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ULTRASONOGRAPHIC STUDIES OF MAMMARY GLAND AFFECTIONS IN GIR COWS

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ABSTRACT

The present study entitled "Ultrasonographic studies of mammary gland affections in Gir cows" was conducted to establish technique of ultrasonography for diagnosis of mammary gland affections in Gir cows. The present clinical study was conducted on 100 Gir cows presented to Department of Veterinary Surgery and Radiology, COVSAH, KU, Junagadh during study period. In present clinical work mammary gland affections i.e., involvement of single teat affections were highest (46.51%), followed by double teat (25.58%), four teat (18.60%) and triple teat (6.97%). Teat obstruction contributed for the highest number of cases (42) followed by mastitis (33), udder fibrosis (15), udder abscess (06), and teat fistula (04). In Gir cows, the majority of milk flow problems occurred between the ages of 3-6 years followed by 6 years and above. The present study revealed that the average number of lactation or parity of the bovines were 2.94±0.23. In Gir cow, milk flow disorders were most common during the second parity, followed by third parity. The average milk yield of the different groups studied was 12.50±1.72 Kgs. The highest milk yield was recorded in group II (teat fistula) was 21.15±2.85 Kg. In group V (udder fibrosis) milk yield was nil and group Id (complete teat obstruction) had the lowest milk yield of 2.06±1.20 Kg.

KEYWORDS: Gir cow, Ultrasonography, Udder.

INTRODUCTION

Udder health is essential in dairy farming, as it is the framework for cost-effective and hygienic dairy production. Prophylactic procedures are just as critical as therapeutic procedures in the dairy industry (Kotb *et al.*, 2020). In the sector of udder health, milk flow disorders are a big concern. They cause various forms of mastitis, which results in a decline in milk production, negative changes in milk components and raw milk quality, increased costs for animal care, early culling of dairy cows and as a result, a negative economic effect (Amin *et al.*, 2017). As a consequence, in animals with udder diseases, a simple and reliable diagnosis and prognosis is necessary, and requires the use of state of the art examination techniques and therapeutic treatments (Kuru *et al.*, 2019).

Evidence-based treatment requires the use of diagnostic imaging. It allows for the visualisation of the mammary gland's internal structure as well as disease interpretation (Martin *et al.*, 2018). Radiography, ultrasonography, computed tomography, and magnetic resonance imaging are all examples of diagnostic imaging. Due to availability, expense and expertise, diagnostic imaging may be limited. Despite global developments in diagnostic imaging, radiography continues to be the most frequently used technique in developing countries such as India (Ragab *et al.*, 2016). The identification of soft tissue masses is limited when radiography is used as the sole imaging technique (Hayward and Currie, 2006). In addition, the technique is insufficient for detecting masses surrounded by fluid. Ultrasonography is recommended as a supporting technique in such situations. Ultrasonography is a diagnostic imaging technique that produces images by using sound waves with frequencies greater than 20,000 Hz. It accomplishes this by the use of a transducer (probe) that generates sound waves and receives their reflected echos (Chandak *et al.*, 2011). Ultrasound is the most commonly used and rapidly growing of all sectional imaging methods today, and it also allows for a huge proportion of many radiology departments' workload. Anatomical imaging, blood-flow assessment, and examination of macro and micro vasculature of deep and superficial organs are all done with it (Dar *et al.*, 2014). In order to understand how ultrasound is produced and an image is created, two

basic concepts must be understood. The piezoelectric effect, which explains how ultrasound is generated by ceramic crystals in the transducer, is the first (Santos *et al.,* 2015). An electric current is applied to the crystals by passing through a cable to the transducer, causing them to deform and vibrate. The ultrasound beam is generated by this vibration. The crystals in the transducer decide the frequency of the ultrasound waves emitted (Streeter and Step, 2007). The pulse-echo theory, which describes how the image is produced, is the second main principle. Since the same crystals are used to produce and absorb sound waves, they can't do it at the same time, ultrasound waves are emitted in pulses rather than continuously. The ultrasound beam reaches the patient in the time between pulses and is bounced or transmitted back to the transducer. These echoed sound waves cause the transducer's crystals to move and generate an electrical signal, which is then transformed into an image shown on the monitor. Just 1% of the time does the transducer emit ultrasound; the remainder of the time is spent receiving the returned echoes (Pierson *et al.,* 1988).

Diagnostic ultrasound has become increasingly popular among veterinarians as ultrasound instruments have become smaller, less expensive, and easier to use. The use of ultrasound imaging has confirmed or supplemented a large number of radiographic procedures, as well as opened up new diagnostic avenues (Wells *et al*., 1995).

Ultrasound transducers are generally in the 2 to 10 MHz range, with 3.5, 5, and 7.5 MHz probes being the most common in large animal general practitioners. The energy of the sound wave generated by the transducer is lost along its direction. Absorption and scatter are the two most common sources of sound wave loss. High-frequency sound waves lose (attenuate) more quickly than low-frequency waves. As a result, high-frequency transducers (7.5 MHz) provide good detail but limited tissue penetration; low-frequency transducers, on the other hand, provide deeper penetration but weaken detail (Szabo and Lewin, 2013).

Simple linear array, convex linear array, sector scanner, phased array, and annular array are all examples of ultrasound transducers. Because of their versatility, simple and convex linear array transducers are most widely used in large animal practice. The relatively large footprint (surface area for patient contact), which becomes problematic in narrow areas such as the intercostal zone, and the reduced penetration depth compared to other technologies are their major drawbacks. For regular ultrasound tests, the authors' clinical service almost exclusively uses simple and convex linear transducers (Rajamahendran *et al.,* 1994).

Ultrasonography (USG) is a technique for detecting morphological anomalies in the mammary gland's canals, sinuses, and glandular tissue (Twardon *et al.,* 2001). Obstructions of the teat and udder cistern, both congenital and acquired, are typical causes of milk flow problems in cattle (Dinc *et al.,* 2000). Inflammation, mucosal lesions, tissue expansion, foreign bodies, milk stones, congenital changes, hematoma, and abscess are all abnormal udder changes that can be diagnosed with USG. In cattle, linear-array transducers with frequency ranges of 5.0 MHz, 7.5 MHz, and 10 MHz are most widely used to perform ultrasound examinations (Szencziová and Strapak, 2012).

The veterinary remove scarcity of comprehensive literature about ultrasonographic findings in both normal and diseased cow. Thus, the current studies describe the current practical applications and prospect of ultrasonography as a diagnostic imaging technique for the evaluation of different physiological and pathological conditions in udder and teat of the Gir cows.

MATERIALS AND METHODS

The current research "Ultrasonographic studies of mammary gland affections in Gir cows" was conducted on 100 Gir cows of various age groups at the department of veterinary surgery and radiology, College of Veterinary Science and Animal Husbandry, Kamdhenu University, Junagadh during year 2021. The collection of patient data, clinical examinations as well as ultrasonographic examinations was performed in Gir cows presented at the Department of Veterinary Surgery and Radiology and Department of Teaching Veterinary Clinical Complex, College of Veterinary Science and Animal Husbandry, Kamdhenu University, Junagadh. A total of 100 Gir cows with mammary gland disease were screened and divided in different five groups. A total of 12 Gir cows with clinical signs of mammary gland affections were chosen. was performed.

Ultrasonography of udder and teat

Complete history pertaining to age, post calving period and average milk production was recorded in the evolved Performa prior to the ultrasonography in all animals. A detailed examination of udder and teat was performed in all animals using ultrasonography.

Clinical evaluation of udder and teat

Prior to ultrasonography, all the animals underwent detailed clinical evaluation as given below.

History

Age, lactation stage, day postpartum and average milk yield, time between first noticing symptoms and referral to the clinic, and pretreatment regimen, if any, were all reported.

Clinical examination

Visual inspection of the affected teat and quarter involved looking for swelling of the udder and teat, discomfort on contact, and hardness of the udder and teat. The bovine's four quarters were visually and physically examined.

By extracting a few squirts of milk from each teat and rolling each teat between fingers to determine any pain elicited as well as the position and size of any obstructive tissue present, the gland and teat were fully palpated.

Hematological parameters
Two milliliters of blood was drawn from each infected animal's jugular vein and transferred to K_3EDTA vials for analysis of various haematological parameters viz Hemoglobin (HB) (g/dll), Packed Cell Volume (PCV) (%), Total Erythrocyte Count (TEC) (10^6/ µL), Total Leukocyte Counts (TLC) (10^3/ µL), Differential Leukocyte Counts (DLC) (%) were evaluated by blood auto analyzer of Diatron health care (Abacus junior vet 5).

Trypsin Inhibitor Spot Test (TIST)
For TIST, 20 µl fresh blood was collected and placed on the undeveloped X-ray film strip (2.5 cm x 2.5 cm). A similar amount of trypsin (20 µl) solution (8 mg/ml) was added and thoroughly combined. The strip was then allowed to stay at room temperature for 10 minutes followed by washing under running tap water and dried. The absence of digestion of the gelatin coat of the x-ray film suggested a positive test, while the presence of digestion indicated a negative event.

Ultrasonographic Evaluation
The results of ultrasonography of the udder and teat in affected animals were reported. The animals were subjected to ultrasonography without sedation after proper physical restraint.

Instrumentation
The ultrasound system e-Saote with multi frequency probes is available at the Department of Veterinary Surgery and Radiology, College of Veterinary Science and Animal Husbandry, Kamdhenu University. Ultrasonographic studies were done with this system. To ensure proper skin and transducer touch, sterile ultrasound coupling gel was used.

Techniques (Rambabu *et al*., 2008)
The surface of the linear transducer with coupling gel was mounted directly on the skin surface of the teat and udder in the contact gel technique. In water bath technique, the teat was embedded in a small plastic jar (decapped disposable usual saline plastic bottle) or container filled with water, and the probe with the gel was applied to the container's external surface.

Ultrasonography of udder
Using two-dimensional, grey scales, B-mode ultrasound unit, the normal Gir cow's udder was scanned to determine its ultrasonographic anatomy, while the affected Gir cow's udder was scanned similarly to arrive at a diagnosis.

Preparation of site and positioning
The animals were restrained in a travis and the hind and forelegs were covered with a rope for Ultrasonographic examination of cow udder. Shaving and thorough cleaning of the area with diluted potassium permanganate solution were used to prepare the site.

Ultrasonographic evaluation of udder
The contact gel application with a 3.5 or 5 MHz frequency probe by direct contact of the probe on the udder skin was the primary method of ultrasound analysis of the mammary gland parenchyma in animals. The probe was mounted on the caudal surface of each half along its longitudinal axis and rotated upward and downward to scan the entire udder (Flock and Winter, 2006). The probe was positioned with an 80^0 scanning angle cranially just above the teat insertion to examine the gland cistern (Ayadi *et al.,* 2003). The probe was mounted on the dorsal and lateral to the caudal aspect of the udder halves to examine supramammary lymph nodes (Hussein *et al.,* 2015).

Ultrasonography of teat
Using two-dimensional, grey scales, B-mode Ultrasonography device, bovine teats were scanned ultrasonographically. Various systems of common and affected bovine teats were photographed in the United States.

Preparation of site and positioning
The animals were restrained in a travis, and the teats were shaved and cleaned with potassium permanganate solution to prepare the site.

Ultrasonographic evaluation of teat
After immersing the teat in a water-filled plastic container, the probe was applied sagittally, beginning at the distal end and working its way to the gland's lactiferous sinus. The probe was also used transversely, at a 90 degree angle to the teat, to observe transverse teat bits (Rambabu *et al.,* 2008).

The normal and abnormal echogenicity of the various structures were determined using sonography. The teat's ultrasonographic appearance was reported and compared to its usual appearance using two-dimensional grey scale B-mode ultrasound at different frequencies (3.5-5 MHz). Teats of bovines suffering from affections were also scanned to investigate the anomaly.

RESULTS

The current research was carried out at the Department of Veterinary Surgery and Radiology, College of Veterinary Science and Animal Husbandry, Junagadh, Kamdhenu University, Gandhinagar. In Gir cows presented at the university clinic, patient data was collected and ultrasonographic examinations were performed. During the given work period, a total of 100 Gir cows were clinically examined, out of that 12 Gir cows were selected which exhibit the clinical signs of

various mammary gland affections. The total number of cases is mentioned in this chapter, along with their age, pathological conditions, ultrasonographic interpretation, and clinic-physiological and haematological records.

Table no. 1: Distribution of milk flow disorders in bovine.

Group	Affections			Animals	
				Cows (n=100)	Teats (n=83)
I	Teat Obstruction (n=42)	Ia	Obstruction at the tip of the teat	14	16
		Ib	Obstruction at the middle of the teat	11	15
		Ic	Obstruction at the base of the teat	09	22
		Id	Full teat fibrosis	8	30
II	Teat Fistula			4	4
III	Mastitis			33	0
IV	Udder Abscess			6	0
V	Udder Fibrosis			15	0

Table No. 2: Occurrence of teat affections in cows and buffaloes.

Number of teats affected	Cows (n= 43)
One	46.51% (n=20)
Two	25.58% (n=11)
Three	6.97% (n=3)
Four	18.60% (n=8)

In present study cows, single teat affections were highest (20, 46.51%), followed by double teat involvement (11, 25.58%), followed by four teats involvement (8, 18.60%) while four teats were involved in 3 cases (3, 6.97%). Out of all the affections presented during the course of present study, obstructive lesions contributed for the highest number (n=42) followed by mastitis (n= 33), udder fibrosis (n=15) udder abscess (n= 6) and teat fistula (n=4)

Age

In this research, ultrasound was performed on all 100 Gir cows, and the most affected age group suffering from mammary gland pathologies was between 3 and 6 years of age 51 (51%) accompanied by 6 and above years of age 37 (37%) and 0-3 years of age 12 (12%).

Table no. 3: Age wise distribution of 100 cases of Gir cows.

Sr. No.	Age group	Total Cases (n= No.)	Percentage (%)
1	0 – 3 Year	12	12
2	3 – 6 Year	51	51
3	6 Year and above	37	37
4	**Total**	**100**	**100**

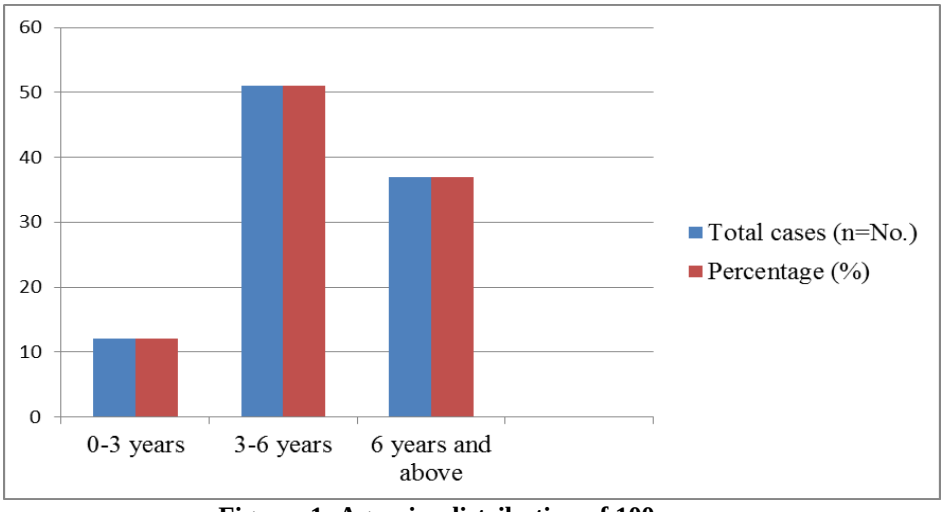


Fig. no. 1 Age wise distribution of 100 cases.

As shown in Table 3, Fig.1, the majority of milk flow disorders in cows occurred between the ages of 3-6 years followed by 6 years and above group. The average age of the bovine in the present study was 5.31±0.19 years.

Table No. 4: Mean ± Standard Error of Age (Years) of animals belonging to various groups.

Sr. No.	Group	Age (Years)
Ia	Obstruction at the tip of the teat	3.81±0.49
Ib	Obstruction at the middle of the teat	4.78±0.32
Ic	Obstruction at the base of the teat	5.11±0.49
Id	Full teat fibrosis	5.35±0.22
II	Teat Fistula	3.85±0.40
III	Mastitis	6.11±0.30
IV	Udder Abscess	5.78±0.49
V	Udder Fibrosis	6.32±0.30

Parity

Present study indicate that most affected parity group of Gir cows suffering from mammary gland affections was between 0 and 2 parity 41 (41%) accompanied by 2 and 4 parity 28 (28%), 4 and 6 25 (25%) and 6 and 8 parity 06 (06%). (Table no.5: Fig. no.2).

Table no. 5: Parity wise incidence of 100 cases.

Sr. No.	Parity	Total Cases (n= No.)	Percentage (%)
1	0-2	41	41
2	2-4	28	28
3	4-6	25	25
4	6-8	06	06
5	**Total**	**100**	**100**

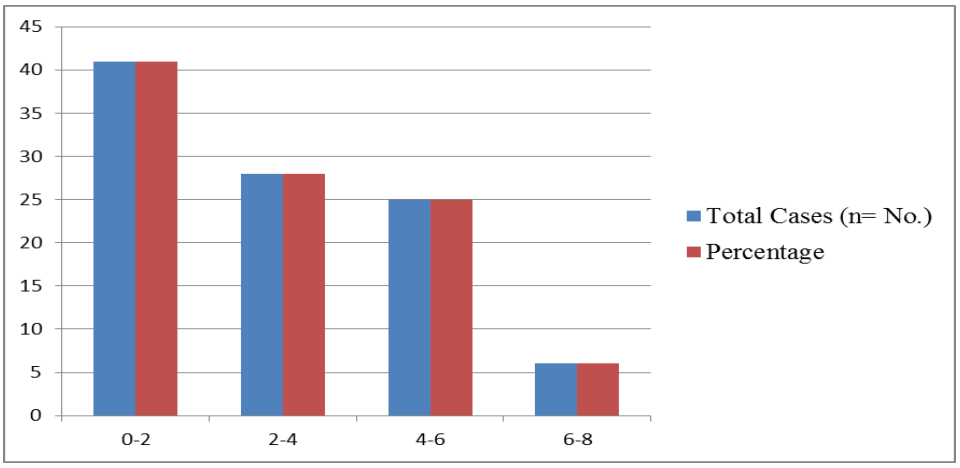


Fig. no. 2 Parity wise distribution of 100 cases.

In Gir cow, milk flow disorders were most common during the second parity, followed by third parity, as shown in Table No.6 and Fig.3.

Table No. 6: Mean ± Standard Error of number of lactation or parity of animals belonging to various groups.

Sr. No.	Group	Parity
Ia	Obstruction at the tip of the teat	2.14±0.25
Ib	Obstruction at the middle of the teat	2.78±0.15
Ic	Obstruction at the base of the teat	2.63±0.26
Id	Full teat fibrosis	2.89±0.19
II	Teat Fistula	2.08±0.29
III	Mastitis	3.74±0.27
IV	Udder Abscess	3.78±0.49
V	Udder Fibrosis	3.50±0.50

Milk Yield

The average milk yield of the different cow groups studied was 12.50±1.72 (Kgs). As shown in Table No.7 and Fig. No.4. The highest milk yield was recorded in group Ie teat fistula (21.15±2.85 Kgs). This means that animals with high milk yields are more susceptible to milk flow problems like teat fistula and leaky teats. This may be due to the udder's large and pendulous scale in high-yielding animals. Group V udder fibrosis (0.00±0.00 Kgs) and group Id complete teat obstruction (2.06±1.20 Kgs) had the lowest milk yields. The milk yield in group V was zero due to complete udder fibrosis. Since one or more teats is totally obstructed in groups Ia obstruction at the tip of the teat, Ib obstruction in the centre of the teat and Ic obstruction at the base of the teat, milk yield was comparatively low.

Table 7: Mean ± Standard Error of Milk Yield (Kgs) of animals belonging to various groups.

Sr. No.	Group	Milk yield
Ia	Obstruction at the tip of the teat	13.07±2.26
Ib	Obstruction at the middle of the teat	15.44±2.19
Ic	Obstruction at the base of the teat	12.25±2.19
Id	Full teat fibrosis	2.89±0.19
II	Teat Fistula	21.15±2.85
III	Mastitis	11.25±2.19
IV	Udder Abscess	5.78±0.49
V	Udder Fibrosis	0.00±0.00

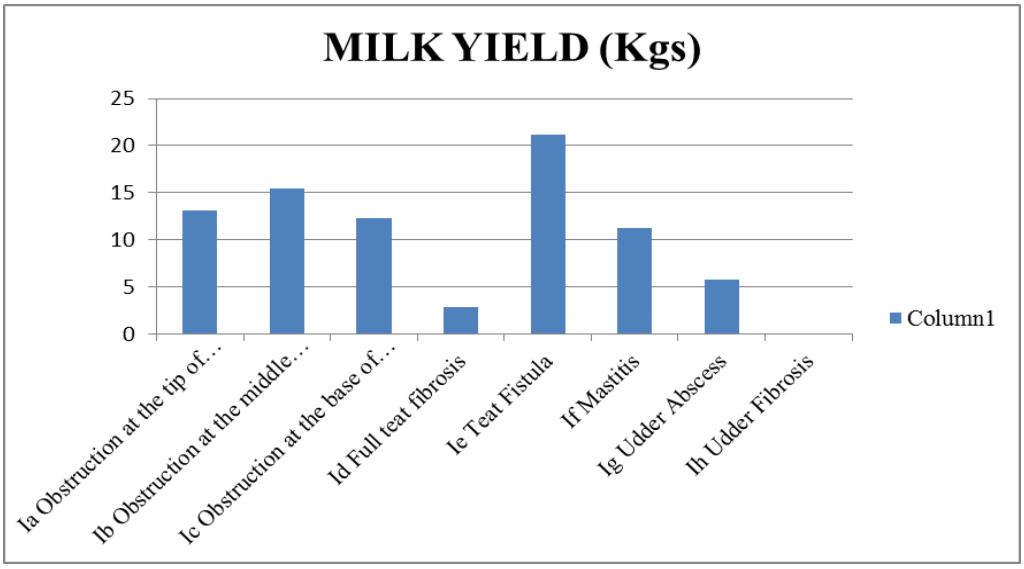


Fig. No. 5 Milk Yield (Kgs) of animals belonging to various groups.

Physical examination

Type and level of obstruction

The type and level of obstruction in clinical cases of teat affection were assessed. The obstruction was assessed to see if it was partial or complete. The degree of obstruction was measured at the teat top, centre, base, and entire teat.

Table No. 8: Type of teat obstruction.

Type of obstruction	No. of cases	Percentage
Partial	23	54.76
Complete	19	45.24

Partially obstructed teats accounted for 54.76 percent of the obstruction cases in 42 animals, compared to fully obstructed teats (45.24 percent) (Table No., Fig. No. 6).

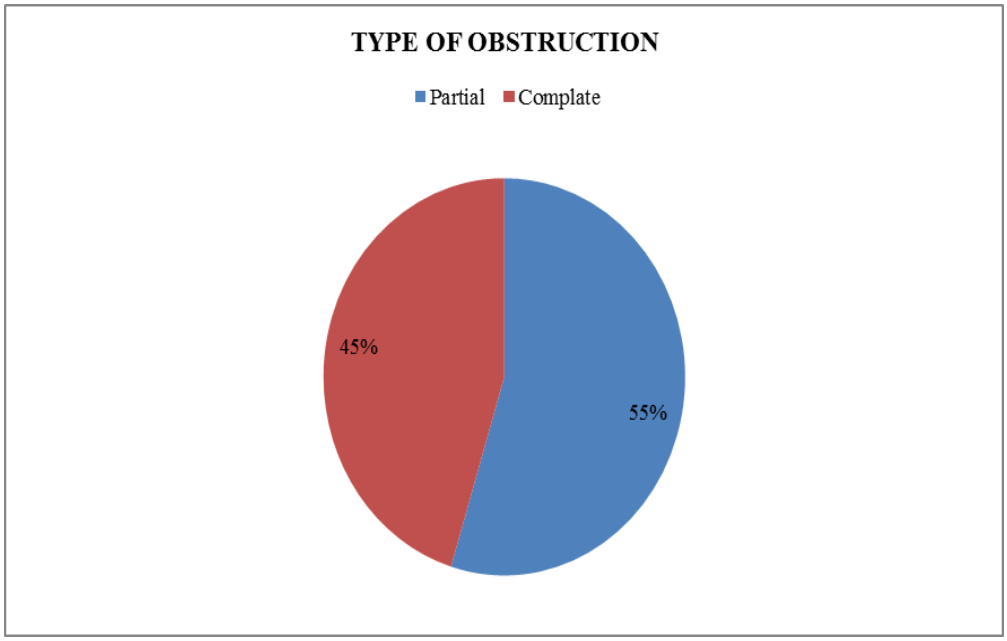


Fig. No. 6 Type of teat obstruction.

Table No.9 and Fig. 7 show the affections according to the level of teat obstruction.

Table No. 9: level of teat obstruction.

Level of teat obstruction	Number of cases	Percentage
Tip	14	33.33
Middle	11	26.19
Base	09	21.42
Full teat	08	19.04

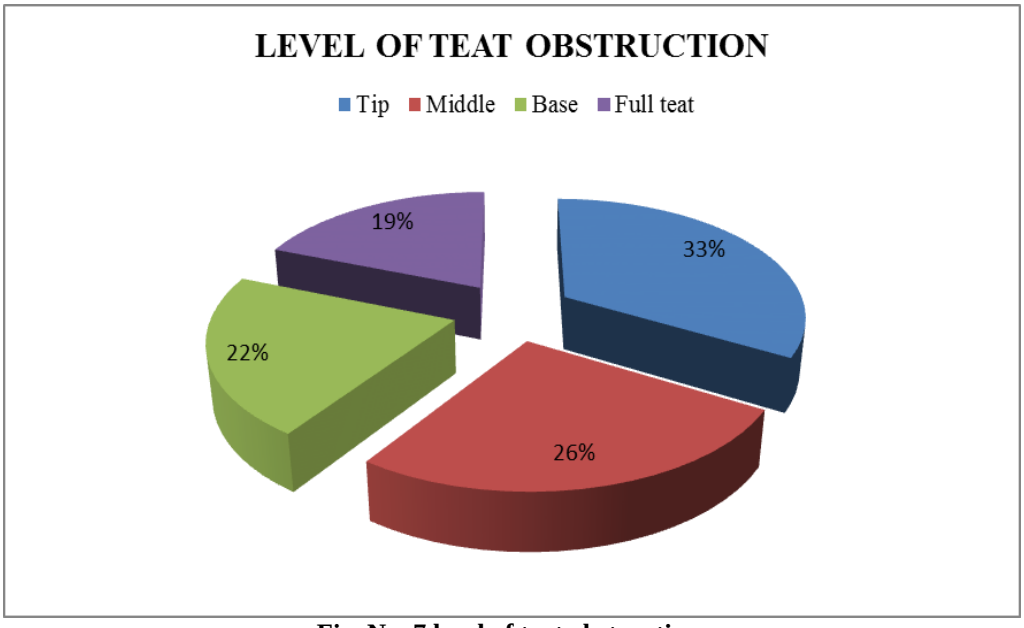


Fig. No. 7 level of teat obstruction.

In this analysis, 33.33% of teats were obstructed at the tip or teat canal, 26.19% in the middle, 21.42% at the base, and 19.04% were obstructed throughout the teat or teat cistern.

Pain

Table No.10 and Fig. No.8 shows the presence or absence of pain when touching the affected teat in different cases of milk flow disorders.

Table No. 10: Pain to touch at teat.

Pain to touch	Numbers of animals	Percentage
Present	30	37.97%
Absent	49	62.03%

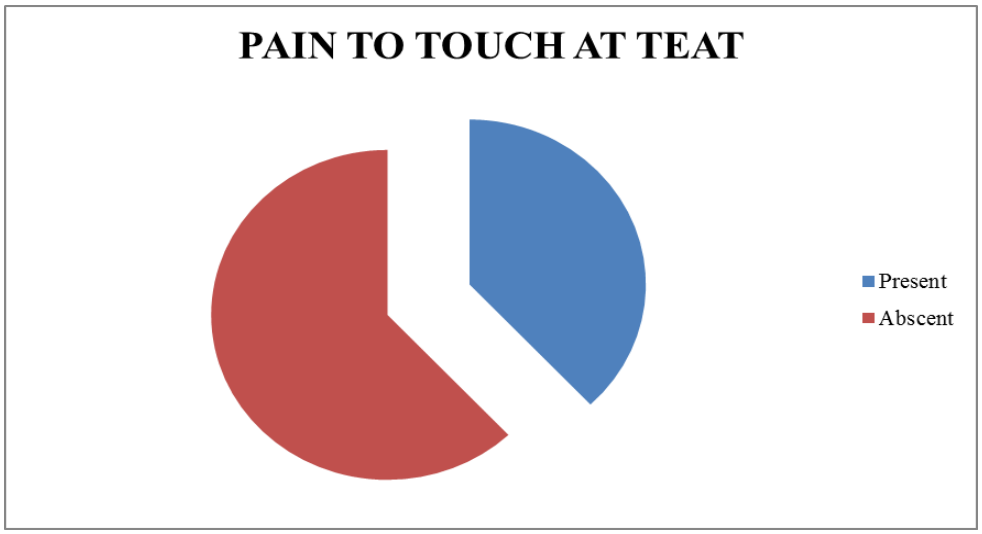


Fig. No. 8: Pain to touch at teat.

Pain to touch the affected teat was noted only in cases of trauma or complete obstruction. Severe pain was reported in early cases of teat fistula and blind quarters. This could be due to the engorgement of teats in cases of complete obstruction where pain was felt on touching.

Palpation

During the analysis, all of the cases with milk flow disorders had their teats and udders palpated to detect any abnormality or affection.

The presence of any localised growth/nodule or diffused fibrosis/growth was palpated by rolling the teat between the thumb and index finger.

The findings are represented in Table No. 11 and Fig. No. 9.

Table No. 11: Findings of palpation of teats.

Findings	Number of animals	Percentage
Localized growth or nodule	34	34%
Diffused fibrosis or growth	29	29%
None	37	37%

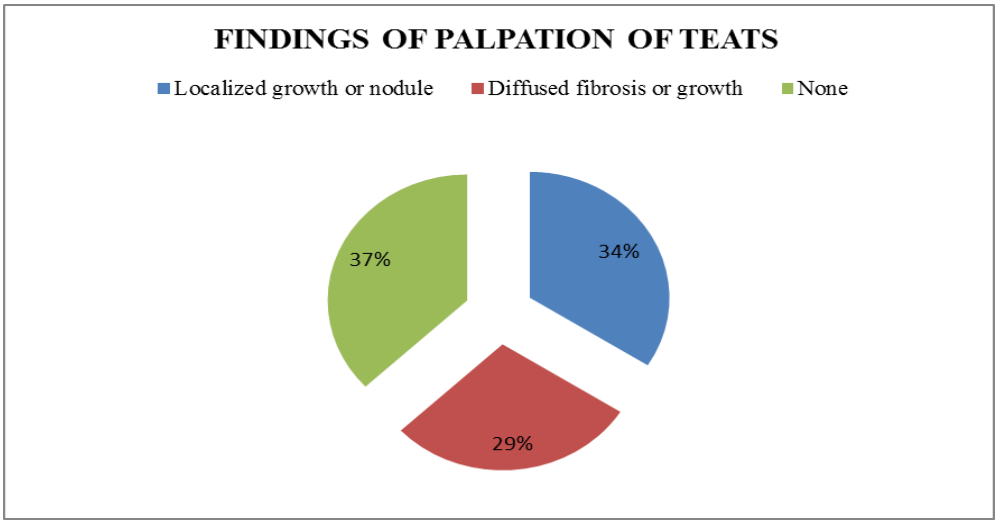


Fig. No. 9 Findings of palpation of teats.

In 14 cases of group Ia obstruction at the teat tip, a localized growth or nodule was 8palpated. By palpating the region of the rosette of Furstenberg and teat canal, only cases with chronic obstructions or those handled previously at the field level were found to be affected. This may be due to the fact that in chronic cases, fibrosis of the teat canal develops, which is easily palpable. Localized growth or nodule was palpated in group Ib obstruction at the centre of the teat and group Ic obstruction at the base of the teat. This may be due to the intimacy being localised at a single stage, as well as the soft texture of the teat in these regions. Only in group Id complete teat obstruction was diffuse fibrosis or development palpable. This may be because a hard fibrotic mass involving the entire teat was readily palpable against the teat skin's delicate texture in the teat. As a result, palpation of teats was found to be very effective in diagnosing the position of the lesion in the current research. It also assisted in determining whether the lesion was diffused or localised.

Clinicophysiological examination of selected animals affected by various mammary gland affections

In present study, clinic-physiological examination was performed in 12 Gir cows. The diverse affection diagnosed ultrasonographically in Gir cows were Teat Spider, Teat tumour, Udder Gangrene, Clinical Mastitis, Gangrenous Mastitis, Teat Pea, Udder Abscess, Udder Fibrosis, Teat Fibrosis, Thelitis, Teat Fistula, Mammary Gland Necrosis. These Gir cows were treated according to suitable protocols. In present study highest rectal temperature was seen in case of clinical mastitis which was 102.5^{o}F. In other mammary gland affections it was recorded as a normal. Other clinical parameters like heart rate and respiration rate was in normal range. In the present study, the average mean value of heart rate, respiration rate and rectal temperature was recorded as 62.70±1.78 (beats per minute), 41.27±1.86 (per minute) and 101.46±0.11 (˚F) respectively. No significant changes were found in these values in cases of various groups.

Hematological examination

Regardless of the form of affections, all of the animals' haematological findings, such as Hb, TLC, and DLC, were reported on the day of presentation to the university clinics. In the present study, most of the haematological parameters were within the normal physiological range. In case of mastitis it was recorded highest.

Trypsin Inhibitor Spot Test (TIST)

Table no.12 shows TIST result which show positive test in case of infectious causes and negative for non-infectious causes.

Table no. 12: Trypsin Inhibitor Spot Test (TIST) report of selected animals.

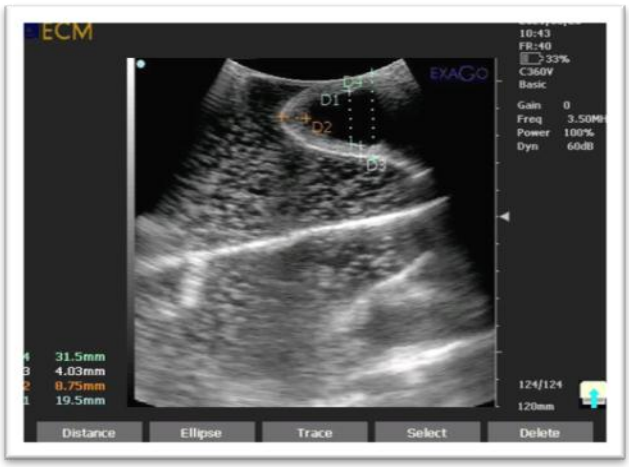
Case No.	Affection	TIST Result
1.	Teat spider	Negative
2.	Teat tumor	Negative
3.	Mammary gland necrosis	Positive
4.	Clinical mastitis	Positive
5.	Gangrenous mastitis	Positive
6.	Teat pea	Negative
7.	Udder abscess	Positive
8.	Udder fibrosis	Negative
9.	Teat fibrosis	Negative
10.	Thelitis	Positive
11.	Teat fistula	Negative
12.	Udder gangrene	Negative

Ultrasonography

In present study, after restraining the animal in the travis, Sonography of the teat and udder was performed in the standing position. B mode ultrasonography was performed on the affected and contra-lateral normal teats and udder with ExaGo veterinary ultrasound scanner using a convex linear 3.5 MHz or convex linear 5 MHz transducer of USG machine. The scanning was done in longitudinal and transverse planes using a direct contact technique in case of scanning of udder and for scanning of teat water bath technique is used.

Ultrasonography of normal contra lateral teat

B mode ultrasonography of the normal contra lateral teats was performed using linear transducer of 3.5 MHz frequency. Examination of the normal teat was done using water bath technique. On the longitudinal scan, the teat canal appeared as a thin, bright, hyperechoic line, bordered on each side by parallel, thick hypo-echoic bands. The rosette of Furstenberg, which connects the teat canal and the teat cistern, was visualised as a hyperechoic structure. When the teat cistern was filled with milk, three layers of the teat wall were clearly distinguished: outer hyperechoic (skin), hypo echoic (musculature), and inner hyperechoic (mucosa). Blood vessels in the teat wall's middle layer emerged as anechoic cavitations. Anechoic vessels from the venous ring of the rosette of Furstenberg could be seen at the junction between the teat and gland cisterns. Annular folds separated the teat and gland cisterns.



The rosette of Furstenberg has been defined as a short hyper echoic line extending from the teat canal into the teat cistern, bordered on each side by parallel hypo echoic lines.

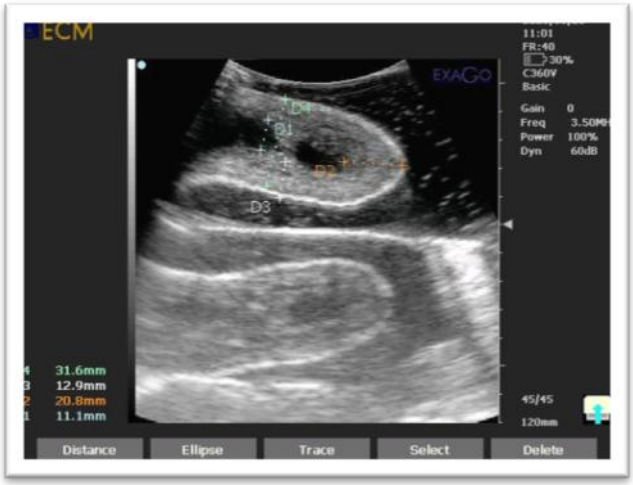
Ultrasonography of normal udder

After applying a cupious amount of acoustic gel to the udder skin, ultrasonographic imaging of the udder parenchyma was performed utilizing a 3.5 MHz or 5 MHz convex transducer on the udder skin. The transducer was placed on the caudal surface of each half along its longitudinal axis and moved upward and downward to scan the entire udder. The glandular parenchyma of the bovine udder was found to be homogeneous hypo echoic with anechoic alveoli in this investigation.

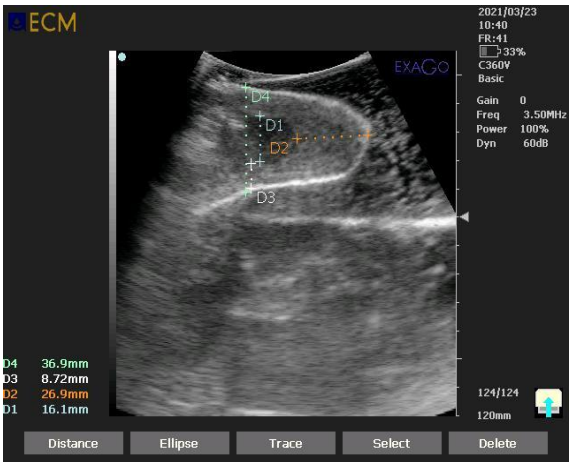
Ultrasonography of the affected mammary gland

Abnormalities at the level of the teat canal and the Furstenberg rosette were seen in animals suffering from obstruction at the tip of the teat (group Ia). Fibrosis was found in the area of Furstenberg's rosette in this group, and the rosette was not clearly delineated.

In group Ib animals, obstruction in the middle of the teat could be seen ultrasonographically as a hyper echoic nodule or echogenic mass in the teat cistern lumen, partially impeding milk flow.



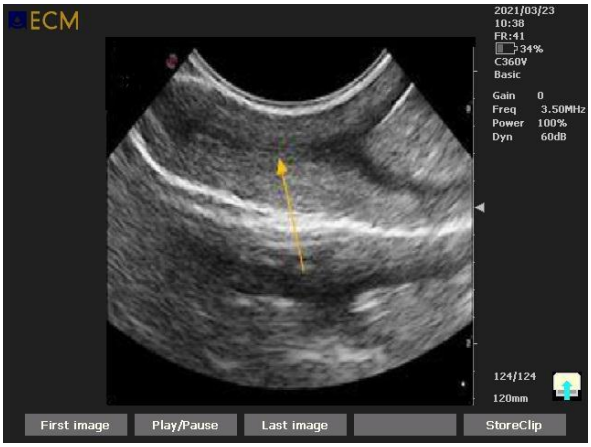
The mucosal membrane was thickened on ultrasound in animals of group Ic diagnosed with teat blockage at the base (border between gland cistern and teat cistern), and the teat wall thickness was correspondingly increased in these cases. The anechoic lumen of the teat cistern could not be observed distal to the obstruction in cases of full occlusion. The animals with full teat fibrosis (group Id) had hyper echoic cordial bands and the teat cistern disappeared on ultrasonography in this study.



In the fistulised teats of group II animals, ultrasonography revealed a break in the continuity of the three layers of the teat wall indicating a fistulous tract. In these situations, the teat cistern had collapsed and did not appear as anechoic as in normal teats. This could be due to milk leaking from the fistulous opening on its own.

Ultrasonography of mammary gland affected with mastitis (Group III) shows homogenous hypo echoic with lack of clarity of visualization of milk alveoli and lactiferous duct. There is loss of an echogenicity of gland cisterns and appeared as mixed hypoechogenic content.

Animal affected with udder abscess (Group IV) had hypo echoic space occupying images within the homogenous hyper echoic udder parenchyma on ultrasonography.



The fibrosed udder ultrasonography in group VII animals showed different degrees of echogenicity and homogeneity. The capsule was broad and hypo echoic in general. In comparison to anechoic glandular cisterns seen in normal udders, the lactiferous duct of the glandular cistern looked to be hypo echoic.

Treatment

In animals with obstruction at various levels of teat, after ultrasonographic procedure and confirming the site and extent of obstruction, a teat siphon and teat tumour extractor was used to remove the obstruction. This was followed by passing a sterile baby feeding tube of 8-10 number size into the teat canal which was inserted up to the glandular cistern. The catheter was fixed within the teat using adhesive tapes over the teat and its tip was closed. Owner was advised to open the cap of the catheter to drain the milk twice daily. Immediately after placing the catheter, 5ml of Gentamicin Sulphate was injected into the operated teat through the catheter and a column of Gentamicin sulphate was left back in the catheter to prevent any ascending infection. Combination of Amoxicillin and Sulbactam was administered I/M twice daily @ 10mg/kg B.Wt. Meloxicalm @ 0.2mg/kg B.Wt I/M was administered once daily for 3 days. Telephonic follow up was done at suitable intervals.

SUMMARY AND CONCLUSIONS

In present study on Gir cows single teat affections were highest (46.51%), followed by double teat (25.58%), four teat (18.60%) and triple teat (6.97%) involvement. Teat obstruction contributed for the highest number of cases (42) followed by mastitis (33), udder fibrosis (15), udder abscess (06), and teat fistula (04). In bovines, the majority of milk flow problems occurred between the ages of 3-6 years followed by 6 years and above. In this study, the average number of lactation or parity of the bovines was 2.94±0.23. In Gir cow, milk flow disorders were most common during the second parity, followed by third parity. The average milk yield of the different groups studied was 12.50±1.72 (Kgs). The highest milk yield was recorded in group II teat fistula (21.15±2.85 Kgs). Group V udder fibrosis milk yield was nil and group Id complete teat obstruction (2.06±1.20 Kgs)

had the lowest milk yields. Teat obstruction was found to be partial in 54.76% of cases and full in 45.24%. According to the findings, 33.33% of teats are obstructed at the tip or teat canal, 26.19% in the middle, 21.42% at the base, and 19.04% involve the entire teat or teat cistern. Teat obstruction was associated with pain while touching the affected teat in 37.97% cases. Palpation of the teat helped in diagnosis only in 63% of cases. While in 37% cases palpation failed to diagnose the condition.

The Ultrasonographic appearance of mammary gland in Gir cows clearly visible by linear transducer (3.5 MHz) especially teat canal, rosette of Furstenberg, teat cistern and teat wall as compared to linear transducer (5 MHz). In present study, Ultrasonography is found easy, quick and low cost technique for diagnosis and differential diagnosis of teat and udder lesions in Gir cows. Water bath technique of Ultrasonography for teat affections in Gir cows provides rapid and more accurate technique for determination of features and size of teat structures. It also allows for detection of alterations in affected teats, teat canal, shortening and teat wall thickening. In present study, partial obstruction of milk flow was more common than complete obstruction. In present clinical study cases of mastitis and fibrosis, Ultrasonography provides useful information regarding the structural changes of the udder and teat tissue.

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