence of various chemicals (glucose, calcium, phosphorus, creatinine, triglycerides, cholesterol). These chemicals were present at significant levels. The minimum concentration of glucose recorded was 1.7205 mmol/L, while as maximum concentration was 3.718, with mean of 2.675mmol/L. Analysis of calcium concentration revealed a range of 8.15mmol/L to 67.5 mmol/L with a mean of 21.925mmol/L. Analysis of phosphorus concentration revealed a range of.297mmol/L to 1.67mmol/L with an average of

0.978mmol/L. Creatinine concentration varied between 26.52 µmol/L to 132.6 µmol/L with an average of 67.84micromol/L. Triglyceride concentration varied from.044 to 1.32 mmol/L. Cholestrol concentration varied between 0.13 to 0.312 mmol/L with a mean of 0.224 mmol/L.

Enzyme analysis

The activities of two enzymes SGPT and SGOT were also analysed in same randomly selected 35 cystic fluids by autoanalyzer. Aspartate transaminase (AST) is a cytoplasmic and mitochondrial enzyme that catalyses the transamination of L-aspartate to oxaloacetate and glutamate. Alanine Transaminase (ALT) is a cytoplasmic enzyme that catalyzes the reversible transamination of L-alanine and 2-oxoglutarate to pyruvate and glutamate (Burtis *et al.*, 2006). The concentration of SGPT ranged from 3 U/L to 14 U/L with an a mean of 6.75U/L, while as the concentration of SGOT ranged from 172 U/L to 259 U/L with a mean of 214U/L.

India is one of the endemic zones of *Taenia hydatigania* in goats. Cysticercosis is responsible for a high degree of morbidity in livestock especially small ruminants. In our present study, a total of 382 carcasses were examined after routine slaughter in small animal slaughter house Bareilly from august to

January 2015. 88 goat carcasses were found to be positive for cysticercosis among which 12 carcasses were positive for both hydatidosis and cysticercosis. The infection rate was 23.04% for cysticercosis. Most of the cysts were observed in abdominal cavity attached to omentum and mesentry (86.36%), while as 11.36% were attached to outer surface of liver and 2.27% to diaphragm which is in accord with observations of Nath *et al.*, (2010) and Rafdar *et al.*, (2005). The present investigation of highest prevalence of cysticercosis in mesentry and omental fat was also similar to the studies of Pathak and Gaur (1982), Deka and Gaur (1983) and Nichal *et al.*, (2003). The prevalence rate of cysticercosis(27.29%) in goats in U.P was reported by Pathak and Gaur in 1982, while as 34.2% was reported in goats in Nigeria by Nwosu *et al.*, (1996) and 18.04% in goats by Radfar *et al.*, (2005) in Iran. The present study obtained lower prevalence (23.04%) as compared to study carried by Pathak and Gaur in 1982, however Ray *et al.*, (1977) reported 11.7% of prevalence of *T. hydatigena* cysticercosis in goats at Tarai region of Pantnagar, Uttrakhand. The decrease in infection may be due to more awareness among farmers and improved sanitary conditions as compared to three decades back which may have played a role in reducing the infection rate in intermediate hosts.

Infection rate and distribution of cysts

Animals examined	<i>Cysticercosis tenuicollis</i> positive	Omentum & mesentry	Liver	Diaphragm
382	88 (23.04%)	76 (86.36%)	10 (11.36%)	2 (2.27%)

Enzyme analysis

Enzyme activity	Minimum	Maximum	Mean	SE
AST	2U/L	14U/L	6.1U/L	1.21
ALT	5U/L	60U/L	7.92U/L	2.65

Chemical analysis

Parameters	Minimum	Maximum	Mean	SE
Glucose	1.72 mmol/L	3.718 mmol/L	2.675 mmol/L	0.540
Calcium	8.15 mmol/L	67.5 mmol/L	21.925 mmol/L	6.89
Phosphorus	0.297 mmol/L	1.67 mmol/L	0.978 mmol/L	0.23
Triglyceride	0.044mmol/L	1.32 mmol/L	1.021 mmol/L	3.4
Creatinine	26.5 µmol/L	132 µmol/L	67.84 µmol/L	8.65
Cholesterol	0.13 mmol/L	0.312 mmol/L	0.224 mmol/L	0.43

The variation in prevalence between different countries may be due to different managerial conditions associated with rearing of livestock. African and Asian countries have higher prevalence as compared to European countries (Hasslinger and Weber Werringhe, 1988 reported a prevalence rate of 16.7% in sheep in Germany) as former usually go for extensive rearing system while latter go for intensive rearing of livestock. Stray dogs' population is also one of the main contributory factors for higher prevalence in developing and least developed countries which perpetuates cycle in definitive and intermediate hosts.

The present study of chemical and biochemical profile of cystic fluid affirms the findings of Nath *et al.*, (2010) in relation to calcium which reports 20.085 mmol/L (on conversion from mg/100ml), while as our findings reports 21.925mmol/L. Our study findings reveal higher creatinine (67.84 micromol/L) and triglyceride (1.021 mmol/L) as compared to Nadjat and Naseem whose findings report lower concentration of triglyceride (0.69) and creatinine (52.3). While as glucose concentration in our finding (2.67) is lower than Nadjat and Naseem whose findings reveal concentration of 3.10. The difference may be due to strain variation between Indian and central Asian region. The activities of enzymes AST (6.1) in our study corroborates with the findings of Nath *et al.*, (2010) who reports a concentration of AST

(5.03) which is significantly higher than Athmer *et al.*, (2017) who reports AST (2.019). Furthermore the concentration of ALT (7.92) in our finding is higher than Athmar (2017) who reports ALT (6.38). These findings indicate considerable variation in biochemical composition of cysticercus cyst fluid between Indian and Central Asian isolates. However further study is required to validate the results.

The present study concludes that. *Taenia hydatigena* cysticercosis is still highly prevalent (23.04%) in goats in Bareilly region, although our study shows reduction in incidence as compared to the study carried by Pathak and Gaur in U.P in 1982. Cysts are predominantly present in abdominal cavity attached to mesentery and omentum (86.36%), followed by liver (11.36%), diaphragm (2.27%). The chemical and biochemical concentration of cystic fluid in our study for calcium 21.95 mmol/L, phosphorus 0.978mmol/L, creatinine 67.84micromol/L, glucose 2.675 mmol/L, triglyceride 1.021 mmol/L and cholesterol 0.224 mmol/L while as enzyme activity for AST 6.1U/L and ALT 7.92U/L.

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