

Research Article

A Retrospective Study on the Prevalence of Obstructive Urolithiasis in Domestic Animals during a Period of 10 Years

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ABSTRACT

During the period of 10 years from April 1997 to March 2007, a total of 905 cases of obstructive urolithiasis were recorded, which constituted a hospital incidence of 6.05%. The year wise hospital incidence of urolithiasis showed an increase in recent years. Maximum incidence was recorded in caprine, followed in decreasing order by buffaloes, cattle and canine. The affected goats and buffaloes were male animals of non-descript and mixed breeds. Among dogs, maximum incidence of urolithiasis was recorded in Spitz/Samoyed (39%) followed by non-descript dogs (19%). The goats and buffaloes of young age were more commonly affected than the older animals of these species. Among the cattle the affected animals were either the calves of 0-6 months of age or the adult bullock above 3 years of age. Among dogs, maximum number of cases was recorded in the age group of 3-7. Maximum number of cases of urolithiasis in ruminants was recorded in winter season or peak summer. Complete obstruction was recorded in 90.57% buffalo calves, 75.44% goats and 55.26% dogs. However, in cattle more number of animals had partial obstruction than complete obstruction (43.33%). Rupture of urinary bladder was recorded in 13.93% goats, 41.33% buffalo calves and 40% bullock. Even in dogs 6.52% cases were brought with rupture of the bladder. It was concluded that the occurrence of obstructive urolithiasis has increased during recent past. Young goats and buffalo calves maintained on concentrate rich diet in winter season are mainly affected and thus need special attention. Early presentation of the case to clinic may minimize the chances of rupture of the bladder and subsequent fatal complications.

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INTRODUCTION

Urolithiasis is the disease of prime importance in domestic animals all over the world. Since the disease has multifactorial etiology, it is important to study the occurrence of disease and prevalence of the factors responsible for its occurrence. An adequate knowledge and detailed study of these factors, type of the animals suffering most, and type of obstruction can help the farmers and veterinary practitioners in adopting necessary preventive and managerial strategies. Previous studies on urolithiasis showed that animals at a variety of locations and under diverse climatic conditions are affected, but States of Punjab, Haryana, Uttar Pradesh, Bihar, Madhya Pradesh, Orissa, Andhra Pradesh, Kashmir and Tamil Nadu had very high incidence of urolithiasis (Prasad *et al.*, 1978, Gera and Nigam, 1979, Tyagi *et al.*, 1982; Muhee, 2006; Singh *et al.*, 2008; Gugjoo *et al.*, 2013). At international level, disease has a common occurrence in North American countries, United Kingdom, Australia, Switzerland, Scotland, Japan and Africa (McIntosh *et al.*, 1974, Tiruneh, 2000).

Protein rich diet, concentrate feeding, changes brought about by weaning, early age of castration, lower water consumption, deficiency of Vitamin-A during winter season and high water loss during summer are thought to be some of the factors responsible for urolithiasis in animals (Smith and Sherman,

1994; Kakine *et al.*, 1997; Amarpal *et al.*, 2004; Gugjoo *et al.*, 2013). In India the ruminants are mostly reared by small and marginal farmers and landless laborers and their managerial practices do differ considerably from that is prevailing in developed countries. A large number of cases of obstructive urolithiasis are reported at IVRI, polyclinic. Thus a study was planned to find a long term pattern of occurrence of obstructive urolithiasis in different species of animals and to identify some of the major etiological factors responsible for obstructive urolithiasis in animals in this region through the records of 10 years.

Materials and Methods

The study was conducted in the Division of Surgery, IVRI, Izatnagar. The records of clinical cases of urolithiasis reported at the surgical unit of polyclinic, IVRI, Izatnagar from April 1997 to March 2007 were screened to record the available information regarding the cases of urolithiasis brought for the treatment in the polyclinic. The information regarding history, species, breed, age, sex, duration of illness was recorded, where available. Feeding habit of animal, clinical symptoms, treatment given and outcome of the treatment (if available) were also recorded. Type of obstruction (partial or complete) and the status of the urinary bladder (intact or rupture) were

also recorded in each case. The data obtained about the cases of urolithiasis was utilized to calculate the overall percentage of cases suffering from urolithiasis, hospital incidence, age, sex, breed, and season-wise distribution of cases, and type of obstruction and status of the bladder.

RESULTS AND DISCUSSION

During the period of 10 years from April 1997 to March 2007, a total of 14957 cases were reported at surgical unit of IVRI polyclinic, out of which 905 cases were diagnosed to be suffering from obstructive urolithiasis. The overall hospital incidence of 6.05% was thus recorded at the surgical unit during this period, which suggested that obstructive urolithiasis is a predominant surgical condition. Year wise distribution of cases showed a sharp increase in the number of cases during the last few years and the cases increased from a total of 26 cases in 1997-1998 to 144 cases in the year 2006-07. The maximal number of cases (166) was recorded in the year 2005-2006 (Fig. 1). The year wise hospital incidence of urolithiasis was 3.58 % (1997-98), 2.58% (1998-99), 5.86% (1999-2000), 4.15% (2000-2001), 5.88% in 2001-2002, 5.40% in 2002-03, 6.54% in 2003-04, 7.23% in 2004-05, 8.27% in 2006-06 and 7.13% in 2006-07 (Fig. 2). Though the total number of surgical cases also increased through these years but a gradual increase in the hospital incidence of obstructive urolithiasis suggested that the occurrence of obstructive urolithiasis has increased alarmingly. All the affected animals were males except for 4 female dogs.

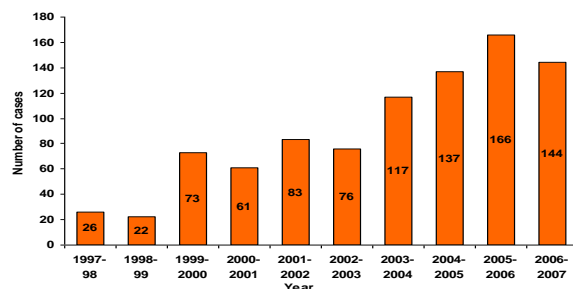


Figure 1: Year-wise distribution of case of urolithiasis

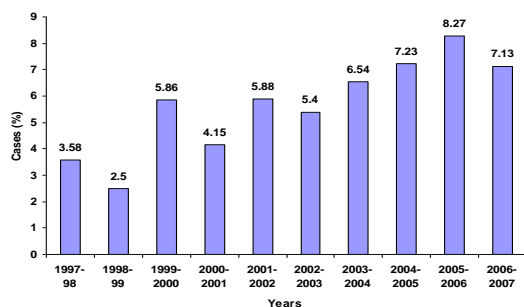


Figure 2: Hospital incidence (%) of urolithiasis

The species wise distribution of total 905 cases of urolithiasis revealed maximum incidence in caprine (53%) followed, in decreasing order, by buffaloes (27%), cattle (10%), canine (8%), equine (1%), ovine (1%) and only one case was recorded in feline (Fig. 3). The exact cause of more incidences of calculi in goats is difficult to pin point on the basis of this study because calculi form in the urinary tract of the animals as a result of interaction of various physiological, managerial and nutritional factors (Gutierrez et al., 2000). Some studies, however, have recorded that calculi are more common in

animals managed on rations composed of mainly grains (Radostits et al, 2000). In this region goats are mainly reared for sacrifice at the time of Eid (a Muslim festival).

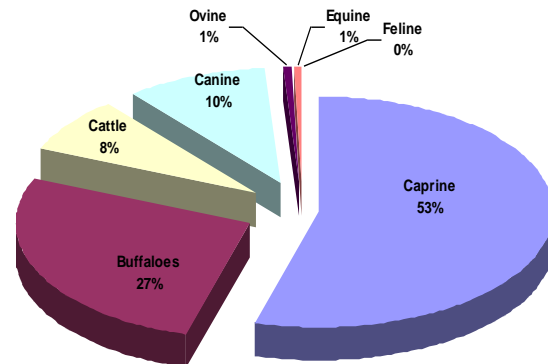


Figure 3: Species wise distribution of case of urolithiasis

They are fed high concentrate ration, mainly composed of wheat bran, which could be the cause of calculi formation in large number of goats. Wang et al (1997) also reported more incidence of urolithiasis in animals fed high grain diet with calcium: phosphorous ratio as low as 1:1. Most of the buffalo calves brought for treatment belonged to urban dairies and were also maintained on high grain diet as the availability of green fodder is less in our urban conditions. The animal owners try to compensate the deficiency of green fodder by providing additional quantity of concentrate ration, which could have precipitated in urolithiasis. The occurrence of urolithiasis in buffalo calves increased gradually and maximum number of cases was recorded during 2004-05 (Fig. 4).

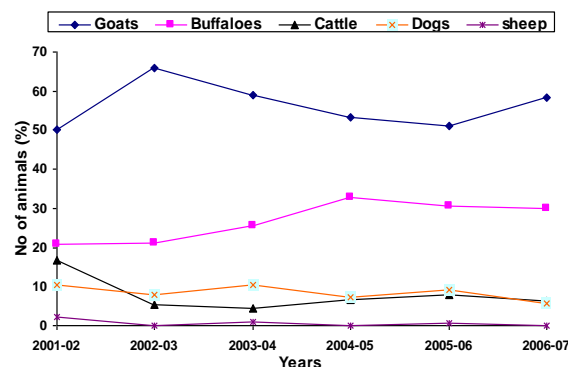


Figure 4: Year-wise percentage of different species in case of urolithiasis

The affected goats and buffaloes were of non-descript and mixed breeds. Among dogs, maximum incidence of urolithiasis was recorded in Spitz/Samoyed (39%) followed by non-descript dogs (19%), Lhasa-Apso (7%), Pomeranian (14%), Doberman (8%), German Shepherd (5%), Cocker Spaniel (3%), Boxer (3%) and Great Dane (2%) (Fig. 5). As mentioned by Weaver (1970) the breed-wise prevalence of the cases of urolithiasis depends upon the local popularity of the breed. Most of the caprine in the present study were either non-descript or were the crosses of local breeds. Buffaloes were mainly of Murrah crosses while cattle were either crossbred calves or bullocks of mixed breeds. The cases represented the most prevalent breeds of these ruminants in this region. In canine, a high incidence of

uroolithiasis recorded in Spitz and Non-descript dogs could also be due to more population and likeliness for these breeds among people in this region. High incidence in German shepherds (Amma et al., 2011), non-descript and Pomeranians (Thilagar et al., 1996; Amma et al., 2011) has been reported in earlier studies. Small breeds of dogs were found to be most commonly affected by obstructive urolithiasis in another study (Lekcharoensuk et al., 2001; Jeong-Seong Mok, 2002; Kim-Chae Wook et al., 2004).

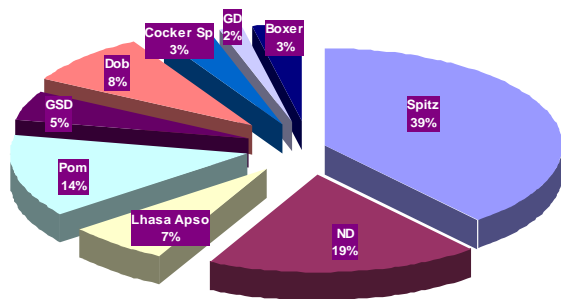


Figure5: Breed wise distribution of case in dogs.

The goats and buffaloes of younger age groups were more commonly affected than the older animals of these species. Analysis of cases of urolithiasis to find the age wise incidence in different species revealed that in caprine maximum number of cases (38.51%) was recorded in the goats of the age group of 4-6 months followed by animals of 0-3 months (31.34%) of age. Thus, goats of below 6 months of age constituted about 70% of the cases in caprine. 12.84% cases were recorded in the goats of 7-9 months age and 5.97 % in the goats of 10-12 months of age. Only 11.34 % cases were recorded in the goats above 1 year of age. Almost a similar trend was recorded in buffaloes where 43.92% cases were recorded in the calves of 4-6 months of age and 27.70% cases in the calves of 0-3 months of age and only 4.05 % cases were recorded in the animals of 1 year of age or above. Only one case was recorded in an adult buffalo; a large calculus was found lodged in this animal at the tip of the urethra. Among the cattle the affected animals were either the calves of 0-6 months of age or the adult bullock above 3 years of age. Among dogs, maximum number of cases was recorded in the age group of 3-7 years followed, in decreasing order, by the animals of more than 7 years, 1-3 years and the dogs of less than 1 year of age. Amarpal et al. (2004) and Gugjoo et al. (2013) also recorded a high incidence of urolithiasis in caprines and buffaloes below 6 months of age. Many animals were very young and animals below 1 month of age were also presented. Radostits et al. (2000) also reported urinary obstruction in lambs as young as 1 month of age.

Bhatt et al. (1973) and Bailey (1975) assigned high protein diet and changes brought about by weaning to be the possible causes of urolithiasis in ruminants. Weaning in goats is done around 3 months of age and buffalo calves are also put on more solid diet at this age to meet their body requirements. Feeding of high concentrate diet, rich in phosphates at this age could have led to precipitation of phosphate and crystallization of struvite, which could be the main reason of more incidence of urolithiasis in young caprine and buffaloes. Normal attachment of urethral process to prepuce and narrow urethral diameter could further predispose the young caprine to urethral obstruction even with smaller crystals. All the goats were castrated but all the buffalo calves were uncastrated. Similar to the present study Gutierrez et al. (2000) also reported that obstructive urolithiasis is more common in young castrated

goats. Early castration has been implicated as one of the factors responsible for obstructive urolithiasis in animals. However, in the present study none of the buffalo calves was castrated. Therefore, it seems that feeding of highly digestible ration with poor mineral balance could be the main factor responsible for calculogenesis in goats and buffalo calves as suggested by McIntosh et al. (1974). Early age of castration may also predispose the animal to obstruction but may not be considered as the main cause of urolithiasis in young animals.

In cattle, the picture was totally different and majority of the affected animals were adult but cases were also recorded in the animals below 6 months of age. High incidence in adult bullocks might be due to the poor development and narrowing of penile urethra due to deficiency of testosterone hormone in early castrated animals (Bhatt et al., 1973). Bailey (1975) also reported a higher incidence of obstruction in steers in comparison to bulls and partial castrates, owing to the early age of castration (Bailey, 1975). However, urolithiasis in uncastrated young calves could be attributed to managemental practices namely feeding of high concentrate diet, or other climatic conditions in this region specially presence of abnormally high phosphate in water and soil.

In canine the highest incidence (45.16%) was noticed in animals in the age group of 3 to 7 years. The results are in conformity with the observation of Osborne et al. (1981), Ling et al. (1998), Amarpal et al. (2004), Singh et al. (2008) and Amma et al. (2011) who recorded the highest incidence of urolithiasis in canine between 3 to 8 years of age.

Month and season wise distribution of cases in goats revealed that maximum number of cases was recorded in January and February, which constituted 38% of total cases. Another peak of cases of urolithiasis was recorded in the months of May and June, where 24% cases were recorded. Only few cases (2-4%) were recorded in each of April, July, August, September and October months. In the months of March, November and December 6-8% cases were recorded in each month (Fig. 6).

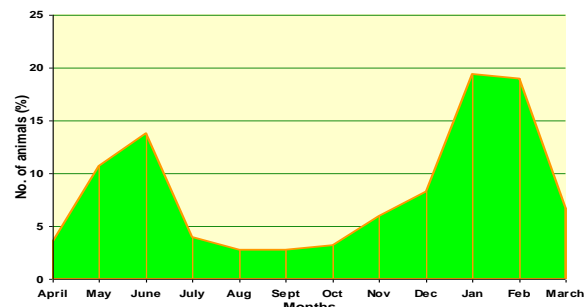


Figure 6: Month wise distribution of cases in goats.

In buffalo calves maximum cases were recorded in January (24.76%) followed by February (22.86%) and December (16.19%) and only few cases were recorded during rest of the year (Fig. 7). Minimal number of cases was recorded in the months of July (0.95%) and August (1.90%). Cases of urolithiasis in buffalo calves were concentrated from the month of December to February (>63%). In dogs most of the cases were recorded from February to July.

In the present study maximum number of cases of urolithiasis was recorded in winter season. Incidence of urolithiasis has been reported to be affected by seasonal variations and contrary to the results of the present study, higher incidences of urolithiasis have been reported in bovine

during summer (Bhatt et al, 1973). Nottle (1982) also reported higher incidences of renal calculi in sheep during May and June.

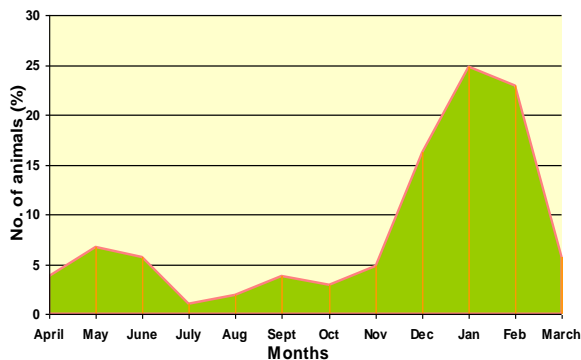


Figure 7: Month wise distribution of cases in buffaloes

In our study also many cases of urolithiasis in ruminants and especially in goats were recorded in summer but maximum number of cases was recorded during peak winter. Water intake is an important factor in calculi formation. Lower water intake in winters can raise the relative concentration of urinary mineral solutes and increase the likelihood of their precipitation (Larson, 1996). Further, few studies have reported seasonal variation in quantity of ion excretion in urine of animals, which may also cause seasonal variation in formation of calculi (Robertson et al, 1974).

On taking history and clinical examination the nature of obstruction was categorized as partial when slight dribbling of urine was observed or complete when complete blockade to the flow of urine was noticed. In goats 75.44% cases were reported with complete obstruction and only 24.66% cases with partial obstruction. In buffalo calves 90.57% cases were recorded with complete and 9.43% cases with partial obstruction. In dogs 55.26% cases were recorded with complete obstruction and 44.74% with partial obstruction. However, in cattle 56.67% cases had partial obstruction and 43.33% cases had complete obstruction (Fig. 8). In short, the type of obstruction was complete in majority of cases and partial obstruction was in lesser number of cases through out the year and at all age groups in all the species except bullocks. High percentage of complete urethral obstruction recorded in buffaloes and caprine could be attributed to sandy or pasty nature of calculi detected in these species. These calculi usually fill a greater length of urethra thus causing complete obstruction. In both species more number of cases was reported in younger animals where the chances of formation of pasty calculi are more due to rapid calculi formation.

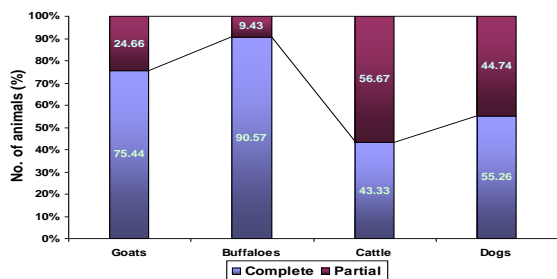


Figure 8: Type of obstruction in different species.

Feeding of high concentrate diet might have led to rapid precipitation of phosphates in alkaline urine pH. Calculi in cattle and canine were generally well defined in shape (Hawkins, 1965). These types of calculi may not fit snugly in the

urethra and thus cause only partial obstruction. In both species, more number of cases was recorded in adult animals where the chances of well formed calculi are more. However, due to irritation and subsequent urethral inflammation partial obstruction may be converted to complete obstruction.

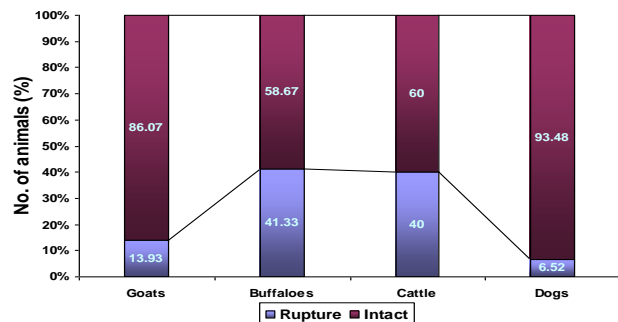


Figure 9: Status of urinary bladder in different species.

Status of the bladder was ascertained by clinical examination, abdominocentesis, radiological and sonographic examinations as per the need of the case. In goats, 13.93% animals had ruptured urinary bladder but in buffalo calves 41.33% cases were reported with rupture of bladder. In bullocks also 40% of the animals were reported with ruptured urinary bladder (Fig. 9). However, in dogs only 6.52% cases were brought with rupture of the bladder. It was noted that the cases of rupture of urinary bladder were considerably higher in buffaloes as compared to goats. The number was also very high in bullocks (40%).

Delayed detection of disease, delayed presentation of cases, due to transportation problems and common practice of administration of lasix (a diuretic), by local veterinarians resulting in increased formation of urine (Adam, 1995) might be responsible for increased chances of rupture of urinary bladder in cattle and buffaloes. The detection of obstruction could be earlier in canine and caprine owing to their close association with their owner therefore; they were reported earlier to clinics thus reducing the chances of rupture of the urinary bladder. The results of the study indicated that the occurrence of obstructive urolithiasis has increased during recent past. Young goats and buffalo calves maintained on concentrate rich diet in winter season are mainly affected and thus need special attention. Early presentation of the case to clinic may minimize the chances of rupture of the bladder and subsequent fatal complications.

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