

# Prevalence and epidemiological trends of obstructive urolithiasis in ruminants presented at Indian veterinary research institute (IVRI): a five-year study

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## Abstract

Obstructive urolithiasis is a frequently encountered surgical emergency in veterinary practice, particularly in male ruminants and small animals. A retrospective evaluation of cases presented to the Referral Veterinary polyclinic cum TVCC of the Indian Veterinary Research Institute (IVRI), Izatnagar over a five-year period revealed a high prevalence of obstructive urolithiasis. More than 700 cases were recorded annually during the study period. Male animals were predominantly affected, and early castration emerged as an important predisposing factor. Feeding practices, particularly excessive feeding of bran-based concentrates, were strongly associated with the occurrence of urinary calculi. A marked seasonal pattern was also observed, with peaks during summer and winter months. The present analysis highlights epidemiological trends and major risk factors associated with obstructive urolithiasis and emphasizes the need for improved management practices to reduce its occurrence.

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## INTRODUCTION

Obstructive urolithiasis refers to the formation and retention of urinary calculi within the urinary tract leading to partial or complete obstruction of urine flow. The disease is of considerable clinical importance because it often results in severe pain, metabolic disturbances, bladder rupture, and death if not treated promptly. In veterinary medicine, obstructive urolithiasis is commonly reported in cattle, buffaloes, sheep, goats, and occasionally in dogs (Radostits et al., 2007). The condition occurs more frequently in male animals because of anatomical features of the male urethra. The urethra in males is longer, narrower, and contains natural constrictions such as the sigmoid flexure in ruminants and the os penis in dogs, making it more susceptible to obstruction by urinary calculi (Smith, 2015). Several factors influence the occurrence of urolithiasis including diet composition, mineral imbalance, water intake, age at castration, and environmental conditions (Constable et al., 2017). High-concentrate diets rich in phosphorus, especially those containing wheat bran, are strongly associated with phosphatic stone formation. Early castration is another major risk factor because it prevents normal urethral development. The Referral Veterinary polyclinic cum TVCC of IVRI serves as a major referral hospital in northern India and receives a large number of obstructive urolithiasis cases annually. Therefore, a retrospective evaluation of these cases provides valuable insights into epidemiological patterns and risk factors.

## MATERIALS AND METHODS

A retrospective analysis of obstructive urolithiasis cases presented to the Referral Veterinary polyclinic cum TVCC, ICAR-Indian Veterinary Research Institute (IVRI), Izatnagar, Bareilly, was conducted over a period of five years. Clinical records from the surgery unit were examined to identify confirmed cases of urinary obstruction due to urolithiasis.

Information collected from the case records included:

- Year of presentation

- Castration status
- Feeding history
- Seasonal occurrence
- Clinical findings

Cases were categorized based on sex distribution, feeding practices, and seasonal occurrence to determine possible risk factors associated with obstructive urolithiasis.

## RESULTS

A consistently high number of obstructive urolithiasis cases were reported each year during the five-year period. More than 700 cases were recorded annually, demonstrating the high prevalence of the condition in animals presented to the institute.

**Table 1.** Year-wise prevalence of obstructive urolithiasis cases at IVRI

| Year | Number of Cases |
|------|-----------------|
| 2019 | 890             |
| 2020 | 904             |
| 2021 | 750             |
| 2022 | 779             |
| 2023 | 917             |

The highest number of cases was recorded in 2023 (917 cases), while the lowest number was recorded in 2021 (750 cases). The consistently high case numbers throughout the study period demonstrate the widespread occurrence of obstructive urolithiasis in animals presented to the hospital. Male animals constituted the overwhelming majority of cases. This observation is consistent with previous studies that report a strong sex predisposition due to anatomical features of the male urinary tract. Early castrated animals were more frequently affected compared to intact males or animals castrated later in life. The reduced urethral diameter resulting from early castration likely contributed to increased susceptibility to urethral obstruction.

Dietary history revealed that many animals had been fed bran-based concentrate diets, particularly wheat bran. Such diets often result in an inverted calcium-to-phosphorus ratio, favoring the formation of phosphatic calculi. Seasonal analysis revealed a bimodal distribution of cases, with two clear peaks during summer and winter months.

**Table 2.** Seasonal distribution of obstructive urolithiasis cases

| Season  | Relative Frequency |
|---------|--------------------|
| Summer  | High               |
| Winter  | High               |
| Monsoon | Moderate           |
| Spring  | Lower              |

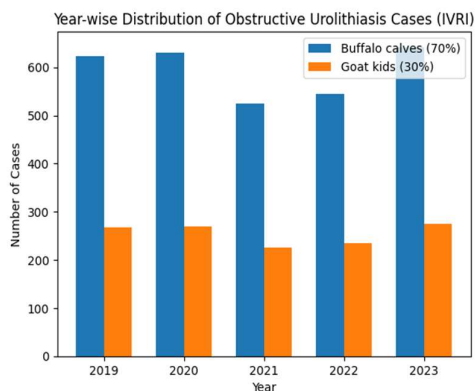
During summer, dehydration and reduced water intake result in highly concentrated urine, which promotes crystallization of urinary salts. In winter, animals often consume less water due to cold temperatures while concentrate feeding increases, further increasing the risk of stone formation.

The majority of affected animals were male, accounting for more than 98 % of total cases, while females were rarely affected. Another notable finding was the higher incidence in animals castrated at a young age. Early castration resulted in incomplete urethral development, making the urethra narrower and more prone to obstruction.

**Table 3.** Influence of castration age on occurrence

| Castration Status       | Relative Occurrence |
|-------------------------|---------------------|
| Early castrated animals | High                |
| Late castrated animals  | Moderate            |
| Intact males            | Lower               |

Dietary history revealed that a large proportion of animals had been fed bran-based concentrate diets, particularly wheat bran. Excessive feeding of bran leads to an imbalance in the calcium-to-phosphorus ratio of the diet, predisposing animals to phosphatic urolith formation. Across the study period, buffalo calves constituted the majority of obstructive urolithiasis cases, accounting for approximately 70% of the total cases, whereas goat kids represented about 30% of the affected animals. This indicates that buffalo calves were more frequently affected than goat kids in animals presented to the Referral Veterinary polyclinic of IVRI (Fig.1)



**Fig.1** Species-wise distribution of obstructive urolithiasis cases at IVRI (2019–2023)

## DISCUSSION

The present analysis confirms that obstructive urolithiasis remains one of the most common surgical conditions encountered in veterinary hospitals. The predominance of male animals among affected cases is well documented in the literature and is primarily related to anatomical factors. The long and narrow urethra in males provides multiple sites for calculi to lodge and cause obstruction. Early castration emerged as a significant predisposing factor. Testosterone is essential for normal development of the urethra during puberty. Animals castrated before puberty fail to develop a sufficiently wide urethral lumen, making them more susceptible to obstruction. Dietary factors also play a crucial role in the pathogenesis of urolithiasis. Wheat bran, which is widely used as a livestock feed supplement, contains high levels of phosphorus. Excessive feeding of bran disrupts the calcium-phosphorus ratio and promotes the formation of phosphatic calculi such as struvite and apatite. Seasonal peaks observed during summer and winter are consistent with earlier studies. Reduced water intake and increased urine concentration during extreme climatic conditions significantly increase the risk of urolith formation. The very high number of cases recorded annually at IVRI highlights the need for effective preventive strategies. Balanced feeding practices, ensuring adequate water intake, and avoiding early castration can significantly reduce the incidence of obstructive urolithiasis.

## CONCLUSION

The retrospective evaluation of obstructive urolithiasis cases presented to the Veterinary Clinical Complex of IVRI between 2019 and 2023 revealed a consistently high prevalence of the disease. A total of several hundred cases were reported annually, with the highest number recorded in 2023. Male animals were predominantly affected due to anatomical predisposition. Early castration and excessive feeding of bran-based concentrate diets were identified as major risk factors. Seasonal peaks were observed during summer and winter months. Improved feeding management, delayed castration, and adequate water availability are essential preventive strategies to reduce the incidence of obstructive urolithiasis in livestock.

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