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Systematic Epidemiology and Prevalence Analysis of Intestinal Ciliate *Buxtonella sulcata* in Buffaloes of Haryana

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ABSTRACT

Background: Buxtonellosis is a disease caused by intestinal ciliated protozoan *Buxtonella sulcata*. This intestinal ciliate may result in subclinical infection or clinical disease including diarrhoea, so systematic epidemiology investigation was done in and around Haryana.

Methods: Total of 800 faecal samples were collected in year 2016-2017 by multi-stage stratified random sampling from buffaloes of Haryana. Effect of age (1-6 and >6 months), sex (male and female), floor (*Kutcha* and *Pukka*), clinical manifestation (Diarrhoea and non-diarrhoea) and season were studied.

Result: In total 477 (59.12%) buffaloes were infected with *B. sulcata* in Haryana. According to sex, 68.27% male and 56.35% female were infected with *B. sulcata,* respectively. Age-wise prevalence in 1-6 months and above 6 months was 60.75% and 57.5%, respectively. Prevalence of infection on *Katcha* and *Pakka* floor was 65.85% and 56.13% respectively, with a significant difference. Buffaloes with diarrhoea were more likely to be *B. sulcata* positive (85%) than the buffaloes without diarrhoea (46.66%) with a significant difference. Buffaloes were having more infection in monsoon (78.18%) followed by summer (58.36%) and winter (38.13) with a significant difference. Animals having diarrhoea with intensity of infection above 10 (+++) cyst/trophozoites were 89.40% (+++) followed by 6-10 (++) cyst/ trophozoites 63.50% and 1-5 (+) cyst/trophozoites 39.98%.

Key words: Buffaloe, *Buxtonella sulcata*, *Katcha* and *Pakka* floor.

INTRODUCTION

Buffaloes are the lifeline of the rural peasantry in Haryana. The state produces around 86 lakh tones of milk in a year around 80 per cent from buffaloes. Protozoa that cause diarrhoea in animals are *Eimeria* spp., *Entamoeba histolytica*, *Balantidium coli*, *Buxtonella sulcata*, *Giardia lamblia*, *Cryptosporidium parvum*, *Isospora* spp., *etc*. *B. sulcata* is considered as an opportunistic ciliate protozoan inhabiting the colon of bovines (Levine, 1985; Bhatia, 2000). 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 in cattle and buffaloes (Tomczuk *et al*., 2005; Al-Zubaidi and Al-Mayah, 2011; Adhikari *et al*., 2013; Ganai *et al*., 2013; Kumar *et al*., 2017 and Edith *et al*., 2018). It is often misdiagnosed as *B. coli*, a ciliate protozoan found in the caecum and colon of pigs, humans and nonhuman primates (AlSaffar 2010). Although, controversy about the pathogenicity of *B. sulcata* still present. Any comprehensive systematic study on the epidemiology and prevalence 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.

MATERIALS AND METHODS

Faecal samples of buffaloes (800) were collected from the southern and northern parts of Haryana. The collection of faecal samples was done by multi-stage stratified random sampling at the block and village level. One district each from southern and northern parts of Haryana was selected and from each district, four blocks were randomly selected and from each block, four villages were randomly selected and 25 samples were collected randomly from each village (Fig 1). 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). Effect of age (1-6 months and above 6 months), sex (male and female), floor (Kutcha and Pukka) and clinical manifestation (Diarrhoea and non-diarrhoea) and season on *B. sulcata* (present/absent) were studied. The intensity of infection for cyst/trophozoites in animals having diarrhoea was checked by counting total cyst/trophozoites

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in a well spread out direct faecal smear under a coverslip of size (22 × 22 mm). Intensity of infection was classified as 1-5 (+), 6-10 (++) and above 10 (+++) cyst/trophozoites. The data generated were statistically analyzed using IBM SPSS software (version 20). Pearson's Chi-squared test was applied for the epidemiological investigations.

RESULTS AND DISCUSSION

Several studies conducted across the countries and continents showed that *B. sulcata* is a common parasite in cattle and buffaloes. The majority of the *B. sulcata* positive animals showed cysts in the faecal samples but many fresh samples checked immediately also showed trophozoites (Fig 2). The overall prevalence of *B. sulcata* in Haryana was 59.12%. The prevalence rate differs from Al-saffar *et al*., (2013) which had overall prevalence of 35% in buffaloes of Mosul, Iraq. While in another study, carried out by Adhikari *et al.,* (2013), prevalence rate of *B. sulcata* was 27% in water buffalo of Chitwan Valley, southern Nepal. A more or less similar positivity rate of 44.6% in cattle was also recorded by Fox and Jacobs, (1986) in U.K. However, a higher positivity rate of 71.8% of *B. sulcata* in cattle of Denmark (Henriksen, 1977) was reported. The prevalence rate varies in India from place to place as reported by earlier workers (Mamatha and Placid, 2006) of 12.6% and 20.5% for cattle and buffaloes respectively. The reason for differences in the prevalence of infection could be due to many different factors, such as environmental factor, animal, farm management practices and stress factors (Al-Saffar *et al*., 2010). Fox and Jacobs, (1986) showed that seasonal variations in the prevalence of the infection and cyst excretion rates were related to changes in the diet and opportunities for transmission, furthermore, the delivery rate may lead to an increase in the prevalence of infection. The high prevalence in cattle of Denmark would suggest that local environmental factors support the transmission and persistence of the parasite.

Age-wise prevalence of *B. sulcata* in Hisar district had no significant difference between the two age groups i.e. below 6 months 60.75% and above 6 months 57.50% (Table 1). Our findings are in accordance to the findings of Al-Seady and Kawan, (2014) who reported a non-significant difference in infection rate between different age groups. Similarly, Al-saffar *et al*., (2013) reported non-significant difference in infection rate between different age groups but Al-Saffar *et al*., (2010). reported a significant 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). showed a significant 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. Sex wise prevalence of *B. sulcata* in male and female was 68.27% and 56.35%, respectively (Table 1) with no significant difference. This finding is contrary to the one reported earlier by Hasheminasab *et al*., (2015). 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). who showed a 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). also reported that there is a 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).The effect of age and sex on the risk of prevalence of *B. sulcata* was not significant (Table 4).

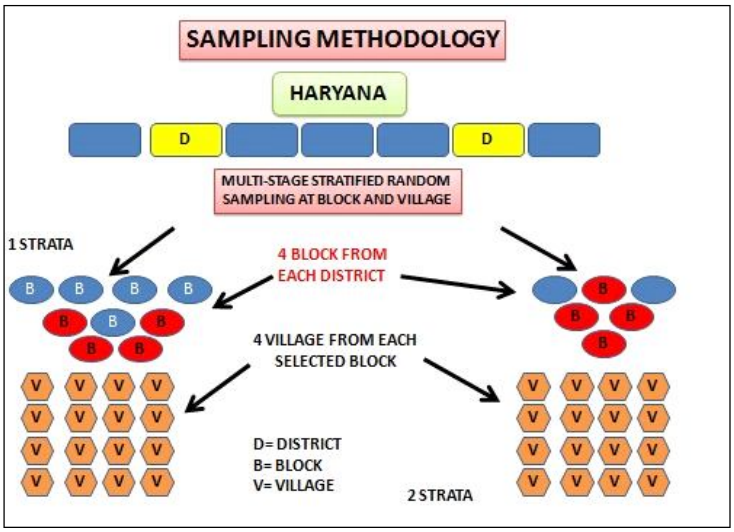

Fig 1: Sampling methodology for collecting faecal sample of buffaloes of Haryana.

The buffaloes kept on *Katcha* floor had 65.85% of infection and those reared on *Pakka* floor had 56.13% of infection with a significant difference (Table 2). The risk of prevalence of *B. sulcata* was lower (OD=0.522) in buffaloes raised on *Pakka* floor as compared to *Katcha* floor (Table 4). Our findings validate findings of Hasheminasab *et al*., (2015). who reported prevalence of *B. sulcata* infection in cattle on *Katcha* floor (50%) was higher than that of cattle on the *Pakka* floor (24.32%) and significant difference in these results suggests *Pakka* floor reduces exposure to infection. *Pakka* floor may be one of the factors to reduce the prevalence of *B. sulcata*. Further investigation is needed in confirming the difference of infection due to Katcha and Pakka floor rearing because the data available is very less and not specific while our study clearly show significant difference which reduces in reducing infection. Animals with diarrhoea had significantly higher (85%) association of *B. sulcata* infection as compared with those not having diarrhoea (46.66%) (Table 2).The animals with diarrhoea were at greater risk (OD=6.30) of having *B. sulcata* infection as compared to animals without diarrhoea (Table 4). This finding matches with several other researchers (Nurialtug *et al*.,

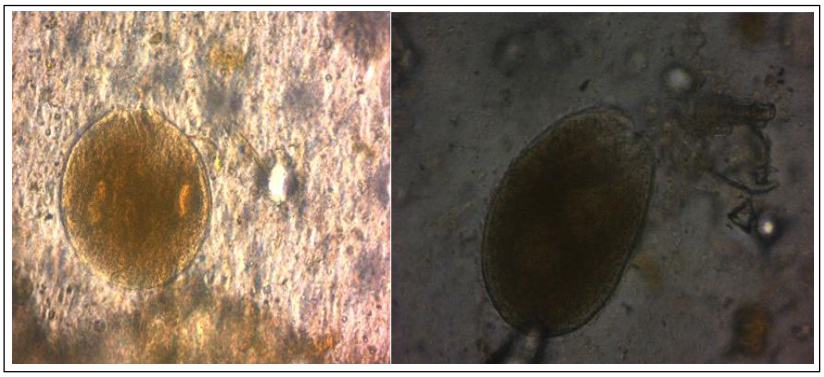

Fig 2: Picture showing cyst (Right) and trophozoites (Left) of *B.sulcata* with doublae-wall.

Table 1: Host age and sex association with *B. sulcata* infection in buffaloes of Haryana.

Animal group	Objects	Total samples examined	Number of *B. sulcata* positive samples	Per cent prevalence	χ^2 value
Age	Below 6 months	400	243	60.75	3.547*
	Above 6 months	400	230	57.50	
Sex	Male	186	127	68.27	8..094*
	Female	614	346	56.35	

*P>0.05.

Table 2: Association of *B. sulcata* with Diarrhoea and non-diarrhoea, floor type and season in buffaloes of Haryana.

Animal group	Objects	Total samples examined	Number of *B. sulcata* positive samples	Per cent prevalence	χ^2 value
Floor	Pakka	554	311	56.13	23.36**
	Katcha	246	162	65.85	
Season	Summer	245	143	58.36	27.54**
	Winter	257	98	38.13	
	Monsoon	298	233	78.18	
Clinical manifestation	Diarrhoea	260	221	85	37.56**
	Non-diarrhoea	540	252	46.66	

**P<0.05.

Table 3: Degree of intensity of infection of *B. sulcata* and its association with diarrhoea in buffaloes.

Degree of infection	Total number of samples examined	Per cent of diarrhoea positive	χ^2 value
+	284	39.98	189.84**
++	137	63.50	
+++	53	84.90	

**P<0.05.

2006; Kaewthamasorn and Wongsamee, 2006; Al-Saffar *et al*., 2010. Al-Zubaidi and Al-Mayah; 2011 and AlSaffar *et al*., 2013) which means *B. sulcata* can be one of the causes of diarrhoea in ruminants while fig 3 show the association of prevalence with diarrhoea or non-diarrhoea animals. Animals were having more infection in monsoon followed by summer and winter 78.18% 58.36%, 38.13% respectively which showed significant difference (Table 2). A significantly higher prevalence of *B. sulcata* in buffaloes was observed during monsoon season followed by summer and winter season and buffaloes in mansoon season were two (OD=2.88) times more prone to infection than that of winter season. Kumar *et al*., (2017) reported the highest incidence of *B. sulcata* infection in buffaloes in winter (43.8%) followed by monsoon (31.0%) and summer (31.0%). Our repo is supported by Hasheminasab *et al*., (2015) who reported higher prevalence in rainy season (63.38%) than summer (44.15%) and winter (28.99%) in cattle. Fox and Jacobs (1986) showed that seasonal fluctuations in the prevalence of the infection and cyst excretion rates were related to changes in the diet and opportunities for transmission, furthermore, the delivery rate of cyst excretion may lead to an increase in the prevalence of infection. The intensity of infection of *B. sulcata* in buffaloes was higher in diarrhoeic animals as compared to non-diarrhoeic. Animals with an intensity of infection of 1-5 cysts/trophozoites per slide (+) only 39.98% of buffaloes were diarrhoea positive, when intensity was 5-10 cysts/ trophozoites (++), 63.50% of buffaloes were diarrhoea positive and when intensity was above 10 cysts/trophozoites (+++), 84.90% of buffaloes were diarrhoea positive (Table 3). The association between intensity of *B. sulcata* infection and diarrhoea was significant. Our findings are similar to Tomczuk *et al.,* (2005), Al-Saffar *et al*., (2010), Al-Zubaidi and Al-Mayah, (2011) and Hong and Youn, (1995) The ability of this parasite to cause diarrhoea is not related to the invasiveness of the trophozoite in the intestinal mucosa rather the metabolic products which result from the rapid multiplication of the parasite (Tomczuk *et al.,* 2005) our findings revealed that as intensity of infection increase there is increase in number of diarrhoeic cases and Fig 4 show association between diarrhoea animals and intensity of infection.

Table 4: Fitting of multiple logistic regression models for identifying the risk factors of *B. sulcata* infection in buffaloes of Haryana.

Variables	Category	Coefficient (β)	P-value	Exp (β) orodd ratio
Age	0-6 months	-0.043	0.067	0.958
	Above 6 months[a]	0.00	-	-
Sex	Male	0.183	0.791	1.201
	Female[a]	0.00	-	-
Floor	Katcha	-0.651	11.353	0.522
	Pakka[a]	0.00	-	-
Season	Summer	-0.151	0.786	0.860
	Monsoon	1.058	0.060	2.880
	Winter[a]	-	-	-
Clinical manifestation	Diarrhoea	1.843	85.522	6.315
	Non-diarrhoea[a]	0.00	-	-
Constant		0.686	9.433	1.986

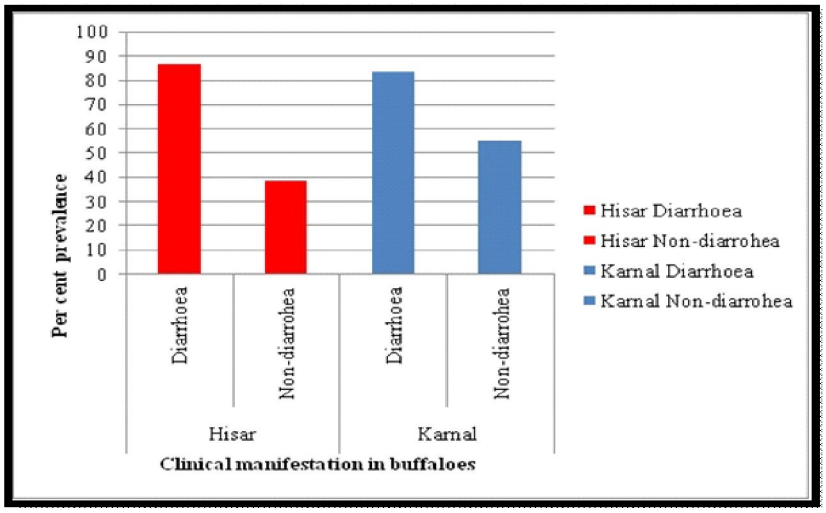

Fig 3: Association of *B. sulcata* infection with diarrhoea in buffaloes.

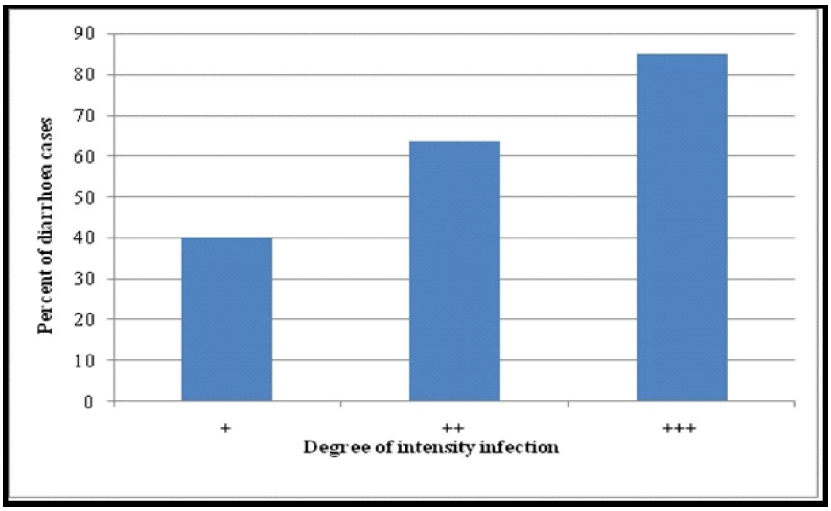

Fig 4: Degree of intensity of infection of *B. sulcata* and its association with diarrhoea in buffaloes.

Odds ratio

In epidemiologic studies, the odds ratio measures the intensity or the degree of association between a risk factor and an outcome. The degree of association increases as the odds ratio increases.

CONCLUSION

This detailed epidemiology and prevalence analysis revealed the presence of more *B. sulcata* in buffaloes when kept Katcha floor and animals having diarrhea while infection increases in monsoon and summer season as compared to winter in Haryana. Further extensive research on *B. sulcata* in buffaloes is needed in different parts of India and other ruminants.

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Conflict of interest: None.

REFERENCES

Adhikari, B.B., Rana, H.B., Sultan, K.M.I. and Devkota, B. (2013). Prevalence of *Buxtonella sulcata* in water buffaloes and cows in Chitwan Valley, Southern Nepal. Journal of Veterinary Parasitology. 2: 55-60.

Al-Saffar, T.M., Al-Taee, A.F., Hadi, E. and Suleiman, E. (2013). Diagnostic study of *Buxtonella sulcata* in buffaloes in Mosul, Iraq. Iraqi Journal of Veterinary Sciences. 24(1): 27-30.

Al-Seady, H.H.O. and Kawan, M.H. (2014). Prevalence of *Buxtonella sulcata* in neonatal and young lambs in three regions in Baghdad city (Abu Ghraib, Yusufiya and Mahmudiyah). Journal of Kerbala University. 10(2): 89-94.

Al-Suffer, T.M., Suliman, E.G. and Al-Bakri, H.S. (2010). Prevalence of intestinal ciliate *Buxtonella sulcata* in cattle in Mosul. Iraqi Journal of Veterinary Sciences. 24(1): 27-30.

Al-Zubaidi, M.T. and Ai-Mayah, K.S. (2011). Prevalance of *Buxtonella sulcata* in neonatal and young calves in Al-Nasir station and some regions in Baghdad (Al-Sultalasnd Gazaliya). Iraqi Journal of Science. 52(4): 420-424.

Bhatia, B.B. (2000). Textbook of Veterinary Protozoology, I.C. A.R., Pusa, New Delhi. 336-337.

Edith, R., Balagangatharathilagar, M., Gomathinayagam, S. and Roy, P. (2018). Incidence of *Buxtonella sulcata* Infection in cattle from organized and unorganized dairy farms in Tamil Nadu. In Scientific Research Forum.

Fox, M.T. and Jacobs, D.E. (1986). Pattern of infection with *Buxtonella* sulcata in British cattle. Research in Veterinary Science. 41: 90-92.

Ganai, A., Parveen, S., Kaur, D., Katoch, R., Yadav, A., Godara, R. and Ahamed, A. (2013). Incidence of *Buxtonella sulcata* in bovines in R.S. Pura, Jammu. Journal of Parasitic Disease. 39(3): 446-447.

Hasheminasab, S.S., Moradi, P., Talvar, H.M., Wright, I. and Darbandi, M.S. (2015). *Buxtonella* spp. like infection in cattle in Sanandaj province, Iran. Annals of Parasitology. 61(4).

Henriksen, S.A. (1977). *Buxtonella sulcata*, an intestinal ciliate of apparently frequence occurrence in Danish cattle (author's transl). Nord. Vet. Med. 29(10): 452-457.

Hong, K.O. and Youn, H.J. (1995). Incidence of *Buxtonella sulcata* from cattle in Kyonggido. Korean Journal of Parasitology. 33(2): 135-138.

Kalkal, H. and Sangwan, A.K. (2019). Morphological differentiation between pig and buffalo parasitic ciliates to identify species. Haryana Veterinarian. 58(2): 150-152.

Kaewthamasorn, M. and Wongsamee, S. (2006). A preliminary survey of gastrointestinal and haemoparasites of beef cattle in the tropical livestock farming system in Nan Province, Northern Thailand. Parasitology Research. 99(3): 306-308.

Kumar, B., Maharana, B.R., Prashad, A., Joseph, J.P. and Patel, B.R. (2017). Incidence of *Buxtonella sulcata* in Jaffrabadi buffaloes of South-Western Gujarat, India. Buffalo Bulletin 36(4): 623-628.

Levine, N.D. (1985). Veterinary Protozoology, Ames: Iowa State University Press. 334-364.

Mamatha, G.S. and ED' Souza, P. (2006). Gastro-intestinal parasitism of cattle and buffaloes in and around Bangalore. Journal of Veterinary Parasitology. 20(2): 163-165.

Nurialtug, Y., Yuksek, N. and Ozkan, C. (2006). Parasites detected in neonatal and young calves with diarrhoea. Bulletin Veterinary Institute in Pulawy. 50: 345-348.

Tomczuk, K., Kurek, L., Stec, A., Studzinska, M. and Mochol, J. (2005). Incidence and clinical ciliate *Buxtonella sulcata* infection in cattle. Bulletin Veterinary Institute in Pulawy. 49: 29-33.