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PREVALENCE OF BOVINE AND BUBALINE CYSTICERCOSIS IN PUNJAB, PAKISTAN

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ABSTRACT

Cysticercosis is zoonotic disease infecting cattle and buffaloes having worldwide distribution. Prevalence of cysticercosis is more in underdeveloped countries, and people working in abattoirs are at greater risk to contract infection during handling of slaughtered carcass. The present study was carried out to determine the prevalence of cysticercosis in cattle and buffaloes in province of Punjab, Pakistan. A total of 2400 animals (n=800 animals from each of 3 zones of Punjab where n=400 cattle; n=400 buffaloes) were randomly selected and examined through postmortem at public and private abattoirs. The prevalence of cysticercosisin cattle and buffaloes was 2.92% and 3.17%, respectively. The highest prevalence of cysticercosiswas observed in cattle (3.75%) and buffaloes (3.5%) of North Punjab followed by those of South Punjab and Central Punjab. A higher prevalence of cysticercosis was observed in cattle (4.63%) and buffaloes (5%) at public sector abattoirs than at private sector abattoirs, where prevalence of cysticercosiswas 1.52% and 1.67% in cattle and buffaloes, respectively. The prevalence of cysticercosiswas higher in female cattle (3.75%) and female buffaloes (3.83%) than in male animals, which was 2.53% in male cattle and 2.80% in male buffaloes. The frequency analysis showed non-significant difference of prevalence in both male and female. In liver, the highest prevalence was observed both in cattle (31.4%) and buffalo (31.6%). In cattle, other organs like heart, lungs, tongue and esophagus showed prevalence of 22.9, 2.9, 11.4 and 8.6%, respectively while in buffaloes, heart and tongue showed 23.7% prevalence and lungs were affected in 2.6% animals with cysticercosis. Statistically, the difference in prevalence of cysticercosiscysts in different organs of cattle and buffaloes was significantly different ($P<0.05$). In conclusion, cysticercosis is prevalent in cattle and buffaloes with variable infection in different zones of Punjab province.

Key words: prevalence, bovine cysticercosis, buffaloes, heart, tongue, Punjab

INTRODUCTION

Cysticercosis is a disease of cattle and buffaloes which is of zoonotic importance particularly for abattoir workers. The disease is prevalent all over the world with variations in distribution (Minozzo *et al*., 2002; Doyle *et al*., 1997). Poor hygiene, use of semicookedmeat, sun-cured meat are risk factor for transmission of disease from animals to humans (Minozzo *et al*., 2002). The disease is more common in underdeveloped countries compared to developed world (Frolova, 1982; Gracey and Collins, 1992; Symth, 1994; Cabaret *et al*. 2002).In developing countries, inappropriate education about health and non-availability of taenicides are the main causes for the spread of the infection (Pawlowski, 1996). The variations in epidemiological patterns of cysticercosis throughout these countries are a reflection of the numbers and distribution of human and cattle populations (Harrison *et al*.1996).

In East African countries 30 to 80% prevalence has been documented (Tembo, 2001).The prevalence of bovine cysticercosisin many African countries has been studied extensively over the past few decades. Prevalence of bovine cysticercosisin Zambia was 6.1% (Dorny, 2002), Namibia had 6.2% in communal and 2.3% in commercial cattle (Kumba *et al*. 2001), Ethiopia 3.2% (Tembo, 2001), Egypt 0.23% in native cattle and 7.25% in imported cattle (Haridy *et al*., 1999), Kenya 33.02% (Onyango-Abuje *et al*., 1996), Nigeria 10.2%, Chad 6.67% and in Zaire 22.3% (Frolova, 1982).

In Pakistan, high prevalence of cysticercosis is due to open lavatory practices and unhygienic eating habits like under-cooked beefsteak, burgers, tikka, kababs, and other fast foods at local food streets. Another major factor is failure to observe precautionary measures during slaughtering in abattoirs. There is no proper meat inspection in abattoirs. Illegal slaughtering is common. Due to health-oriented nature, this problem must be addressed at national level with same pace as

international efforts. According to World Health Organization data, nearly two decades ago 50 million cases of this infestation occurred in the world and death toll was 50,000 annually (WHO, 1996). This paper describes prevalence of bovine cysticercosis in cattle and buffaloes in Punjab province, Pakistan.

MATERIALS AND METHODS

A prospective study was conducted from November; 2012 to October 2013 to find out the prevalence of cysticercosis in cattle and buffaloes at different HACCP certified public and private abattoirs in Punjab, Pakistan.The province of Punjab was divided into 3 zones viz. North zone (includes Attock, Rawalpindi, Jehlum, Mianwali, Khushab etc.), South zone (includes Bahawalpur, Dera Ghazi Khan, Multan, Bhakkar, Rajanpur, Vehari etc.) and Central zone (includes, Sahiwal, Okara, Lahore, Sheikhupura, Kasur, etc.). These cattle and buffaloes procured to abattoirs from live animal markets and household farmers throughout these3 zones of Punjab province were included in this study. A total of 2400 animals slaughtered at different abattoirs were randomly selected and inspected for the presence of cysticercosis. Sample size distribution included 800 animals (n=400 cattle; n=400 buffaloes) from each of the 3 zones viz. North, South and Central zones. Data on each animal were recorded in a "data capture form" wherein entries included species, sex, age, breed, zone, organs infested, etc.

Each animal included in this study was subjected to an ante-mortem inspection. During this inspection, body temperature, respiration rate, heart rate, apparent anomalies, blemishes, other clinical abnormalities and body condition were recorded very carefully as per routine criteria. After ante-mortem inspection, cattle and buffaloes were slaughtered; postmortem examination followed immediately in the same facility. Postmortems were performed according to standard inspection procedures for cysticercosis (Ostertag, 1902). The animals were inspected for the presence of cysts of bovine cysticercosis. The prevalence of bovine cysticercosis in cattle and buffaloes was calculated using formula described by Thrusfield (2005).

Statistical Analysis: The data on prevalence were analyzed by using chi-square test and odd ratio (OR) were calculated for individual risk factors. Statistical analysis was performed on statistical software package"SPSS13.00".The probability level of $P<0.05$ was considered as statistically significantly different.

RESULTS

The prevalence of bovine cysticercosisin cattle and buffaloes is given in table 1 and table 2. The overall prevalence of bovine cysticercosisin cattle and buffaloes was 2.92 and 3.17 percent, respectively. Data on zone-wise prevalence of bovine cysticercosisin cattle and buffaloes showed the highest prevalence of bovine cysticercosiswas in cattle (3.75%) and buffaloes (3.5%) of North Punjab followed by those of South Punjab and Central Punjab.

Data on abattoir-wise prevalence of bovine cysticercosisin cattle and buffaloes showed higher prevalence of bovine cysticercosisin cattle (4.63%) and buffaloes (5%) at public sector abattoirs than at private sector abattoirs, where prevalence of bovine cysticercosiswas 1.52% and 1.67% in cattle and buffaloes, respectively. Data regarding sex-wise prevalence of bovine cysticercosisin cattle and buffaloes showed that prevalence of bovine cysticercosiswas higher in female cattle (3.75%) and female buffaloes (3.84%) than in male animals which was 2.54% in male cattle while 2.81% in male buffaloes (Table 1 & 2).

Breed-wise data for prevalence of bovine cysticercosisin cattle and buffaloes indicated the highest prevalence of bovine cysticercosis in Cholistani cattle (3.15%) and Nili-Ravi buffaloes (3.96%) while prevalence of bovine cysticercosiswas 3.05, 2.94, 2.78 and 2.27 percent in Sahiwal, Dhani, Lohani and crossbred cattle, respectively. No positive case was found in Dajal cattle and Kundi buffalo. When compared statistically, a non-significant difference ($P>0.05$) in prevalence of bovine cysticercosisin different cattle breeds was observed. Age-wise prevalence of bovine cysticercosisin cattle and buffaloes showed that animal of 3 years and above age group were more affected with bovine cysticercosis. Prevalence was 7.69 and 8.84 percent in cattle and buffalos of 3-5 years old, respectively. Younger animals with less than one year age had the lowest prevalence (0.65 % for cattle and 0.97% for buffaloes). In age group of 1 to 3 years prevalence was 2.06% in cattle while it was 1.90% in buffaloes. The prevalence of bovine cysticercosiswas significantly different ($P<0.05$) among different age groups of cattle and buffaloes (Table 1 & 2).

Data on body condition-wise prevalence of bovine cysticercosis indicated highest prevalence of bovine cysticercosis in weak cattle (3.26%) and weak buffaloes (8.84%) than good conditioned and medium body conditioned animals, which were 2.79% in good body condition cattle while 2.93% in medium body condition cattle. In buffaloes good body conditioned animals showed 3.04% prevalence while medium conditioned animals showed 3.28% prevalence. Statistically, a non-significant difference ($P>0.05$) was observed in prevalence of bovine cysticercosis in cattle and buffaloes having different body condition (Table 1 & 2).

Tissue-wise prevalence of bovine cysticercosisin cattle and buffaloes is shown in Table 3 and Plate 1 to

Plate 8. In liver, the highest prevalence was observed both in cattle and buffalo (31.4 and 31.6 percent, respectively). In cattle, other organs like heart, lungs, tongue and esophagus showed prevalence of 22.9, 2.9, 11.4 and 8.6%, respectively. While in buffaloes heart and tongue showed 23.7% prevalence and lungs were 2.6% affected with bovine cysticercosis. Statistically, the difference in prevalence of bovine cysticercosiscysts in different organs of cattle and buffaloes was significant (P<0.05).

Table 1. Prevalence of cysticercosisin cattle in three zones of Punjab, Pakistan.

Parameters	No. examined	Positive		95% CL	Odd Ratio/P-value
		N	%		
Zone/Area –wise					
South Punjab	400	11	2.75	1.45-4.73	Mantel-Haenszel Chi-sq P<0.439
Central Punjab	400	9	2.25	1.10-4.09	
North Punjab	400	15	3.75	2.19-5.97	
Abattoir-wise					
Public sector abattoir	540	25	4.63	3.09-6.66	OR=3.16 [reciprocal = 0.32]
Private sector abattoir	660	10	1.52	0.77-2.68	
Sex-wise					
Male	827	21	2.54	1.62-3.79	OR=0.67 [reciprocal = 1.50]
Female	373	14	3.75	2.15-6.07	
Breed-wise					
Sahiwal	360	11	3.05	1.62-5.25	P<0.960
Cholistani	444	14	3.15	1.81-5.11	
Dhani	204	6	2.94	1.20-6.02	
Lohani	36	1	2.78	0.14-12.95	
Cross bred	132	3	2.27	0.58-6.06	
Dajal	24	0	0	0.00-11.73	
Age-wise					
6 Month – 1 Year	310	2	0.65	0.11-2.12	P<0.001
1-3 Year	630	13	2.06	1.15-3.42	
3-5 year and above	260	20	7.69	4.90-11.43	
Body condition-wise					
Good	610	17	2.79	1.69-4.34	P<0.940
Medium	375	11	2.93	1.55-5.04	
Weak	215	7	3.26	1.43-6.33	
Overall					
Total	1200	35	2.92	2.07-3.99	

Table 2. Prevalence of cysticercosis in buffaloes in three zones of Punjab, Pakistan.

Parameters	No. examined	Positive		95% CL	Odd Ratio/P-value
		N	%		
Zone/Area –wise					
South Punjab	400	13	3.25	1.82-5.36	Mantel-Haenszel Chi-sq P<0.827
Central Punjab	400	11	2.75	1.45-4.73	
North Punjab	400	14	3.50	2.01-5.67	
Abattoir-wise					
Public sector abattoir	540	27	5.00	3.39-7.09	OR=3.11 [reciprocal = 0.32]
Private sector abattoir	660	11	1.67	0.88-2.88	
Sex-wise					
Male	783	22	2.81	1.81-4.15	OR=0.72 [reciprocal = 1.38]
Female	417	16	3.84	2.29-6.03	
Breed-wise					
Nili Ravi	960	38	3.96	2.86-5.34	OR=20.07 [reciprocal = 0.05]
Kundi	240	0	0	0.00-1.24	
Age-wise					

6 Month – 1 Year	310	3	0.97	0.25-2.61	
1-3 Year	630	12	1.90	1.04-3.22	P<0.001
3-5 year and above	260	23	8.84	5.83-12.78	
Body condition-wise					
Good	625	19	3.04	1.89-4.62	
Medium	365	12	3.28	1.79-5.52	P<0.966
Weak	210	7	3.30	1.47-6.48	
Overall					
Total	1200	38	3.17	2.28-4.28	

Table 3. Tissue wise prevalence ofcysticercosis in cattle and buffaloes in Punjab, Pakistan.

Tissue	Cattle		Buffaloes	
	No. Positive	Prevalence (%)	No. Positive	Prevalence (%)
Liver	11	31.4**	12	31.6**
Heart	8	22.9**	9	23.7**
Lungs	1	2.9**	1	2.6**
Tongue	4	11.4**	9	23.7**
Esophagus	3	8.6**	2	5.3**
Skeletal Muscles	3	8.6**	2	5.3**
Masseter Muscles	3	8.6**	1	2.6**
Multiple tissues	2	5.7**	2	5.3**

**indicates that values in the same column are statistically significantly different (P<0.05). The tissue based prevalence of bovine cysticercosis in different organs of infected cattle and buffaloes were significantly high in liver, heart, tongue and esophagus as compared to skeletal muscles, Masseter muscles and other body tissues.

Plate1. Cysticercci in cross section of Liver

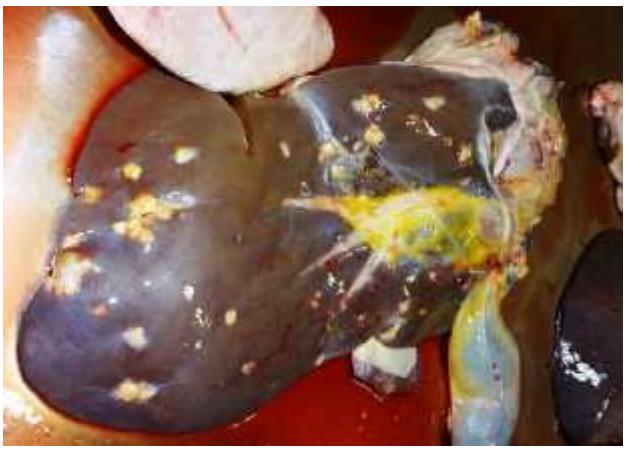

Plate 2. Cysticercci on the surface of liver

Plate 3. Cysticerci in cross section of tongue (bovine)

Plate 4. Cysts in body muscles (bovine)

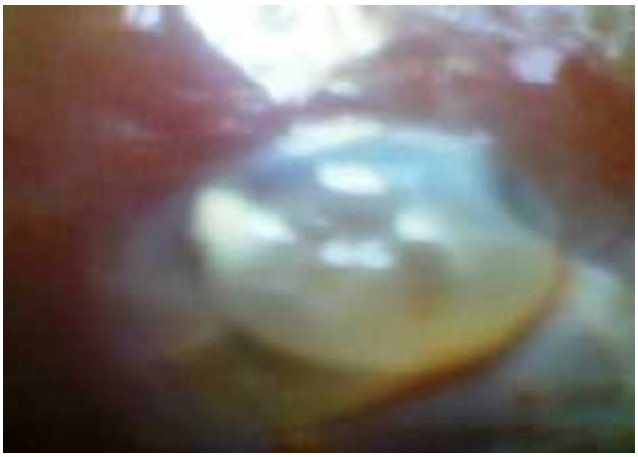

Plate 5. Cyst in liver

Plate 6. Cysts in body muscles

Plate 7. Cysticercciin esophagus (larval form) form)

Plate 8. Cysts in liver of buffalo

DISCUSSION

Cysticercosis is an important worldwide food borne parasitic disease and has public health implications. Human is the final host of *Taeniasaginata* while larval stage of this parasite causes muscles infestation in cattle and buffaloes which is commonly known as cysticercosis (Minozzo *et al*. 2002; Hancock *et al*. 1989). On the other hand, taenia infestation in human is named as taeniasis which is caused by adult stage of *Taeniasaginata* (Hancock *et al*. 1989). The occurrence of cysticercosisis more common in developing countries due to poor hygiene, and people habitually consume sun-cured, semi-cooked or un-cooked beef (Florova, 1982; Symth, 1994). The disease is also a problem in developed countries wherein large "rare" (semi-cooked) beefsteak is consumed. It is worth noting that tape worm/ parasite eggs have been recognized to be resistant to all stages of sewage treatment. Moreover, it is also important that even the high levels of meat inspection in abattoirs of even technologically developed countries have not succeeded in eliminating this parasite (Florova, 1982; Symth, 1994).

In current study, out of 2400 animals examined at different abattoirs, overall 73(3.04%) cattle and buffaloes tested positive through postmortem inspection procedure. Previous reports on bovine cysticercosis indicated low infection rates as described by Haridy *et al*. (1999) 0.23, Rodriguez-Hidalgo *et al*. (2003) 0.37% and Abdo*et al*. (2009) 1.65% which is not congruent with the results of present study. Likewise, the prevalence of cysticercosisreportedin current study is lower than those recorded by Oryan *et al*. (1995) as 7.7%, and Kandil *et al*. (2012) as 4.4%. These differences in the reported prevalence rates are predictable due to various reasons like climatic dissimilarity among the localities, management of animals, number of collected samples, in addition to control measures and elimination programs in such countries. In current study, the prevalence of cysticercosis was higher in public abattoirs than in private abattoirs. This difference in prevalence could be due to animal selection procedures for slaughter. The private sector abattoirs usually have developed strict SOPs

regarding animal selection and slaughtering, which are not usually followed by public sector abattoirs. Prevalence of cysticercosis was higher in female animals as compared to males. Furthermore, this study revealed that prevalence of cysticercosis was higher in North Punjab compared to South Punjab, while the Central Punjab had the lowest prevalence. This difference could be attributed to life style of the people and tradition of keeping animals (animals are fed on pastures) and open field defecation.

Age of the animal was also determined as risk factor for cysticercosis. Prevalence of bovine cysticercosis was higher in 3-5 years age group of cattle and buffaloes than in 1-3 years age group and 6 month-1year old animals. Research work of other researchers also supported the findings of this study in this regard. The proportion of carcasses found to be infected with cysts was significantly different for species (cattle 2.1%; buffalo 4.7%), gender (higher in females than males) and age (higher in animals >2.5 years of age) (Nauman *et al*. 2013). In detail, the percentages were in cattle and buffaloes 2.6% and 6.0% for females vs. 1.9% and 4.1% for males, and 3.8% and 7.4% for animals >2.5 years of age vs. 1.4% and 2.8% for animals <2.5 years of age (Nauman *et al*. 2013).

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