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## Clinical studies and Therapeutic management of various affections of udder and teat in goats

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### Abstract

Over all incidence of udder and teat affection were 66.67% (n=78) and 33.33% (n=30), respectively out of total 108 cases. Among the udder affections viz. mastitis was highest 38.46% followed by fibrosis of udder 11.11%, gangrenous mastitis 10.26%, oedema of udder 3.42%, equally wounds on udder and udder abscess 1.71%. While the teat affection, teat fistula was highest 16.67%, followed by teat obstruction 10.00%, equally growth on teat and teat laceration 3.33%. The age wise distribution of various affections 29.81%, of udder 26.49% and teat 13.33% in goats higher in 2-3 year age group followed by other age groups. The changes in physiological and haematological parameters at day '0' and 5<sup>th</sup> were also noted. The bacteriological isolates and antibiotics sensitivity revealed *Staphylococcus Spp.* (29.41%) were found sensitive to Enrofloxacin (75%), the mixed infection of *Staphylococcus Spp.* and *Streptococcus Spp.* (17.64%) to Enrofloxacin, Gentamicin and Amikacin (66.66%, each). *Pseudomonas Spp.* (11.76%) to Gentamicin (100%), *Escherichia coli* (11.76%) and *Klebsilla Spp.* (5.88%) to Enrofloxacin and Gentamicin (100%, each) and the *Bacillus cereus* (5.88%) to all antibiotics (100%) except Streptomycin and Ceftriaxone. Cases of mastitis treated according to antibiotic sensitivity test, udder flushed with 1% povidone iodine. Fibrosis of udders were treated with oral proteolytic enzyme preparations, intraparanchymal prednisone 1-2 ml, flushing of teat with diluted povidone iodine twice a day. Udder oedema treated with diuretic, antibiotics and corticosteroid along with application of ice packs. Surgical affection of udder managed by radical mastectomy by two techniques: in first technique (n=2) in which major blood vessels were first identified and double ligated, followed by conventional mastectomy. In second technique (n=2) conventional mastectomy was done. The technique one was advantageous by less duration of surgery, minimal bleeding and less chances of contamination. The teat obstructions managed by removal of obstructions and baby feeding tube were inserted for 3 days. The teat fistula repaired by three tier technique. The histopathological of tumours in two cases revealed myxomatosis and papilloma.

**Keywords:** Udder, teat, goat, therapeutic management

### Introduction

The udder is responsible for milk production and milk is an important source of income to the farmers. The quality and quantity of milk directly affected by various conditions of udder and teat of animals. The chronic suppurative mastitis, gangrenous mastitis and neoplastic or hyperplastic conditions of the udder, pendulous udder, udder abscesses and irreparable udder injuries in goats can be treated with radical mastectomy as a salvage procedure (Kumar *et al.*, 2019) [16]. By screening through the available literature, the diseases of udder and teats are well documented in cattle and buffalos but very little information is available in small ruminants. Any clinical affections of udder and teat causes great economic loss. Hence, it is essential for early and accurate diagnosis for clinical entity. The work on various affections of udder and teat in India is very merge. Thus, the present study aims to describes the treatment of affections of udder and teat in goats.

### Materials and Methods

The present study was carried out in 30 non-descript female Goats which were presented with udder and teat affections at Veterinary Clinical Complex (VCC), College of Veterinary Science & Animal Husbandry, Kamdhenu University, Anand (Gujarat) during the year January 2021 to December 2021. All the cases classified according to affections and subjected for details studies included the estimation of physiological and haematological parameters on day '0' and day 5<sup>th</sup>. The cases according to conditions, treated either medicinally based on antibiotic sensitivity findings or surgically by following standard surgical protocols and

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principles. The outcome of each and every cases were studied.

## Results and Discussion

### Incidence of various affections of udder and teat

Over all incidence of udder and teat affection were 66.67% (n=78) and 33.33% (n=30), respectively out of total 108 cases. Among all affections, the udder affections viz. mastitis were found to be highest 38.46% (n=45) followed by fibrosis of udder 11.11% (n=13), gangrenous mastitis 10.26% (n=12), oedema of udder 3.42% (n=4), wounds on udder 1.71% (n=2) and udder abscess 1.71% (n=2). While the incidence of teat affection, teat fistula was highest 16.67% (n=15), followed by teat obstruction 10.00% (n=9), growth on teat 3.33% (n=3) and teat laceration 3.33% (n=3).

The age wise distribution of various affections of udder and teat in goats revealed 2-3 year age group was found to be highly affected 39.81% (n=43) followed by 3-4 year age group 21.30% (n=23), 4-5 year age groups 13.89% (n=15), 1-2 year age group 15.74% (n=17) and above 5 year age group 9.26% (n=10). The incidence of udder affections were found to be highest 26.49% (n=31) in 2-3 year age group followed by 17.10% (n=20) in 3-4 year age group, 8.55% (n=10) in 4-5 year age group, 7.69% (n=9) in age groups of 1-2 and in above 5 years age group 6.84% (n=8). The incidence of teat affections, 13.33% (n=12) found to be highest in age group of 2-3 year followed by 8.89% (n=8) in 1-2 year age group, 5.56% (n=5) in 4-5 year age group, 3.33% (n=3) in 3-4 year age group and 2.22% (n=2) in above 5 year age group. Mbindyo *et al.* (2014)<sup>[19]</sup> reported higher rate of subclinical mastitis whereas Fasulkov *et al.* (2014)<sup>[9]</sup> and Kashyap *et al.* (2014)<sup>[14]</sup> reported lower rate of incidence of various affection udder but higher rate of incidence of teat affections compare to findings of the present study. The findings of the Andreasen *et al.* (2002)<sup>[2]</sup> are in agreement with the findings of the present study who reported in young age goat. The various affections, similar to the present study were also reported by Gautam *et al.* (2016)<sup>[11]</sup> and Jahangirbasha *et al.* (2016)<sup>[13]</sup> in middle aged goat whereas Monsang *et al.* (2014)<sup>[20]</sup> and Abubakar *et al.* (2020)<sup>[1]</sup> in old aged goats. Cable *et al.* (2004)<sup>[5]</sup> reported the affections of udder in age ranges from 1–10 years in Goats. Ashwani Kumar *et al.* (2012)<sup>[3]</sup> reported chronic suppurative mastitis in 10 years old goat in Ludhiana and Yadav *et al.* (2018)<sup>[25]</sup> reported acute gangrenous mastitis in a Goats while Kumar *et al.* (2019)<sup>[16]</sup> fibrosed gangrenous udder. Aziz and Kamal, (2018)<sup>[4]</sup> reported udder oedema in four year old pregnant doe. Kashyap *et al.* (2017)<sup>[15]</sup>, Kumar *et al.* (2020)<sup>[18]</sup> reported teat fistula in four year old Jamunapuri goat and two year old Sirohi goats, respectively and Ninu *et al.* (2021)<sup>[21]</sup> in four goats.

A total 30 animals were selected for the detail study for various affections of udder (n=20) viz. mastitis (n=6), udder fibrosis (n=6), gangrenous mastitis (n=4), udder wound (n=2), udder oedema (n=1), udder abscesses (n=1) and teat affections (n=10) viz. teat obstruction (n=4), teat fistula (n=3), teat tumor (n=2) and teat laceration (n=1) were included in the study for the detail investigations.

### Clinical symptoms wise incidence of affections of udder and teat in goats

The goats were categorized based on their symptoms exhibited and recorded during clinical examinations at the time of presentation. The major symptoms recorded during examinations and palpation of udder of goats affected with

mastitis (n=6) included decreased milk production in 83.3% (n=5), abnormal secretions such as clots, flakes, or discolored secretion in 66.6% (n=4) and painful, hot, red, hard and swollen udders; and simultaneously asymmetry of udder in 50% (n=3) cases. In all cases no any treatment given before presenting to Clinics. The goats affected with fibrosis of udder (n=6) exhibited hard, painless, cold, firm consistency with normal milk but less yield less milk yield recorded in 50% (n=3), complete stoppage of milk in 33.33% (n=2) and abnormal milk in 16.6% (n=1) were recorded whereas the gangrene of udder (n=4) was characterised by sudden onset, dark discolouration of udder in 75% (n=3) goats and oedema with progressive discolouration of the distal part of the udder with foul odour secretion in 50% (n=2) were observed. The goats presented with wounds on different area over the udder (n=2) was mostly caused by barbed fencing wire. Superficial and deep lacerations were recorded in 50% (n=1, each). One goat had pain, swelling and warm udder on palpation (50%, n=1) while other goat did not exhibit any symptoms whereas oedematous udder touching the ground, cold to touch, swollen udder and teat, soft in consistency, watery secretions from teat, bruises on teat seen on digital pressure. In multiple abscesses on udder exhibited painful subcutaneous fluctuating swellings in udder without any pain and warmth. In cases of teat obstructions (n=4) clinical signs were unsymmetrical right and left teat. The affected teat with distal obstruction particularly in streak canal teat orifice (n=1) was swollen with fluctuating fluid inside. Other teat obstructive cases (n=2) showed pain on palpation and thickened teat canal. The cases of teat fistula (n=3) presented with continuous dribbling of milk from fistula. All fistula were acquired due to barbed fencing wire. The teat fistula were on left teat in 66.66% (n=2) and right teat in 33.33% (n=1). In one goat thick granulated edges were seen due to case was presented after 1 week of injury. The teat lacerations (n=1) was superficial caused by fencing wire. There were no other symptoms exhibited by Goats. In one case there was tumour growth which was tennis ball shaped, attached to base of teat on caudal side by cord like structure, on applying digital pressure the growth was soft and painless having thick scaly dermatitis on epidermis of skin. In other goat with papillomatous cluster growth on teat skin, the growth was blackish on one teat. Almost similar observations were recorded by Danmallam *et al.* (2019)<sup>[7]</sup>, Fasulkov *et al.* (2014)<sup>[9]</sup> in acute mastitis, Monsang *et al.* (2014)<sup>[20]</sup> in chronic recurrent mastitis in a goat which did not respond to routine medicinal management. Kashyap *et al.* (2017)<sup>[15]</sup> and Ninu *et al.* (2021)<sup>[21]</sup> also reported teat fistula caused by barbed fancing wire and thorn.

### Physiological and hematological parameters of goats with udder and teat affections

The cases of goats affected with various affections of udder and teat (n=30) cover under present study were subjected for measurement of the physiological parameters, viz., rectal temperature (°F), pulse and respiration rates (per minute) and haematological parameters, viz., Haemoglobin (g/dl), Total Leukocyte Count ( $\times 10^3$ ), DLC and Packed Cell Volume (%) were measured on day '0' and on day 5<sup>th</sup>. The statistical analysis was done for comparison only in affections recorded in six goats while the estimation of mean  $\pm$  SE was made in the affections recorded in less than six and more than one animals. The mean rectal temperature of goats affected with mastitis varying significantly while in goats with udder fibrosis varying non-significantly and within normal range.

The mean rectal temperature for gangrenous mastitis cases were  $103.77 \pm 0.48$  on day '0' and  $101.57 \pm 0.53$  on day 5<sup>th</sup> showed decrease in temperature to normal range. The rectal temperature of a goat with udder oedema revealed  $99.00^{\circ}\text{F}$  on day '0' which was subnormal and  $101.3^{\circ}\text{F}$  on day 5<sup>th</sup>, respectively whereas  $103.7^{\circ}\text{F}$  in a goat with udder abscess which was higher and  $102.0^{\circ}\text{F}$  which was within normal limit on 5<sup>th</sup> day of treatment. While the mean rectal temperature of the goats affected with the udder wound cases and various teat affections were day '0' and day 5<sup>th</sup> was within normal range. The mean pulse rates of goats affected with mastitis and udder fibrosis varying non significantly and within normal range on both 0<sup>th</sup> and 5<sup>th</sup> day. The mean pulse rates for gangrenous mastitis cases were  $92 \pm 6.28$  on day '0' and  $75 \pm 5.33$  on day 5<sup>th</sup> where as for the goat affected with udder abscess was 59 on day '0' and 67 on day 5<sup>th</sup> day. The mean pulse rates were below normal range might be due to bacteraemia and toxemia which was came to normal on day 5<sup>th</sup> indicated the response of surgical management by radical mastectomy which reduced the bacterial load and ultimately reduce the toxemia. The mean pulse rate for remaining affections of udder and various affections of teat revealed the pulse rates were within normal range on day '0' and on day 5<sup>th</sup>. The mean respiration rates were recorded from the goats affected with mastitis and udder fibrosis varying non-significant and were within normal range. The mean respiratory rates of goats with udder wound revealed  $32.50 \pm 1.50$  on day '0' which was higher and  $28.00 \pm 1.00$  on day 5<sup>th</sup> became normal after treatment. The mean respiratory rates for the goats affected with remaining affections of udder were in normal range. Various affections of teat revealed the respiratory rates were within normal range except teat laceration 32 which was higher on day '0' and 27 on day 5<sup>th</sup> became normal after treatment. Similar observation reported by Ashwani Kumar *et al.* (2012)<sup>[3]</sup>, Monsang *et al.* (2014)<sup>[20]</sup> in a goat with mastitis, Jahangirbasha *et al.* (2016)<sup>[13]</sup> in fibrous gangrenous mastitis, Gautam *et al.* (2016)<sup>[11]</sup> in fibrosed udder, Aziz and Kamal, (2018)<sup>[4]</sup> in udder oedema and Kumar *et al.* (2020)<sup>[18]</sup> in a Goat with teat fistula. In contrary, elevated body temperature, heart rates and respiratory rates were recorded by Danmallam *et al.* (2019)<sup>[7]</sup> in goats with mastitis whereas Yadav *et al.* (2018)<sup>[25]</sup> reported dyspnoea in goats with gangrenous mastitis.

The mean haemoglobin concentration in goats affected with mastitis and udder fibrosis varying non-significantly and within normal range. The mean haemoglobin concentration in all goats affected with various udder and teat affection were within normal range. The mean total leucocytes count in goats affected with mastitis varying significantly and in cases of udder fibrosis varying non-significantly and higher than the normal values. In the goats affected with the various affections udder and teat which revealed total leucocytes count within normal range and declined manner. In contrary to the Low level of haemoglobin were observed by Cable *et al.* (2004)<sup>[5]</sup> in goats with various affections of udder. Ashwani Kumar *et al.* (2012)<sup>[3]</sup> and Monsang *et al.* (2014)<sup>[20]</sup> also reported low haemoglobin and normal total leukocyte count in chronic suppurative mastitis. The mean neutrophils (%) level in goats affected with mastitis varying significantly where as in goats with udder fibrosis varying non-significantly, and higher than the normal values. The mean values of goats affected with gangrenous mastitis and udder abscess were also higher than the normal values whereas for other affections value remain within normal limit. The

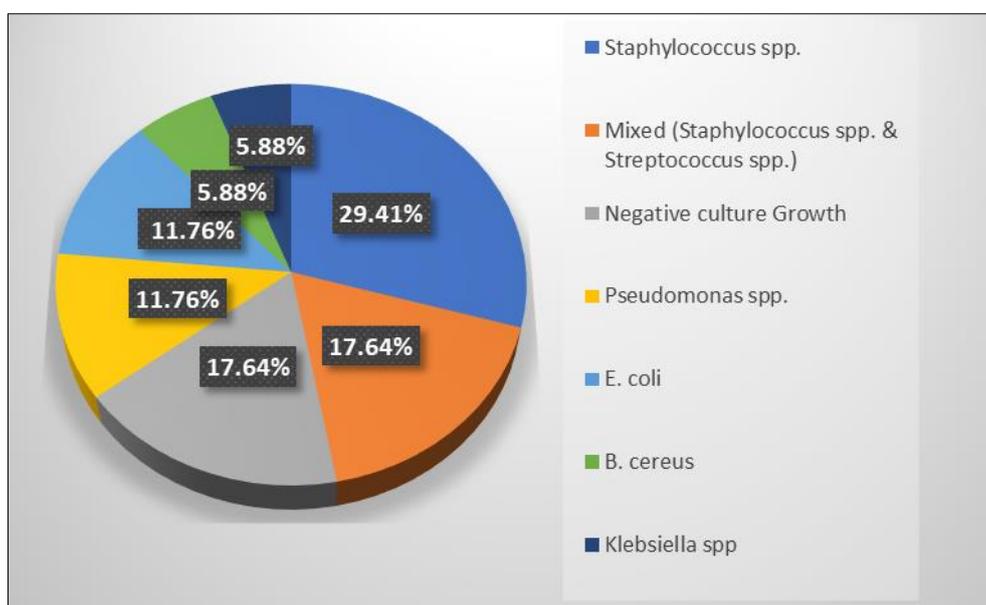
neutrophil level in goats affected with different teat affections revealed within normal range except in goats with teat fistula on day '0' which was came to normal on day 5<sup>th</sup>. The neutrophil level in goats affected with teat lacerations were within normal limits. Almost similar observations made by Ashwani Kumar *et al.* (2012)<sup>[3]</sup> and Monsang *et al.* (2014)<sup>[20]</sup> in chronic suppurative mastitis, Yadav *et al.* (2018)<sup>[25]</sup> in gangrenous mastitis. The mean lymphocytes (%) level in goats affected with mastitis varying significantly and lower than the normal values while in goats with udder fibrosis varying non-significantly and within normal values. The mean values of lymphocytes in goats for remaining affections were below the normal range. The mean values of lymphocytes in goats affected with teat obstructions and growth on teats were within normal range where as in goats with teat fistula lower than the normal values. The lymphocytes level in goat with teat laceration on day '0' was 53.90% which was in normal limit but 46.90% on day 5<sup>th</sup> which was lower than the normal values. The findings of the Garba *et al.* (2019)<sup>[10]</sup> reported the lower level lymphocytes count in mastitis does as compare to findings of the present study. The mean eosinophils (%) level found to be within normal range and varying non-significantly in the goats affected with mastitis and fibrosis of udder. The mean eosinophils (%) level in goats for remaining affections of udder and teat were also within normal range. The mean of monocyte (%) level in goats affected with mastitis and udder fibrosis were varying non-significantly and higher than the normal values. The mean value of monocyte (%) in goats with wounds on udder were higher than the normal values. The mean value of monocyte (%) in goats with gangrenous mastitis were found to be within normal range where as in goats with wounds on udder, udder oedema and teat fistula were higher than the normal values while for the remaining affections of udder and teat remain within normal limit. The mean packed cell volume (%) level revealed non-significant in goats affected with mastitis and lower than the normal values and within normal range in udder fibrosis. The mean packed cell volume in goats with gangrenous mastitis and wounds on udder, udder oedema, udder abscess and various teat affections found to be lower than the normal values. In the present study packed cell volume in various affections revealed within normal range. Similar observations made by Cable *et al.* (2004)<sup>[5]</sup> in goats affected with various affections of udder.

#### **Cultural isolation and antibiotics sensitivity test of milk and/or pus from affected goat**

The milk and/or pus samples collected aseptically from affected goats (n=17) affected with mastitis (n=6), gangrenous mastitis (n=4), udder abscess (n=1), teat fistula (n=1), teat laceration (n=1) and teat obstruction (n=4) were subjected for microbiological examinations for bacterial culture isolation and antibiotics sensitivity test which revealed *Staphylococcus* Spp. (29.41%, n=5) was found to highest followed by mixed infection of *Staphylococcus* Spp. and *Streptococcus* Spp. whereas negative for any growth (17.64%, n=3, each), equally *Pseudomonas* Spp. and *E. coli* (11.76%, n=2, each), equally *Bacillus cereus* and *Klebsilla* Spp. (5.88%, n=1, each) (Fig. 1). From the milk and/or pus samples from goats affected with mastitis, *Staphylococcus* Spp. (n=2) was found to be highest followed by Mixed infection of *Staphylococcus* Spp. and *Streptococcus* Spp. (n=2), equally *E. coli* Spp. and *Klebsilla* Spp. (n=1, each) were isolated. In cases of gangrenous mastitis highest bacterial isolate was

*Staphylococcus* Spp. (n=2) followed by equally mixed infection of *Staphylococcus* Spp. and *Streptococcus* Spp.; and *Pseudomonas* (n=1, each). *Staphylococcus* Spp. was isolated from the pus sample of goat affected with abscess in udder. The affections wise isolates revealed *E. coli* from teat fistula, and a goat affected with teat laceration revealed *Pseudomonas* Spp. and samples from the teat obstruction revealed negative for any growth from three milk samples and *Bacillus cereus* from one milk sample. In the present study *Staphylococcus* Spp. was found to be highest isolate from milk and/or pus samples of mastitis and gangrenous mastitis. The *Staphylococcus* Spp. were found to be sensitive to Enrofloxacin (75%) followed by Gentamicin, Ampicillin, Cefotaxime, Amoxicillin (50% each). The mixed infection of *Staphylococcus* Spp. and *Streptococcus* Spp. was highly sensitive to Enrofloxacin, Gentamicin and Amikacin (66.66% each). *Pseudomonas* Spp. were most sensitive to Gentamicin (100%) followed by Enrofloxacin and Streptomycin (50%, each). *Escherichia coli* and *Klebsilla* Spp. were found

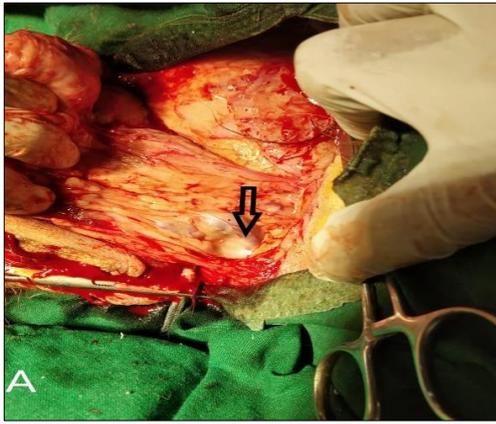
sensitive to Enrofloxacin and Gentamicin (100%, each) followed Amikacin (50%). The *Bacillus cereus* were highly sensitive to all antibiotics (100%) except Streptomycin and Ceftriaxone (Table 1). Similar findings reported by Virdis *et al.* (2010) [24] in mastitis, Mbindyo *et al.* (2014) [19] in mastitis whereas Ashwani Kumar *et al.*, (2012) [3] reported the negative for culture in goat with suppurative mastitis, Yadav *et al.* (2018) [25] in gangrenous mastitis, but in contrary they reported *E. coli* and *S. aureus* were found sensitive to only Ceftiaxone and Ciprofloxacin were found to be highly sensitive while Gentamycin was moderately sensitive and Amoxicillin was resistance. There are no comparable references available regarding bacterial culture and antibiotic sensitivity test, from the udder affections like udder abscess, teat fistula and teat obstruction in goats. The bacterial isolated were reported in present study might be due to delay presentation or contamination of affected site by any mean responsible for the proliferation of bacteria.



**Fig 1:** Distribution of bacterial isolates from milk and/or pus samples of affected goats

**Table 1:** Antibiotic sensitivity of bacterial isolates from milk and / or pus from affected goats

Antibiotics Isolates	<i>Staphylococcus</i> <i>spp.</i>	Mixed infection of <i>Staphylococcus spp. &amp;</i> <i>Streptococcus spp.</i>	<i>Pseudomonas spp.</i>	<i>E. coli</i>	<i>B. cereus</i>	<i>Klebsilla</i> <i>spp.</i>	Total
Amikacin	-	2 (66.66%)	0	1 (50.00%)		0	3 (21.42%)
Penicillin	-	-	0	0	1 (100%)	0	1 (7.14%)
Gentamicin	2 (50.00%)	2 (66.66%)	2 (100%)	2 (100%)	1 (100%)	1 (100%)	10 (71.42%)
Enrofloxacin	3 (75.00%)	2 (66.66%)	1 (50.00%)	2 (100%)	1 (100%)	1 (100%)	10 (71.42%)
Ampicillin	2 (50.00%)	-	-	-	1 (100%)	-	3 (21.42%)
Streptomycin	-	1 (33.33%)	1 (50.00%)	-	0	-	2 (14.28%)
Cefotaxime	2 (50.00%)	1 (33.33%)	-	-	1 (100%)	-	4 (28.57%)
Amoxicillin	2 (50.00%)	1 (33.33%)	-	-	1 (100%)	-	4 (28.57%)
Ceftriaxone	-	-	-	-	-	-	-



**Fig 2:** External pudendal artery



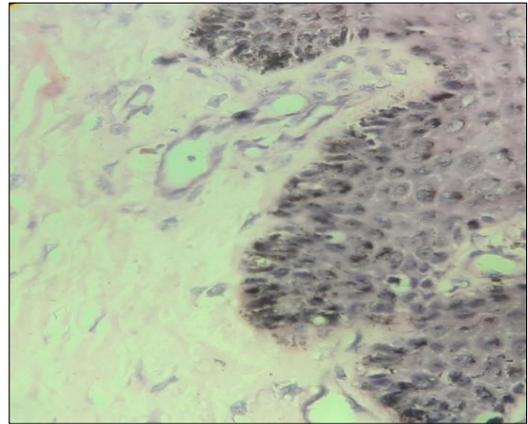
**Fig 3:** Superficial caudal epigastric vein



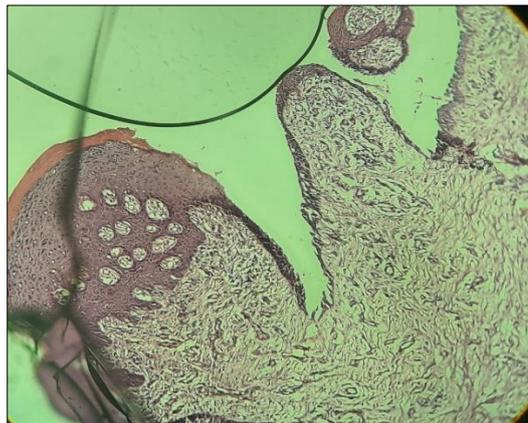
**Fig 4:** Amputated udder with multiple abscess



**Fig 5:** Amputated udder with gangrenous mastitis



**Fig 6:** Myxomatosis of mass on teat



**Fig 7:** Papilloma on teat

## Therapeutic Management

### Therapeutic Management of Udder Affections

In all cases of mastitis (n=6), gangrenous mastitis (n=4) and udder abscess (n=1) were treated based on cultural isolation and antibiotics sensitivity test. Inj. Enrofloxacin @ 5mg /kg BW IM was given on day of presentation followed by either Enrofloxacin @ 5mg /kg BW IM or Inj. Gentamicin 4 mg/kg BW IM depending upon antibiotics sensitivity test for five days along with Inj. Meloxicam @ 0.2 mg/kg BW IM as anti-inflammatory for three days. Pus flocs or any other abnormal secretion were drained with teat siphon and teat canal were flushed with 5% Povidone iodine after diluting with normal saline by inserting 12 Fr Ryle's tube attached to 50 ml syringe and given intra-mammary infusion medications. The owners were advised to drain the content from udder and teat frequently for the first three days. Follow-up information was obtained through telephonic conversations with owners. All cases responded well.

The cases of udder fibrosis in goats (n=6) were treated with Inj. Prednisone 1-2 ml intraparenchymal (Constable *et al.*, 2013)<sup>[6]</sup> and Inj. Enrofloxacin @ 5mg /kg BW IM along with flushing of udder and teat with diluted Povidone iodine solution with normal saline twice a day for five days along with oral proteolytic enzymes half bolus was given twice a day for 5 days. Out of six cases, four cases which were presented within week of parturition recovered well from clinical symptoms whereas remaining two cases with delayed presentation did not responded to medicinal management even after 10 days of medication. Owners of these goats were advised for mastectomy, but they did not agreed for surgical management.

In the present study the goats with mastitis were treated with antibiotics and anti-inflammatory medication along with intra-mammary infusion. Yang *et al.* (2019) [26] suggested that the main treatment of mastitis is commonly administration of intra-mammary infusion of an ointment or intramuscular or intravenous injection of antibiotics. However, the treatment is anticipated to become problematic in the near future to the rapid increase in antibiotic-resistant pathogens. As per Abubakar *et al.* (2020) [11] gangrenous mastitis in goats have poor prognosis as septicaemia can easily develop. Therefore, early treatment is key to the success of treatment and appropriate antibiotics based on culture sensitivity test should be used.

The goats presented with udder oedema were treated with Inj. Enrofloxacin @ 5mg /kg, Inj. Frusemide @ 1mg/kg/day and Inj. Dexamethasone @ 20 mg total dose IM for three days. The owner was also advised to use ice on affected udder. There was great improvement in this case on 5<sup>th</sup> day of presentation with reduction in watery discharge from udder and teat skin.

The cases of gangrenous udder (n=3) and udder with multiple abscess (n=1) in goats which were not responded to medicinal management, were subjected for the surgical therapeutics. For the radical mastectomy two surgical procedures were used. Among them, in first technique (n=2) major blood vessels were first identified and double ligated as described by El-Maghraby *et al.* (2001) [8] in goats through inguinal approach, then udders were amputated as per standard surgical procedure (Fig. 2 and 3). In second technique (n=2) the mastectomy was done by conventional surgical procedure (Fig. 4 and 5). The surgical technique first was found to be unique having advantages over the conventional mastectomy *Viz.* the duration of surgery were less, bleeding was minimal and contamination through blood circulation was less while compared to physiological mastectomy were no chance of sepsis and endotoxaemia so prevent the chances of systemic infections and toxemia. Post-operative Inj. Enrofloxacin @ 5mg /kg BW IM or Inj. Gentamicin @ 4 mg/kg BW IM depending upon antibiotics sensitivity test along with Inj. Meloxicam @ 0.2 mg/kg BW IM as an anti-inflammatory for five days. There was dehiscence of skin sutures was observed in one case on 2<sup>nd</sup> day of mastectomy. This case was managed by repetition of skin suture. All cases were recovered within fifteen days and ski stiches removed.

The radical mastectomy in goats were also performed by Monsang *et al.* (2014) [20], Gautam *et al.* (2016) [11], Jahangirbasha *et al.* (2016) [13], Kumar *et al.* (2019) [16] and Abubakar *et al.* (2020) [11] along with almost similar post-operative care with uneventful recovery. Cable *et al.* (2004) [5] also performed radical mastectomy in 20 ruminants ad stated that after radical mastectomy animals did well and this procedure was well tolerated which made animals more comfortable and prolonged their lives. The radical unilateral mastectomy as a salvage procedure can be a viable alternative to save the life of the goats with fibrosed and gangrenous udder and to retain lactation in the normal, unaffected udder quarter.

Two goats which were presented with wounds on udder were treated in routine manner with Povidone iodine (5%) along with Inj. Enrofloxacin @ 5mg /kg BW IM and Meloxicam 0.2 mg /kg BW IM for 5 days. There were no any complications observed and the wounds were healed within ten to twelve days.

### Therapeutic Management of Teat Affections in Goats

The goats with teat obstructions (n=4) were treated with help of teat opener, teat tumour extractor and mosquito artery forceps depending upon location of obstruction. After removal of obstruction the teat was lavage with normal saline and Ryle's feeding tube 12 Fr for three days. The owners were advised to remove cap of tube only at the time of milking.

Three goats were presented with teat fistula and a goat with deep teat laceration. The teat fistula in goats were repaired by three tier technique using 3-0 Vicryl (Polyglactin 910) and Nylon 3-0. In teat laceration debridement of edges were done and apposition of tissue layer was done properly. All the cases were repaired in lactation phase and skin sutures were removed after ten days to twelve days after complete healing. The post-operative management was followed similar to that of goats treated for teat fistula and lacerations. All goats recovered well without any complications. Almost similar therapeutic management carried out by Kashyap *et al.* (2017) [15] and Kumar *et al.* (2020) [18] who kept infant tube to maintain potency while in our cases daily lavage was carried by Rayle's tube. Ninu *et al.* (2021) [21] also treated teat fistula in four goats and also suggested to use of scalp vein, feeding tube or infusion tubes are mandatory to prevent accidental obliteration of the teat canal during suturing, suture dehiscence and pain resulting from milking during the post-operative period.

In the present study a goat presented with deep laceration so it was treated surgically by multiple layer suturing technique. Kumar *et al.* (2017) [17] also used similar pattern in a Holstein Friesian cow and Sreenu *et al.* (2014) [23] in a cow.

The goats (n=2) were presented with growth on teat. Among them one goat with pediculate tumorous growth attached to left teat base at caudal side which was connected by thick fibrous cord, the removal of this ball shaped growth along with cord without entry into teat after proper ligation of vessels over the growth. The muscular layer was apposed by 3-0 vicryl (polyglactin 910) by continuous suture pattern and skin suture done with nylon 3-0 by interrupted suture pattern. In other goat there was papilloma on skin, the affected edges and tissues along with papilloma were removed and repaired by three tier technique. There were no any complications observed and skin suture were removed after 12<sup>th</sup> days after healing.

### Histopathological Examination of growth on teats

The histopathological investigation was carried in two goats, the growth attached to the teat and a papillomatous growth around chronic teat fistula. Histological the growth attached to teat was myxomatous tissue with mild to moderate oedema covered by thick horny skin layer (Fig. 6) and the papilloma growth on teat skin was hyperplastic growth of basal layer with excessive melanosis was noticed with marked increasing of keratin layer (Fig. 7). In contrary to findings of the present study other types of tumours were observed by Andreasen *et al.* (2000b) [2] reported fibroepithelial hyperplasia in goats whereas Gulbahar *et al.* (2007) [12] reported fibroedina and Fasulkov *et al.* (2014) [9] mammary gland induration.

### Conclusions

The incidence of the udder affections found higher than the teat affections in goats. Among affections of the udder mastitis was reported highest and teat fistula was found to be highest among the teat affections. The distribution of overall

affections of udder and teat in goats reported highest in 2-3 year age group. *Staphylococcus* Spp. was found highest isolated organism among infections of udder and teat. Most of bacterial isolates were sensitive to Enrofloxacin followed by Gentamicin. Use of proteolytic enzyme preparations along with local infiltration of steroids and flushing with diluted povidone iodine in early stage of mammary gland fibrosis helps to resolve it completely. Advanced double ligated of vessels of mammary gland during mastectomy have advantages over conventional mastectomy techniques.

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