ACKNOWLEDGEMENT

The author is ever grateful and indebted to the Almighty Allah without whose grace it would have ever been possible to pursue this study in this field of science and to complete this clinical report writing for the Degree of Doctor Of Veterinary Medicine (DVM).

The author would like to express his deep sense of gratitude and thanks to Professor **Dr. Gautam Buddha Das**, Vice Chancellor, Chittagong Veterinary and Animal Sciences University.

The author would like to express his deep sense of gratitude and heartfelt appreciation to Professor **Dr. Md. Kabirul Islam Khan**, Dean, Faculty of Veterinary Medicine.

The author would like to express his ever indebtedness, deepest sense of gratitude, sincere appreciation and profound regards to her reverend and beloved teacher and Supervisor Professor **Dr. A.K.M Saifuddin**, Head, Department of Physiology, Biochemistry & Pharmacology, Chittagong Veterinary And Animal Sciences University for his scholastic guidance, sympathetic supervision, valuable advice, constant inspiration, affectionate feeling, radical investigation and constructive criticism in all phases of this study.pt also.

The author highly express his sincere gratitude and gratefulness to the internship Coordinator, **Dr. Bibek Chandra Sutradhar**, Associate professor, Department of Medicine ans Surgery, Chittagong Veterinary And Animal Sciences University., for his constant inspiration, cordial co-operation, valuable suggestion for completion of the report work.

The author would like to express his heartfelt appreciation & thanks to **Dr. Mohammed Ashif Imtiaz Shawn,** DVM (CVASU), MS fellow (Pharmacology) and **Dr. Abu Sayeed**, DVM (CVASU), MS fellow (Epidemiology), Chittagong Veterinary And Animal Sciences University .

The author

CONTENTS

CONTENTS (cont.)

List of figures

List of tables

ABSTRACT

Urolithiasis is the retention of urine subsequent to lodgment of calculi anywhere in the urinary conduct from up to urethral orifice. The disease results in heavy economic losses. Obstructive urolithiasis is a serious, potentially fatal condition, most commonly causing symptoms in castrated male animals, but also occurring in breeding males.The current study was planned to investigeate the relationship of urolithiasis with goat breed, age, sex, effect of castration, effect of feeding systen and effect of urine pH. In my study the prevalance of urolithiasis in male was found 6.67% out of 284 goats, in breed groups almost 43% was recorded which was the highest value, in age groups within the age limit 0-6 months were found mostly affected in different breeds. In considering castration there were found almost 65% of cases with previous castration histroy, almost 72% with concentrate feeding and almost 79% having alkaline urine. The study recommends proper feeding that is preventive to urolithiasis, selection of less succeptible breeds and early screening be treated mandatorily to compensate economic loss to farmers.

Key words: Urolithiasis, Calculi, Urethral orifice, Castrated, Concentrate, Alkaline, Screening

CHAPTER I

INTRODUCTION

Uroliths are concretions of solid mineral and organic compounds that cause disease through direct trauma to the urinary tract and obstruction of urinary outflow (Kalim et al., 2011). They are commonly found in the urinary bladder but have also been reported to occur in the urethra at the point of the sigmoid flexure (Singh and Singh, 1990) and urethral process (Kannan and Lawrence, 2010). Formation of urinary calculi is dependent on the super saturation of urine with soluble ionized minerals. Crystal formation occurs when the inhibitory capacity of mucopolysaccharides, ions and organic acids is exceeded.

Urinary calculi formation is complex and multifactorial (Radostits et al., 2005), resulting from a variety of risk factors exist for the development of uroliths in ruminant species. Decreased salt or water intake, urinary stasis, urinary tract infection, high urine pH (struvite, calcium phosphate, and calcium carbonate stones), vitamin A deficiency, and high estrogen intake have all been implicated as risk factors. In addition, the anatomy of the male ruminant urinary tract also contributes due to the potential narrowness of the passage and tortuous route.

The sigmoid flexure is a common site for uroliths to lodge in all ruminant species. Uroliths may also be found on lesser occasion at the ischial arch. In small ruminants the urethral process is an extremely common site for uroliths to lodge (Radostits et al., 2000; Hesse et al., 2009).

Urolithiasis is a common problem in castrated male sheep, goats and cattle (prior to 2 months of age) (Makhdoomi and Gazi, 2013), the incidence in goats is the highest and has been reported to be about 49.3% (Amarpal et al., 2004).

There are different types of urine stones including struvite, calcium oxalate, calcium carbonate, calcium phosphate, silica, uric acid, cystine and tyrosine crystals (Samal et al., 2011). Silica, magnesium ammonium phosphate (phosphatic, struvite), calcium carbonate, and calcium oxylate are the most common types of crystals found in ruminants.

Clinical signs of urolithiasis case will vary depending on the duration of obstruction, the site of obstruction, and whether a rupture has occurred. Early clinical signs associated with obstruction include signs of colic. Animals may have an arched stance, tread their feet, swish the tail, or kick at their belly. (Fortier et al., 2004).

Obstructive urolithiasis means the formation of calculi in the urinary tract with subsequent urinary blockage by uroliths (Radostits et al., 2000), which is a life-threatening condition in males. Mortality rate is very high in affected animals due to rupture of the urethra or urinary bladder (Gasthuys et al., 1993). Management of urolithiasis is a difficult task.

Treatment options for obstructive urolithiasis are varied, but resolution usually requires surgical intervention. Partial obstructions may be cured by diuresis, diet change and urine acidification. Analgesics and antibiotics are often indicated in these cases. Complete obstructions and urinary bladder ruptures require surgery.

In these contexts, the study was carried out with the following objectives:

i. To investigate the prevalence of urolithiasis with actual uroliths (crystals) in goat at some selected areas of Bangladesh.
ii. To evaluate the relationship of urolithiasis with epidemiological factors such as age, sex, breed, feeding system.
iii. To study the association of urolithiasis with respect to urinary pH, specific gravity, blood cells and leucocytes etc.

CHAPTER II

REVIEW OF LITERATURE

Urolithiasis is a condition of the urinary tract in which insoluble mineral and salt concretions develop and aggregate around a nidus of proteinaceous material within the bladder or urethra (Belknap and Pugh, 2002). These stones may consist of various mineral combinations and have many shapes and sizes. Nidus formation occurs when mucoproteins in the urine coalesce and precipitate with crystals in supersaturated urine (Belknap and Pugh, 2002). However, if the stones become too numerous or too large, they may cause obstruction of the urethra at the vermiform appendage, the ischial arch, or the neck of the bladder, particularly in castrated male ruminants (Pinsent and Cottom, 1987). This condition, termed obstructive urolithiasis, can rapidly progress to bladder or urethral rupture, uremic crisis, and death (Baxendell, 1984). Male animals are more likely to be affected as females generally have a shorter, wider urethra (Matthews, 1999). Uroliths can occur in all species but are a common problem in domestic ruminants. It has been noted as more of a problem in castrated males (Matthews, 1999; Belknap and Pugh, 2002).

Age and sex distribution:

Urolithiasisis commonly reported in young, castrated male pet goats. Some factors associated with the development of urinary calculi in goats include gender, age at castration, and diet, as well as urine pH and concentration (Smith MC, et al., 1994).

Urolithiasis is significantly more common in male goats compared to female goats, simply due to the anatomy of the male urethra. In contrast to the relatively short, wide and straight urethra present in females, the male urethra is long, narrow, torturous and prone to obstructions, particularly in the sigmoid flexure and urethral process. (Smith MC, et al., 1994; Van Metre D, House J, et al., 1996).

Etiology:

Diets contain excess minerals, such as calcium and phosphorus that encourage urolith formation. Several investigators have created a nutritional model for urolithiasis in various

species, and one of these studies demonstrated a higher incidence of urolithiasis in goats fed a diet with increased phosphorus content compared to those fed a diet with lower phosphorus content.

The age at which castration occurs also is an important factor in the development of urolithiasis. Early castration results in penile hypoplasia, leading to a decrease in the bore size of the urethra, as well as failure of the urethral process to mature and completely separate from its distal attachment to the preputial mucosa (Smith MC, et al., 1994), (Kumar RK et al., 1982). Goats are commonly fed diets that exceed their caloric requirements, and popular diets often contain alfalfa hay, which is high in calcium and grains that tend to be high in phosphorus (Pond WG et al., 2005).

In addition to gender, age at castration and diet, urinary pH and concentration also play a significant role in the formation of uroliths and subsequent development of obstructive urolithiasis. Urinary pH is a major factor in urolith formation- both struvite and apatite uroliths precipitate in alkaline urine (Ewoldt JM, et al., 2006), (Mavangira et al., 2010).

Struvite (magnesium ammonium phosphate) and apatite (calcium phosphate) uroliths are most common in goats fed high grain diets, which makes sense as calcium and phosphorus are often fed in excess (Jones ML, Miesner MD. 2009). Stuvite crystals will form at pH 7.2 to 8.4 and apatite crystals will form at relatively more acidic pH range from 6.5 to 7.5 compared to struvite crystals (Elliot JS, Quaide WL, Sharp RF et al., 1958).

Pathogenesis:

Formation of calculi and development of urolithiasis is a complex process and occurs in a series of phases from formation of nidus, concenctration of urine and lastly the precipitation of various salts from urine. Formation of urinary calculi is dependent on supersaturation of urine with soluble ionized minerals. Crystal formation occurs when the inhibitory capacity of mucopolysaccharides, ions, and organic acids is exceeded (Dusty W. Nagy, 2009). A variety of risk factors exist for the development of uroliths in ruminant species. Decreased salt or

water intake, urinary stasis, urinary tract infection, high urine pH [struvite, calcium phosphate, and calcium carbonate stones], which could however be achieved to a pH < 6.5 in goats (Vengai Mavangira, et al.,2010) by dietary supplimentation of ammonium chloride. Vitamin A deficiency and high estrogen intake have all been implicated as risk factors (Jones ML *et al*., 2009). The infectiuos stones, Obligate urease-producing bacteria [>98%] *Proteus spp*. urease-producing bacteria, *Providencia rettgeri, Morganella morganii, Corynebacterium* urealyticum, *Ureaplasma urealyticum* and facultative urease producing bacteria *Enterobacter gergoviae, Klebsiella spp.*, *Providencia stuartii* and *Staphylococcus spp*. have been reported to act as nidus in initiation of calculi formation. Renal calculi are formed when the urine is supersaturated with salt and minerals such as calcium oxalate, struvite [ammonium magnesium phosphate], uric acid and cystine (Worcester EM, Coe FL, 2010). Cystine is poorly soluble in urine and crystallizes spontaneously within the physiological range of urine pH 6.0 and limit of solubility is 1.33 mmol/L. The main therapeutic option for avoiding cystine crystalization is to maintain urine pH above 7.5 to improve cystine solubility and to ensure appropriate hydration with a minimum of 3.5 L/day (Pearle MS, Asplin JR, et al., 2008). Stones formed by crystalized compounds of the drugs, causing crystalization of urine like Amoxicillin/ampicillin, Ceftriaxone, Ciprofloxacin, Ephedrine, Indinavir, Magnesium trisilicate and Sulfonamide result in unfavorable changes in urine composition under drug therapy (Straub M, Strohmaier WL, Berg W, 2012). In an attempt towards in-depth understanding of the phenomenon, investigation into pathophysiological changes from onset of the urolithiasis workers have developed varieties of experimental models of urolithiasis but they could not fetch much about the aspect other than damages restricted to lower urinary conducts. Studies on urodynamics during obstructive uropathy revealed damage to bladder wall, ureters, kidneys and urine peritonitis (Makhdoomi, D.M and Marudwar, S.S. 1992). Casts and cells are also observed in animals having long standing obstruction of urethra. This is due to pathological changes that commence as a result of accumulation of urine inside the bladder (Dubey,A., Pratap, K., et al., 2006). In the early stages of urinary obstruction, the animal attempts to urinate and the tail may be seen to have a pumping action. As the bladder continues to distend, the animal may kick at its abdomen, wring its tail and lie down frequently. Continued obstruction leads to perforation of the urethra of the penis and/or

rupture of the urinary bladder. Upon perforation or rupture, the animal may not show signs of discomfort any more (Buchholz N, et al., *2010)*. Even with appropriate treatment urethral stricture or hydronephrosis may present long term complications. Clinical signs will vary depending on the duration of obstruction, the site of obstruction, and whether a rupture has occurred (Janke JJ, et al., 2009). Consequent to localization of calculi in urethral tract, complete blockage of the urinary flow from a kidney decreases glomerular filtration rate and, if it persists for more than 48 hours, may cause irreversible renal damage (Wolf,J, 2011).

There is an increased intracystic, and intra urethral pressure developing in pace with duration of obstruction upto 64 to 72 hours of obstruction which declines after re-establishing the free urine flow/ or the seepage of urine from bladder. The increased retrograde pressure built up in the ureter leads to failure of vesico-ureteral reflux and with resultant mild, moderate to degree of nephropathy depending upon duration of obstruction (Makhdoomi, D.M and Marudwar, S.S. 1992) under clinical situations this retrograde pressure nephropathy seems to set at 48 hours of post-obstructive period and thereafter. But whether it could be evidenced before 48 hours of urethral obstruction cannot be ascertained. Obstruction of urine flow whether located in renal pelvis ureter, urinary bladder or urethra causes back pressure induced by the obstructing urine flow impaired the mechanism of tubular reabsorption and tubular secretion, significantly reduced glomerular filteration rate and renal blood flow, thus post renal obstructive uropathy and uraemia develops either due to obstruction to urine flow or destruction of renal parenchyma or both (Smith, J.A. Divers, et al., 1989). Because of retrograde pressure consequent to obstruction of urethra, renal pelvis gets enlarged at the cost of renal parenchyma and the exclusion of the blood flow due to increased pressure inside the inexpansible renal capsule which leads to a disuse atrophy (Radostitis OM, et al., *2005*).

Due to continuous formation of urine and its accumulation in the bladder subsequent to urethral obstruction the bladder gets distended. The increasing pressure and distended stretching of bladder wall resulted in inflammation, pressure ischaemia, devitalization, thinning, trabeculae formation, herniation of mucosa through the musculature of the urinary bladder leading to seepage or voiding of whole of the stagnated urine into the peritoneal

cavity resulting in uroperitoneum and peritonitis, more so in bovine urolithiasis very little is documented about uropathy. The data regarding it is available mostly in dogs or human beings. There occurs a secondary damage to kidney caused by a retrograde intracystic pressure in complete urinary obstructed cases resulting in the uraemia (Makhdoomi, D.M and Marudwar, S.S. 1992).

Diagnosis:

Diagnosis of urolithiasis in goats is frequently made using signalment, history and clinical signs alone, though other modalities such as ultrasound, contrast studies, and serum biochemistry can provide additional information that can be particularly valuable to assess the severity of the condition and serve as prognostic indicators (Ewoldt JM, et al., 2006). Signalment is one key that can add obstructive urolithiasis to a list of differential diagnoses. As mentioned previously, castrated males are more commonly affected by urolithiasis than intact males. A retrospective study of 38 cases of caprine urolithiasis had an age range of 2 months to 12 years of age (Craig, DR, Stephan M, Pankowski RL, 1987). Many of these animals were obese and essentially all of them received high grain diets. The same study also found an increased incidence of obstructive urolithiasis in the summer and winter. This may be related to the water balance of the goats– during the winter, urine may be more concentrated due to decreased water intake. Conversely during the summer, urine may be more concentrated due to increased water loss in the heat.

History and clinical signs of urolithiasis vary depending on the degree and location of obstruction, as well as the duration of obstruction (Jones ML, Miesner MD. 2009). Early signs clinical signs of obstruction can be relatively nonspecific and include anorexia and lethargy. As the disease progresses, clinical signs become more severe and apparent. More advanced signs commonly include stranguria, hematuria, vocalization, tail switching, abdominal distention, restless or anxious behavior to depression and even recumbency in the advanced stages of obstructive urolithiasis, especially when urethral or urinary bladder rupture occurs (Haven ML, et al., 1993).

Incomplete obstruction of the urethra can result in complete obstruction due to the inflammation caused to the urethral mucosa by the urolith (Jones ML, Miesner MD. 2009). The entire clinical course of obstructive urolithiasis can last 2-5 days from onset to death if appropriate medical or surgical intervention does not occur (Smith MC, et al., 1994).

Clinical pathology findings will vary depending on the duration of the urinary obstruction. Common abnormalities include azotemia, hyponatremia, hypochloremia and hypokalemia. More severe derangements are seen in cases of rupture or obstruction of longer duration (Jones ML, Miesner MD. 2009).

Repeated twitching of the penis was often observed and the animal might make strenuous efforts to urinate, accompanied by straining, grinding and grating of the teeth a few drops of blood stained urine (Blood et al., 1989).

Gangwar, S.D., Pandey, N.N. and Celly, C.S. 1990 reported that there is increase in TEC and TLC in urolithiasis patient. An increase in Neutrophils count and Leukocytosis is due to stress condition was reported by Berkow, R. 1998. According to the Kallfelz, F. A. et al.,1987, in case of urolithiasis erythrocyte are normal. There may be a moderate leucocytosis with a slight shift to the left.

Additional diagnostic modalities include contrast radiography, ultrasonography, and endoscopy. Contrast studies can aid in determining the location of an obstruction within the urethra, and rule out bladder rupture (Palmer JL, et al., 1998).

Normograde cystourethrography has also been used to monitor urethral patency following tube cystotomy by inserting the contrast medium through the tube into the bladder in pigs and small ruminants. Numerous studies have found that medical treatment in combination with urethral process amputation is not effective long term and only provides temporary relief as reobstruction is likely (Haven ML, et al., 1993).

Treatment and prevention:

When choosing a treatment modality, the patient's intended use should be taken into consideration. For example, the surgical treatment for breeding goats that best suits continued productivity is location and removal of the urolith (Smith MC, et al., 1994).

The surgical procedure for calculi lodgment in the area of the sigmoid flexure is the same for cattle, sheep or goats. Proper restraint, tranquilization and a regional anesthetic are necessary. The technique may vary exteriorization of the penis at the proximal portion of the sigmoid flexure. In early cases, the calculi may be palpated and removed by simple incision into the urethra. If the urethra is patent, it can be sutured and returned to normal position with a simple skin closer. In more complicated cases, amputation of the penis proximal to the sigmoid flexure or at the perineal area may be necessary (Aiello, 1991).

Aiello, 1991 also reported Chemotherapy has met with limited success and must be done before obstruction is complete. In early cases, smooth muscle relaxants plus anti-inflammatory agents may be helpful. Struvite crystals associated with high grain rations are soluble at a P^H of <6.8. Withholding feed for 24 hrs in conjunction with oral dosing of ammonium chloride can acidify the urine. Acidification of the urine should be maintained for ≥ 1wk following surgery due to the probable presence of multiple calculi in the bladder. A ration with 2:1 calcium to phosphorus ratio greatly reduces the incidence of urolithiasis in feeder animals. The addition of 1-4% salt in the ration has probed beneficial. Ration with 9% salts can be feed consumption or rate of gain is affected; alternatively, 2% ammonium chloride can be added. A well balanced diet that includes adequate amounts of vitamin A along with an ample supply of water is suggested.

It has been suggested that if an animal is to be used for breeding, then surgical tube cystotomy is the best choice, but if the animal is a pet and urethral patency is not required, bladder marsupialization is the better option (Ewoldt JM, et al., 2006).

The location of the obstruction is also taken into consideration when selecting the treatment. For example, if the obstruction is present in the urethral process, amputation of that process may be therapeutic so long as other obstructions are not present. If the obstruction is proximal to the urethral process, passing a urinary catheter for retropulsion may alleviate the obstruction, but other surgical treatment options may be more effective to prevent reobstruction (Smith MC, et al., 1994). Regardless of the treatment modality selected, the

most important component is the correction of fluid and electrolyte abnormalities (Jones ML, Miesner MD. 2009).

Correction requires intravenous fluid administration, which carries the risk of increased bladder distention and rupture; however this is preferred to taking an unstable animal to surgery (Sutton RA et al., 1979).

Surgical treatments are next in line when conservative treatment fails. Traditional surgical treatment options include urethral process amputation, percutaneous or surgical tube cystotomy, perineal urethrostomy(PU), and bladder marsupialization. Recently, laser lithotripsy has been safely and effectively used in three goats to treat calculi lodged in the urethra (Halland SK, House JK, George LW, 2002). Percutaneous tubecystotomy can be used to avoid general anesthesia in high risk patients, but has a higher complication rate compared to surgical tube cystotomy and bladder marsupialization. Surgical tube cystotomy is one of the procedures used for long-term treatment of obstructive urolithiasis in goats, and may be the best surgical option for breeding animals and pets for long-term success (Fortier LA, Gregg AJ, Erb HN, et al, 2004). Cystorrhaphy is another effective surgical techniques for urolithiasis patient (Tygi and singh, 1993).

Ischeal method- A skin incision 2 inches long is made along the midline starting from about 2 inches below the ischeal arch downwards. This exposes the two retractor penis muscles. The remaining part of the operation is as already described. The incision can be started in level with the ischeal arch, but will cause unnecessary bleeding due to the cutting of the ischeo-cavernosus muscles (Venugopalan, 2002).

The addition of chlortetracycline to the ration (20mg/kg) significantly reduced death from obstructive urolithiasis. It had also been reported that deferment of castration, by permitting greater urethral dilatation, might reduce the incidence of obstructive urolithiasis (Blood et al., 1989).

CHAPTER III

MATERIALS AND METHODS

Materials:

Study area:

The study was aimed to determine the proportionate relationship of urolithiasis with age, sex, castration and breed of the goat, along with relationship with some urine properties (pH, Specific gravity, Blood cells). Data were collected from Upazilla veterinary hospital, Feni Sadar.

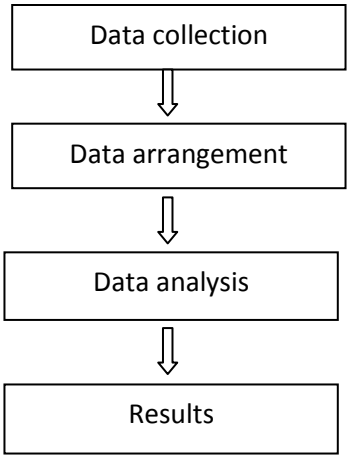
Study duration:

Total study period was from 9th February, 2014 to 8th April, 2014.

Data collection:

All the data were collected from the case encountered during the study period in the Upazilla veterinary hospital, Feni. A total of 278 goats were encountered in the period, among which 14 cases of urolithisis data were collected and analyzed. All the data were collected considering some epidemiological factors like breed, age, sex, castration, feeding system and some urine parameters of the cases like pH, specific gravity, blood cells count of the urine. Black Bengal, Jamunapari, Cross and Local breeds of goats were the choice of selection.

Experimental Design :



Methods:

Statistical analysis:

The data obtained were recorded in the Microsoft Excel and transfer into the statistical software STATA-7 for analysis. A descriptive analysis was carried out for the obtained data. The data were expressed as mean and standard Deviation.

Prevalence of Urolithiasis :

The prevalence of urolithiasis was determined by studying some epidemiological factors like breed, sex, age, castration, feed habit which are explored in the result discussion chapter.

CHAPTER IV

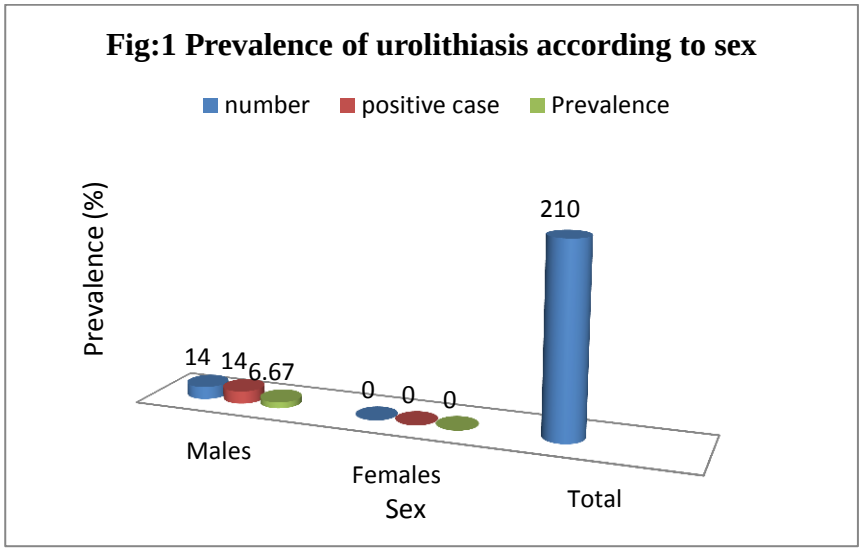
RESULTS

Urolithiasis according to sex

In this study, a total of 284 goats were observed. Out of 284 goats, 210 were male and 74 were female. In 284 goats, urolithiasis was observed in 14 males and no positive case was found in females. The prevalence of urolithiasis was 6.67% found in males **(Table 1)**.

Table 1: The prevalence of urolithiasis in goat according to sex

Sex	Total number of animals	Positive cases	Prevalence (%)
Male	210	14	6.67
Female	74	0	0
Total	284	14	4.93%



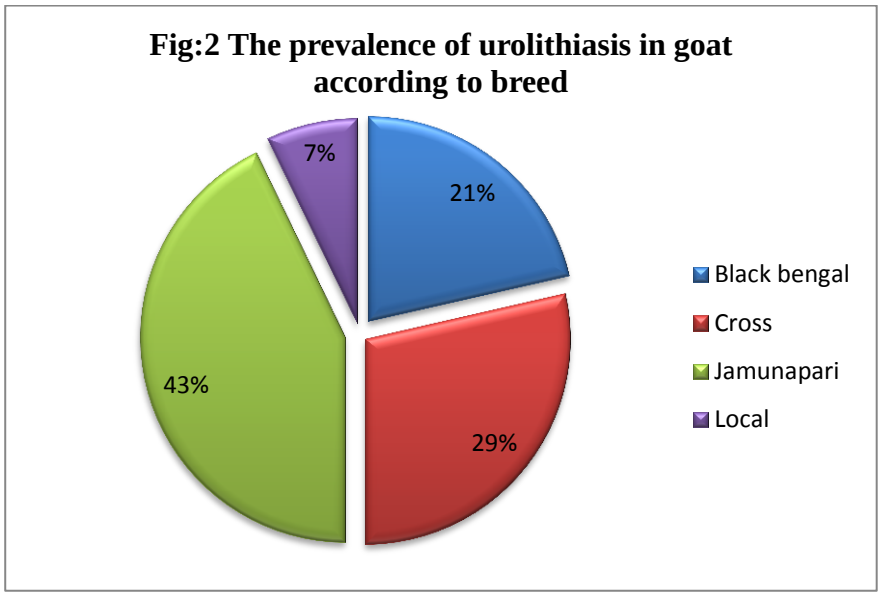
Urolithiasis according to breed

A total 14 number of case records were studied. Among which 3 cases were Black Bengal, 4 cases were cross breed, 6 cases were Jamunapari, 1 (one) case were local goat. According to breed, the prevalence of urolithiasis was found 21.43% in Black Bengal goat, 42.86% in Jamunapari goat, 28.57% in cross breed and 7.14% in local goat was found. The highest

prevalence of urolithiasis was found in Jamunapari goat and the lowest prevalence of urolithiasis was found in Local goat **(Table 2)**.

Table 2: The prevalence of urolithiasis in goat according to breed

Breed	Frequency	Percentage	Cumulative percentage
Black Bengal	3	21.43	21.43
Cross	4	28.57	50.00
Jamunapari	6	42.86	92.86
Local	1	7.14	100
Total	14	100	



Urolithiasis according to age

According to age, in between 0-6 months of age the prevalence of urolithiasis was found 66.67% in Black Bengal goat, 83.33% in Jamunapari goat, 50% in cross breed and 100% in local goat. The most affected goat at this age was Jamunapari and the lowest affected goat was local. The prevalence of urolithiasis was found 33.33% at 7-12 months of age in Black Bengal goat, 16.67% in at 7-12 months of age in Jamunapari goat, 50% in cross breed at 7-12months age and no prevalence was found in local goat at 7-12 months of age **(Table 3)**.

Table 3: The prevalence of urolithiasis in goat according to breed and age

Age (Months)	Black Bengal		Jamunapari		Cross		Local	
	No. of animals	Prevalence (%)	No. of animals	Prevalence (%)	No. of animals	Prevalence (%)	No. of animals	Prevalence (%)
0-6	2	66.67	5	83.33	2	50	1	100
7-12	1	33.33	1	16.67	2	50	0	0

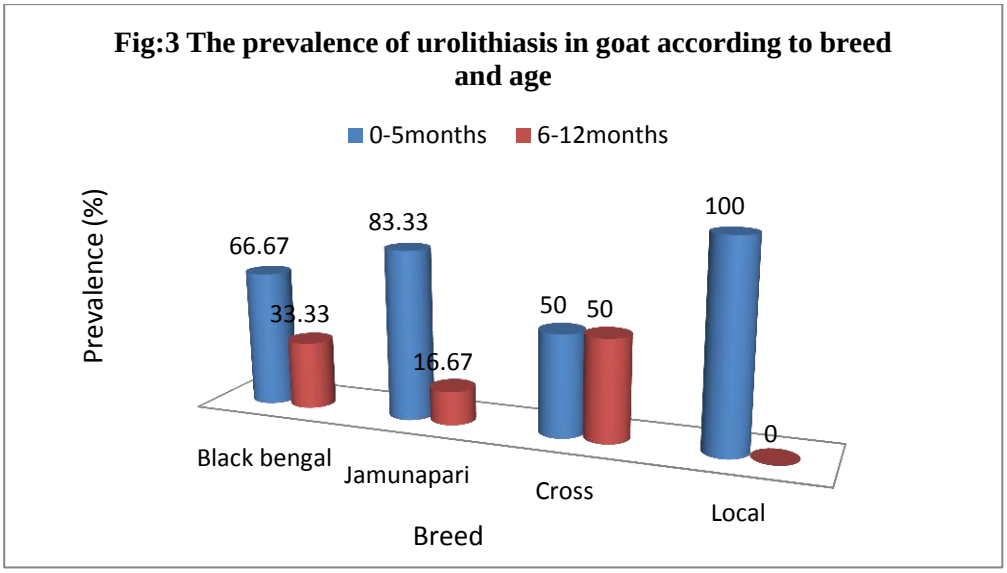


Fig:3 The prevalence of urolithiasis in goat according to breed and age

Urolithiasis in relation to castration

The prevalence of urolithiasis was 64.29% in the cases having history of castration; while cases those didn't have any history of castration had the prevalence of 35.71% **(Table 4)**.

Table 4: The prevalence of urolithiasis in goat in relation to castration

Castration history	Frequency	Percentage	Cumulative percentage
Yes	9	64.29	64.29
No	5	35.71	100

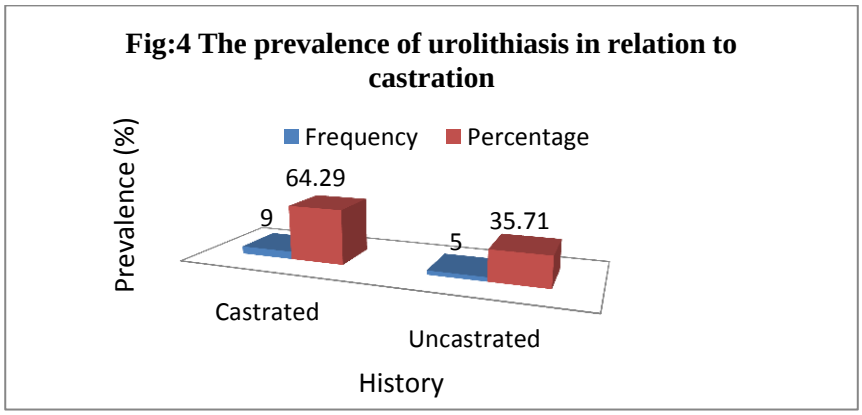


Fig:4 The prevalence of urolithiasis in relation to castration

Urolithiasis in relation to feeding system

According to pasture feeding system, the prevalence of urolithiasis were found highest during concentrate feeding (71.43%) comparing to free grazing history (28.57%) **(Table 5)**.

Table 5: The prevalence of urolithiasis in goat in relation to feeding system

Feeding system	Frequency	Percentage	Cumulative percentage
Concentrate	10	71.43	71.43
Free grazing	4	28.57	100

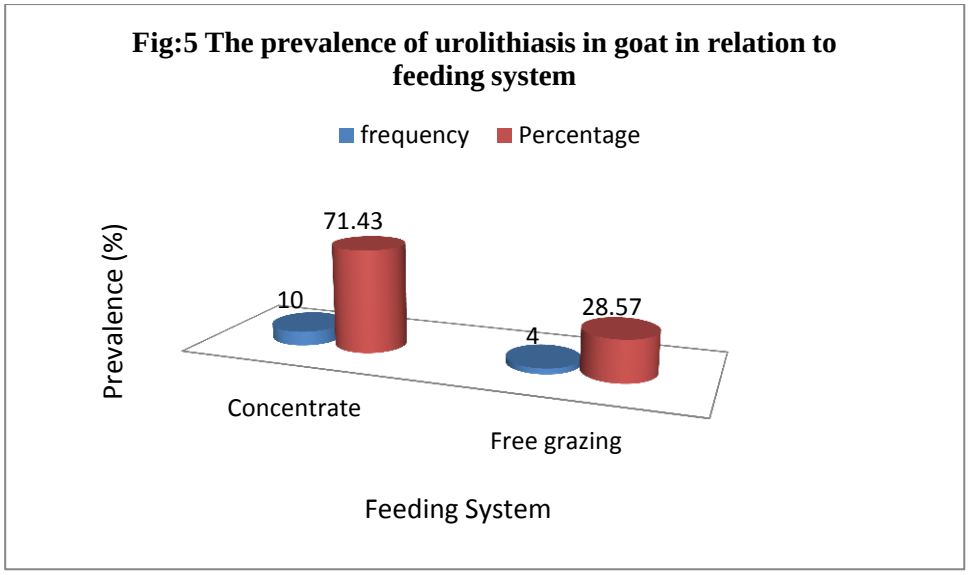


Fig:5 The prevalence of urolithiasis in goat in relation to feeding system

Urolithiasis according to pH of urine

All the cases were divided into two categories where group 1 had acidic urine (pH below 7) and group 2 had alkaline urine (pH above 7). According to the pH, the prevalence of urolithiasis was the highest in those having alkaline urine (78.57%) while the prevalence were lowest (21.43%) in those with acidic urine **(Table 6)**.

Table 6: The prevalence of urolithiasis in goat in relation to pH of Urine

pH	Frequency	Percentage	Cumulative percentage
Group 1	3	21.43	21.43
Group 2	11	78.57	100

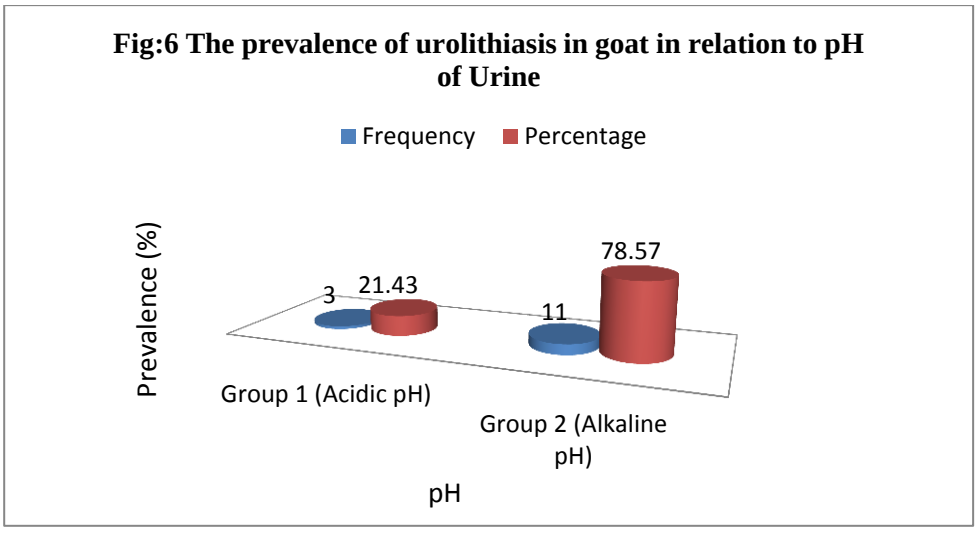


Fig:6 The prevalence of urolithiasis in goat in relation to pH of Urine

CHAPTER V

DISCUSSION

The present study was undertaken to detect the prevalence of urolithiasis in relation with age, sex, breed, feeding system of goat, during the period of February, 2014 to April , 2014.

In this study, a total of 284 goats were observed. Out of 284 goats 210 were male (73.94%) and 74 were female (26.05%). Out of 284 goats urolithiasis was observed in 14 males and no positive case was found in females. The prevalence of urolithiasis was found 6.67% in males. The cause of higher prevalence of urolithiasis in male goats compared to female goats, simply due to the anatomy of the male urethra. In contrast to the relatively short, wide and straight urethra present in females, the male urethra is long, narrow, torturous and prone to obstructions, particularly in the sigmoid flexure and urethral process. (Smith MC, et al., 1994; Van Metre D, House J, et al., 1996).

According to breed, the highest prevalence of urolithiasis was found 42.86% in Jamunapari goat and the lowest prevalence was found 7.14% in local goat.

According to age, the prevalence of urolithiasis were found 66.67% in Black Bengal, 83.33% in Jamunapari, 50% in cross breed of goat and 100% in local goat at 0-6 months of age. There is higher prevalence of urolithiasis at early age of goat. Similar findings were reported by Smith MC, et al., 1994.

According to castration, the prevalence of urolithiasis was found 64.29% in castrated goat. The prevalence of urolithiasis was found 35.71% in uncastrated. In this study, the prevalence of urolithiasis was higher in castrated male goat than uncastrated male goat. Because early castration results in penile hypoplasia, leading to a decrease in the bore size of the urethra, as well as failure of the urethral process to mature and completely separate from its distal attachment to the preputial mucosa (Smith MC, et al., 1994), (Kumar RK et al., 1982).

According to concentrate and free grazing system, the prevalence of urolithiasis was found 71.43% in goat under concentrate feeding system. Goats are commonly fed diets that exceed their caloric requirements, and popular diets often contain alfalfa hay, which is high in calcium and grains that tend to be high in phosphorus (Pond WG et al., 2005). Uroliths are

most common in goats fed high grain diets, which makes sense as calcium and phosphorus are often fed in excess (Jones ML, Miesner MD. 2009).

According to pasture feeding system, the prevalence was found 28.57% goat. The pasture plants contain large quantities of oxalate, estrogen or silica. The most important factor in the development of siliceous calculi was the grass or roughage containing high level silica (Blood et al., 2000).

According to the pH value of urine, the alkaline urine had the higher prevalence 78.57%, while 21.43% prevalence was found in the cases with acidic urine. This finding is similar with Ewoldt JM, et al., 2006 and Mavangira et al., 2010, reported that urinary pH is a major factor in urolith formation- both struvite and apatite uroliths precipitate in alkaline urine.

CHAPTER VI

CONCLUSION

The present study was conducted to find the prevalance of urolithiasis case in relation with goat breed, age, sex, feding, castration and pH of urine. The results found that males are more succeptible to urolithiasis due to their anatomical predisposition, Jamunapari breeds become more affected and goats are mostly affected within 6 months of age. There is a relation between castration and urolithiasis, goats with previous castration history become more affected than non-castrated. Another most important factor in urolithiasis is feeding, concentrate feeding system is mostly responsible for urolithiasis production. Aikaline pH also responsible for urolithiasis that is also depends on feeding mostly.

Preventive measures are effective to struggle this, calcium and phosphorus ratio shuld be stricrly maintained as 2:1, 4% salt should be provived in diet to increase water consumption and urine volume. Finally screening should be done to categorize goats for early treatment.

Reference

Amarpal, P Kinjavdekar, HP Aithal, AM Pawde, Tarunbir, Singh, K Pratap and T Singh, (2004). Incidence of urolithiasis: a retrospective study of five years. Indian J Anim Sci, 74: 175-177.

Aiello, E. S. (1998). The Mark Veterinary Manual, 8th edition, Merck and Co., Inc. Whitehouse station, N.J. U.S.A. pp: 1143-1155.

Blood, D.C.; Radostitis, O.M.; Gay, C.C. and Arunde, J.H. (2000). Diseases of the Urinary System. In: Veterinary Medicine, A text book of the diseases of Cattle, Sheep, Pigs, Goats and Horses, 9th edition. Bailliere Tindall Ltd. The University printing House, Oxford, 24-28 Oval Road, London NW 17 DX, pp. 493-499.

Buchholz N, El-Husseiny T, Moraitis K, (2010) Long-term follow-up of recurrentstone-formers BJU IntJan; 105[1]:1-2.

Craig, DR, Stephan M, Pankowski RL. Urolithiasis: A retrospective study in sheep and goats. J Am Vet Med Assoc 1987;190:1609.

Dubey,A., Pratap, K., Amarpal, Aithal, H.P., Kinjavdekar, P., Singh, T. and Sharma, M.C (2006) Tube Cystotomy and chemical dissolution of urethral calculi in goats. *Indian Joaurnal OfVeterinary Surgery*. 27[2]: 98-103.

Dusty*Vet Med*W*Assoc*. Nagy, (2009) Urolithiasis in small ruminants [Proceedings] CVC in Kansas City procedings.

Ewoldt JM, Anderson DE, Miesner MD, Saville WJ. Short- and Long- Term Outcome and Factors Predicting Survival After Surgical Tube Cystotomy for Treatment of Obstructive Urolithiasis in Small Ruminants. Veterinary Surgery 2006;35:417-422.

Fortier LA, Gregg AJ, Erb HN, and Fubini SL. Caprine Obstructive Urolithiasis: Requirement for 2nd Surgical Intervention and Mortality After Percutaneous Tube Cystostomy,

Surgical Tube Cystostomy, or Urinary Bladder Marsupialization. *Vet Surg* 2004; 33:661-667.

Gangwar, S.D., Pandey, N.N. and Celly, C.S. (1990) Clinico haematological profile of calves in experimental uraemia of post renal origin. *Indian Vet. J.* 67:645-648.

Gasthuys F, M Steenhaut, A De Moor and K Sercu, 1993. Surgical treatment of urethral obstruction due to urolithiasis in male cattle: a review of 85 cases. Vet Rec, 133: 522-526.

George JW, Hird DW, and George LW. Serum biochemical abnormalities in goats with uroliths: 107 cases (1992–2003). *J Am Vet Med Assoc* 2007;230:101–106.

GIBSON B. : Urethral obstruction in ruminants. *Ir. Vet. News*, 1984, September 11-12.

Halland SK, House JK, George LW. Urethroscopy and laser lithotripsy for the diagnosis and treatment of obstructive urolithiasis in goats and pot-bellied pigs. J Am Vet Med Assoc 2002;220:1831-1834.

Haven ML, Bowman KF, Englebert TA, Blikslager AT. Surgical management of urolithiasis in small ruminants. Cornell Vet 1993; 83:47-55.

HAY L. : Prevention and treatment of urolithiasis in sheep. *J. Vet. Postgraduate Clinical Studies*, 1990, 12, 87-91.

Hesse AT, HG Tiselius and R Siener, 2009. Urinary Stones, Diagnosis, Treatment and Prevention of Recurrence. 3 rd edn. Basel, S Karger AG ISBN 978-3-8055-9149-2.

Janke JJ, Osterstock JB, Washburn KE, et al. Use of Walpole's solution for treatment of goats with urolithiasis: 25 cases (2001-2006). *J Am Vet Med Assoc* 2009;234:249–252.

JENNINGS P.B. : The practice of Large Animal Surgery, 1233 pages, W.B. Saunders, Philadelphia, 1984.

Jones ML, Streeter RN, Goad CL. Use of dietary cation anion difference for control of urolithiasis risk factors in goats. *Am J Vet Res* 2009;70:149–155.

Kallfelz, F. A. (1987) Disease of urinary system. *Cornell Vet. (*77): 33.

Kalim MO, R Zaman and SK Tiwari, 2011. Surgical Management of Obstructive Urolithiasis in a male Cow calf. Vet World, 4: 213-214.

Kannan KVA and KE Lawrence, 2010. Obstructive urolithiasis in a Saanen goat in New Zealand, resulting in a ruptured bladder, New Zealand Vet J, 58: 269-271.

Kimeli P, AN Kipyegon and DN Karanja, 2014. Fatal obstructive urolithiasis in a 5 months old buck: a case report. Inter J Vet Sci, 3(1): 40-42.

Makhdoomi DM and MA Gazi, 2013. Obstructive urolithiasis in ruminants - A Rev Vet World, 6: 233-238.

MALLY K.V. and BOMMAIAH C : A modified surgical technique of urethrotomy as a palliative treatment of urolithiasis in bovines. *Mys. J Agric. Sci*, 1972, 6, 90-95.

Palmer JL, Dykes NL, Love K, Fubini SL. Contrast radiography of the lower urinary tract in the management of obstructive urolithiasis in small ruminants and swine. Veterinary Radiology & Ultrasound 1998;39:175-180.

Pearle MS, Asplin JR, Coe FL, Rodgers A, Worcester EM (2008). Medical management of urolithiasis. In: 2nd International consultation on Stone Disease, *Denstedt J,* Khoury S. eds. pp. 57-84.

Pugh DG, 2002. Sheep and Goat Medicine, 1 st Ed. Elsevier Publishing Co, Philadelphia, USA.

Radostitis OM, DC Blood, GC Gray and KW Hinchcliff, 2005. Veterinary Medicine a text book of the disease of cattle, sheep, pig, goat and horse. Bailliere Tindall, London, pp: 1877.

Samal L, AK Pattanaik, C Mishra, BR Maharana, LN Sarangi and RK Baithalu, 2011. Nutritional strategies to prevent urolithias is in animals. Vet World, 4: 142- 144.

Singh J and K Singh, 1990. Obstructive Urolithiasis and Uraemia in Cattle and Buffaloes. A Review. Indian J Vet Surg, 11: 1-20

Smith MC, Sherman DM. Urinary System. In: Cann CG ed, Goat Medicine. Philadelphia: Lea & Febiger,1994;398–402.

Smith, J.A. Divers, T.J and Lamp, T.N, (1989) Ruptured urinary bladder in a Post- parturient cow. *Cornell Vet*.73; 3- 12.

Straub M, Strohmaier WL, Berg W, (2012) Diagnosis and metaphylaxis of stone disease. *World J Urol* 2005 Nov; 23[5]:309-23.

Sutton RA, Wong NL, Dirks JH. Effects of metabolic acidosis and alkalosis on sodium and calcium transport in the dog kidney. Kindney Int 1979;15:520-533.

Tygi, R.P.S. and Singh, J. (1993). The urinary system. In: Ruminant Surgery, 1st edition. CBS publishers and distributors, Asia Printograph, Shahdara, Delhi-110032, PP:263-265.

Vanugopalan, A. (2000) Part 1-General surgery. Essentials of Veterinary Surgery. Eighth edition. 95-97.

Vengai Mavangira, Jennifer M. Cornish,John A. Angelos (2010), Effect of ammonium chloride supplementation on urine pH and urinary fractional excretion of electrolytes in goats *Journal of the American Veterinary Medical Association* , 237 (11): 1299-1304.

Wolf, J (2011) Nephrolithisais: Acute Renal Colic, Medscape. Drug and disease procedures, Dept. of Urology, University of Michigan.

Worcester EM, Coe FL (2010) Clinical practice. Calcium kidney stones. *NEngl JMed.* 363[10]:954- 63.