



E-ISSN: 2320-7078

P-ISSN: 2349-6800

JEZS 2019; 7(6): 1196-1199

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Received: 01-09-2019

Accepted: 05-10-2019

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## Epidemiological investigations of *Buxtonella sulcata* in buffaloes of Hisar district, Haryana

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**Abstract**

The objective of the study was to investigate the effects of epidemiological factors like location, age, sex, housing and clinical manifestation (diarrhoeic or non-diarrhoeic) on the prevalence of *Buxtonella sulcata* in buffaloes of Hisar district. Pearson's chi-squared test was used to find out the relationship between various epidemiological factors and the presence of *B. sulcata* in the faecal samples. A total of 400 faecal samples were screened under the microscope by sedimentation technique. The overall prevalence of *B. sulcata* in buffaloes of Hisar district was 54.5%. Sex wise prevalence was in male and female was 61.22% and 52.31%, respectively. Age-wise prevalence in 1-6 months and above 6 months was 56.84% and 52.38%, respectively. The effect of either Kutcha (mud) or Pukka (brick and concrete) floor on infection with *B. sulcata* showed that the prevalence (66.17%) was significantly more buffaloes reared on Kutcha floor than on Pukka floor (42.34%). Buffaloes with diarrhoea were more likely to be *B. sulcata* positive (86.56%) than the buffaloes without diarrhoea (38.34%).

**Keywords:** Buffaloes, *Buxtonella sulcata*, diarrhoea, and Haryana

**Introduction**

Buffalo rearing is one of the most important economic activities in the rural areas of Haryana contributing significantly to the economy. It provides supplementary income to most of the families dependent on agriculture. Intestinal protozoa occur in man and animals throughout the world. Intestinal protozoa infect their host by contaminated water or food infected with protozoan cysts or oocysts. Protozoa that may cause diarrhoea in animals and humans are *Eimeria* spp, *Entamoeba histolytica*, *Balantidium coli*, *Buxtonella sulcata*, *Giardia lamblia*, *Cryptosporidium parvum*, *Isospora* spp. and *Cyclospora* spp., etc. The parasitic ciliate protozoa *B. sulcata* is a flattened oval protozoan parasite covered with cilia which is morphologically similar to *B. coli*. Both the ciliates inhabit the caecum and colon of their host and largely considered as non-pathogenic. Incidence of *B. sulcata* has been reported by several workers (Henriksen, 1977; Fox and Jacobs, 1986; Wee *et al.*, 1986; Tomczuk *et al.*, 2005; Al-Saffar *et al.*, 2010; Al-Zubaidi and Al-Mayah, 2011; Adhikari *et al.*, 2013; Ganai *et al.*, 2013; Kumar *et al.*, 2017 and Edith *et al.*, 2018)<sup>[13, 9, 25, 24, 7, 2, 10, 17, 8]</sup>. However, this parasite has been misdiagnosed as *B. coli* in several other studies (Niphadkar and Raote, 1994; Palanivel *et al.*, 2005; Randhawa *et al.*, 2010 and Gupta *et al.*, 2014)<sup>[19, 22, 23, 11]</sup>. Any comprehensive study on the epidemiology of buffalo parasitic ciliates in India and particularly in Haryana has not been carried out so far. This study is an attempt to fill the gap.

**Material and Methods**

A total of 400 faecal samples were collected from buffaloes of Hisar district in Haryana. Multi-stage stratified random sampling was done while collecting faecal samples. Four blocks were randomly selected out of the nine blocks in Hisar district and from each block, four villages were randomly selected from the list of villages and 25 samples were collected randomly from each village. Only one faecal sample was taken from each willing household covering a cross-section of the village. Common parasitological techniques like direct smear examination and sedimentation methods were used for faecal sample examination. The trophozoites and cysts were identified based on morphological features as described by Kalkal and Sangwan 2019<sup>[16]</sup>. Effect of location (blocks) age (1-6 months and above 6 months), sex (male and female), floor (Kutcha and Pukka) and clinical manifestation (Diarrhoea and non-diarrhoea) on *B. sulcata* (present/absent) were studied. The data generated were statistically analysed using IBM SPSS software (version 20). Pearson's Chi-squared test was applied for the epidemiological investigations.

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## Results

Majority of the *B. sulcata* positive animals showed cysts in the faecal samples but many fresh samples checked immediately also showed trophozoites (Fig. 1). The overall prevalence of *B. sulcata* in Hisar was 54.5%. Prevalence of *B. sulcata* in Hisar-1, Hisar-2, Adampur and Agroha blocks of Hisar district was recorded as 61.0%, 56.0%, 52.0% and 49.0%, respectively and also shown in Table 1. There was no significant difference in prevalence among the blocks. Age-wise prevalence of *B. sulcata* in Hisar district had a non-significant difference between the two age groups i.e. below 6 months 56.84% and above 6 months 52.38% and other details are shown in Table 2. Prevalence of *B. sulcata* in male and female was 61.22% and 52.31%, respectively and the difference was not significant and other details are shown in Table 3. The buffaloes kept in Kutcha floor had 66.17% of infection and those reared on Pukka floor had 42.34% of infection. Which showed a significant difference in *B. sulcata* infection status and other details is shown in Table 4. The difference in prevalence was significant. In Hisar district buffaloes having diarrhoea had (86.56%) higher association of *B. sulcata* infection compared with those not having diarrhoea (38.34%) and other details are shown in Table 5.

**Table 1:** Prevalence of *Buxtonella Sulcate* In Buffaloes In The Various Block of District Hisar, Haryana

Sr. no	Districts	Blocks	Total samples examined	Number of <i>Buxtonella sulcata</i> Positive samples	Per cent prevalence	Chi-square value	P value
1	Hisar	Hisar-1	100	61	61.0	3.266	.352
2		Hisar-2	100	56	56.0		
3		Adampur	100	52	52.0		
4		Agroha	100	49	49.0		
Total			400	218	54.7		

**Table 2:** Host age association with *Buxtonella sulcata* infection in buffaloes in Hisar, Haryana

Age groups	Total samples examined	Number of <i>Buxtonella sulcata</i> Positive samples	Per cent prevalence	Chi-square value	P value
Below 6 months	190	108	56.84	2.367	.371
Above 6 months	210	110	52.38		

**Table 3:** Host sex association with *Buxtonella sulcata* infection in buffaloes in Hisar, Haryana

Objects	Total samples examined	Number of <i>Buxtonella sulcata</i> Positive samples	Per cent prevalence	Chi-square value	P value
Male	98	60	61.22	0.801	.124
Female	302	158	52.31		

**Table 4:** Floor-type association with *Buxtonella sulcata* infection in buffaloes in Hisar, Haryana

Floor type	Total Samples examined	Number of <i>Buxtonella sulcata</i> Positive samples	Per cent prevalence	Chi-square value	P value
Pukka	196	83	42.34	22.890	.001
Kutcha	204	135	66.17		

**Table 5:** Association of *Buxtonella sulcata* infection with diarrhoea in buffaloes in Hisar, Haryana

Clinical manifestation	Total Samples examined	Number of <i>Buxtonella sulcata</i> Positive samples	Per cent prevalence	Chi-Square value	P value
Diarrhoea	134	116	86.56	83.56	.001
Non-diarrhoea	266	102	38.34		

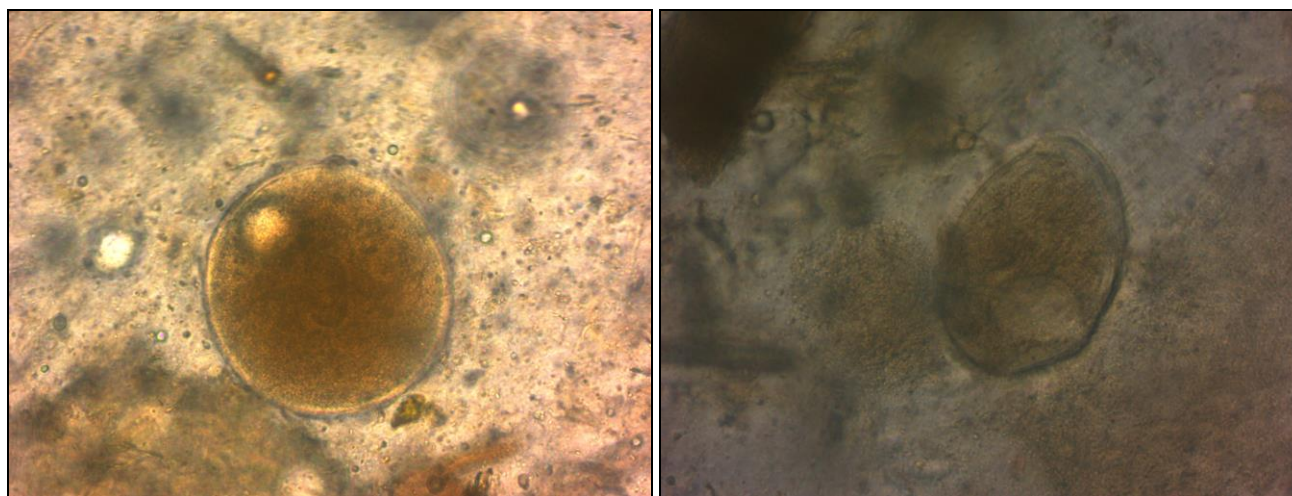
## Discussion

Several studies conducted across the countries and continents showed that *B. sulcata* is a common parasite in cattle and buffaloes. The prevalence of *B. sulcata* in buffalo of Hisar Haryana was also high (54.5%) like reports by other workers. Al-saffar *et al.* (2013)<sup>[3]</sup> had reported an overall prevalence of 35% in buffaloes of Mosul, Iraq. Adhikari *et al.* (2013)<sup>[2]</sup>, showed a prevalence rate of 27% of *B. sulcata* in buffalo in Chitwan Valley, southern Nepal. A more or less similar positivity rate (44.6%) in cattle was also recorded by Fox and Jacobs, (1986)<sup>[9]</sup> in U.K. However, a higher positivity rate of 71.8% of *B. sulcata* in cattle of Denmark (Henriksen, 1977)<sup>[13]</sup> was reported. A prevalence rate of 45.63% of *B. sulcata* in cattle has been reported from Sanandaj province, Iran (Hasheminasab *et al.*, 2015)<sup>[12]</sup>. Whereas, Omeragic and Crnkic, (2015)<sup>[21]</sup> reported 27% prevalence of *B. sulcata* in cattle of Sarajevo area. The prevalence rate varies in India from place to place as reported by earlier workers e.g. (Mamatha and Placid, 2006)<sup>[18]</sup> of (12.6%) and (20.5%) for cattle and buffaloes respectively. The differences in the prevalence of infection could be due to many different factors, such as environmental conditions, animal host, farm management practices and stress factors (Al-Saffar *et al.*, 2010)<sup>[4]</sup>. Fox and Jacobs, (1986)<sup>[9]</sup> revealed that seasonal fluctuations in the prevalence of the infection were related to changes in the nutrition of animals and opportunities for transmission, furthermore, the delivery rate may lead to an increase in the prevalence of infection. The high prevalence in Denmark would suggest that local environmental factors support the transmission and persistence of the parasite. Also, the ubiquitous nature of *B. sulcata* in other studies suggested that transmission and persistence are supported across a wide range of environmental and farming conditions. Host age association with *B. sulcata* infection in buffaloes revealed that in Hisar districts, the difference between 1-6 months of buffaloes age and above 6 months had non-significant ( $p>0.05$ ) difference. Our findings validate Al-Seady and Kawan, (2014) who reported non-significant ( $p>0.05$ ) difference in infection rate between different age groups. Similarly, Al-saffar *et al.* (2013) reported non-significant ( $p>0.05$ ) difference in infection rate between different age groups but Al-Saffar *et al.*, (2010)<sup>[4]</sup> reported significant ( $s0.01$ ) difference between different age groups 3-8 months (11.36%), 2-7 years (35.29%) and 4-8 years (28.75%). Hasheminasab *et al.*, (2015)<sup>[12]</sup> showed significant ( $p< 0.01$ ) difference between different age groups. These findings indicate that animals of any age are susceptible to *B. sulcata* infections and age has little effect on the presence of *B. sulcata* infection. Host sex association with *B. sulcata* infection in buffaloes revealed that there was non-significant ( $p>0.05$ ) difference between male (61.22%) and female (52.31%) buffaloes of Hisar district. This finding is contrary to the one reported earlier by Hasheminasab *et al.*, (2015)<sup>[12]</sup>, who recorded the prevalence of *B. sulcata* was statistically higher in female (47.32%) than male (38.46) in cattle. The possible reason for the higher prevalence rate in female as compared to males may be the different management of females than males. Our findings are similar with Al-Seady and Kawan, (2014)<sup>[5]</sup> who showed non-significant difference in infection rate between male and female as these ratios were (43.6%) and (42.8%) respectively similarly Al-Zubaidi and Al-Mayah, (2011)<sup>[7]</sup> also reported that there is non-significant difference in infection rate between male and female. The non-significant difference in the rate of infection between

males and females is anticipated because no known factor protects either of the two sex and absent in the other sex especially when males and females are raised together and are exposed to the same environmental conditions (Al-Seady and Kawan, 2014)<sup>[5]</sup>.

We studied association of either Kutcha or Pukka floor on infection with *B. sulcata* in buffaloes. The buffaloes kept on Kutcha floor showed a higher prevalence of 66.17% than those on Pukka floor (42.34%) prevalence which had significant ( $p < 0.01$ ) difference. Our findings validate Hasheminasab *et al.*, (2015)<sup>[12]</sup> who reported prevalence of *B. sulcata* infection in cattle on Muddy (Kutcha) floor (50%) was higher than cattle on the concrete floor (24.32%) and significant difference in these results suggests concrete flooring reduces exposure to infection. Concrete flooring may be one of the factors to reduce the prevalence of *B. sulcata*. Further investigation is needed as this study suggests it is a

significant factor in reducing infection. Relationship of *B. sulcata* infection with the presence/absence of diarrhoea in buffaloes was studied using the chi-square test. Animals with diarrhoea were more likely to have *B. sulcata* infection ( $P < 0.01$ ). The buffaloes having diarrhoea had higher (86.56%) association of *B. sulcata* infection than animals not having diarrhoea (38.34%). This finding matches with several other researchers (Fox and Jacobs, 1986<sup>[9]</sup>; Hong and Youn, 1995<sup>[14]</sup>; Aayiz, 2005; Tomczuk *et al.*, 2005<sup>[24]</sup>; Altug *et al.*, 2006<sup>[6]</sup>; Nuri Altug *et al.*, 2006<sup>[20]</sup>; Al-Saffar *et al.*, 2010<sup>[4]</sup>; Al-Saffar *et al.*, 2013<sup>[3]</sup>; Al-Zubaidi and Al-Mayah, 2011<sup>[7]</sup>; Kaewthamasorn and Wongsamee, 2006)<sup>[15]</sup> which means *B. sulcata* can be one of the causes of diarrhoea in ruminants. It is suggested that more comprehensive studies should be done to explain the cause of diarrhoea by *B. sulcata* which has similar behaviour to *Balantidium coli* as a cause of diarrhoea in cattle.



**Fig 1:** Cyst (Right) and trophozoites (Left) of *Buxtonella sulcata* with double wall

## Conclusion

This detail epidemiological investigation revealed the presence of *B. sulcata* in buffaloes of Hisar. Further extensive research on *B. sulcata* in buffaloes is needed in different parts of India and other ruminants its pathogenicity, treatment and control.

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