The Haryana Veterinarian (June, 2023) **62(1),** 143-146 ISSN 0033-4359 (P) **Short Communication**

GROSS MORPHOLOGICAL AND BIOMETRICAL STUDIES ON LACTATING AND NON-LACTATING MAMMARY GLANDS IN BUFFALO

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SUMMARY

The present study was conducted on mammary glands of six lactating and non-lactating buffaloes. Glands were collected from the abattoir immediately after sacrifice. After removal of fascia, the gross anatomical and biometrical observations of mammary glands were recorded. The results revealed that udder of lactating buffaloes were bowl shaped whereas the non-lactating udder was pendulous. Udder was composed of right and left halves, divided internally by median suspensory ligament. Each half was further divided by thin membranes into smaller fore quarters and larger rear quarters. The udder length or depth was measured to be 23.33±1.12 cm and 27.83±0.95 cm in fore and hind quarter of lactating buffaloes, respective and 14.17±0.95 cm and 17.83±0.48 cm in non-lactating buffaloes, respectively. The anterior and posterior width of udder were 47.67±0.99 cm and 43.17 ±1.013 cm in lactating ones, respective and 36.17±0.98 cm and 29.17±0.60 cm in non-lactating ones, respective. The thickness, anterio-posterior diameter and circumference of udder was 44.83 ± 0.79 cm, 45.83 ± 0.95 cm and 121.83 ± 1.80 cm in lactating buffaloes, respective whereas 37.50±1.34 cm, 37.5 ± 0.85 cm and 99.67±1.36 cm in non-lactating buffaloes, respective. The biometrical observations recorded for lactating and non-lactating udder showed significant differences.

Keywords: Biometry, Buffalo, Gross, Mammary Glands

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Mammary gland which provides nourishment to young ones in mammals isa modified sweat gland. The gland carries out process of milk formation, release and gland remodeling according to several lactational stages of animal. The process included replacement of damaged tissue during peak lactation and tissue regression while preparing the gland for ensuing lactations (Paramasivan *et al.*, 2013). The anatomical knowledge of mammary glands at different stages is important for understanding its production physiology, genetics and management (Pandey *et al.*, 2018). It is presumed that the size and morphology of udder varied greatly between animals and during different physiological stages. The superficial location of mammary gland makes it susceptible to trauma and injuries leading to infections. As the genetic arrangements have impact on udder characteristics the selection of milch animals depended greatly on the udder conformations. The shape and size of udder had considerable impact on milk production economics thereby providing important criteria for selection of milch animals (Bhuiyan *et al.*, 2004). Keeping in view the role of conformational traits of udder with respect to productivity in buffaloes, the gross morphological and biometrical study was conducted on mammary gland of lactating and non-lactating Murrah buffaloes.

The tissue samples of mammary glands of 6 lactating and 6 non-lactating adult buffaloes were collected from different abattoirs. The whole udder was collected after de-skinning and was subjected to anatomical studies and biometrical analysis. After removal of fascia, the biometrical observations *viz*., the udder length/depth, anterior width (width of fore quarters) and posterior width (width of hind quarters), thickness of udder, anterio-posterior diameter (diameter measured at base of udder anterio-posteriorly) and circumference of udder were recorded for each specimen. The measurements were done by calibrated scale and inelastic thread. The udder length/depth was measured from the point of attachment of udder with body to base of teat. The width of udder was measured between the lateral extremities of udder in anterior and posterior ends. Thickness of udder measured width at the base of udder i.e. transverse diameter. The anterio-posterior diameter measured the longitudinal diameter of udder at base. The circumference of udder was taken at base level with the help of an inelastic thread (Fig. 1). Arithmetic mean, range, standard error and coefficient of variation for morphometric measurements were computed and statistically analyzed for their significance by using t-test.

The specialized sweat glands in mammals for nurturing young ones were known as mammary glands. In buffaloes these glands were located in the inguinal region and were formed from four mammary units known as quarters. Each quarter was separately drained by a single appendage known as teat. A thin skin layer covered all the four quarters along with their teats. The skin remained loosely attached to the glandular unit and thus slipped over

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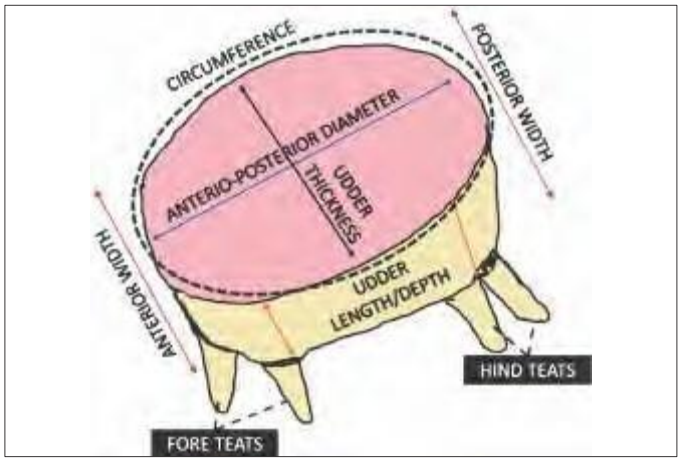

Fig. 1. Schematic diagram showing parameters for biometrical studies on lactating and non-lactating udder of buffalo

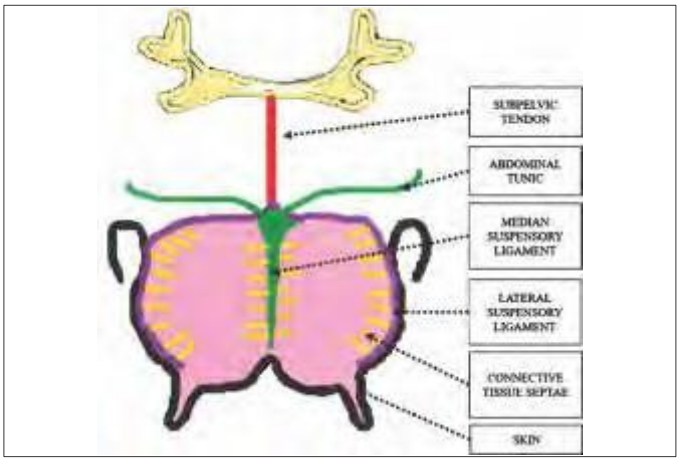

Fig. 2. Schematic diagram showing suspensory apparatus of buffalo udder

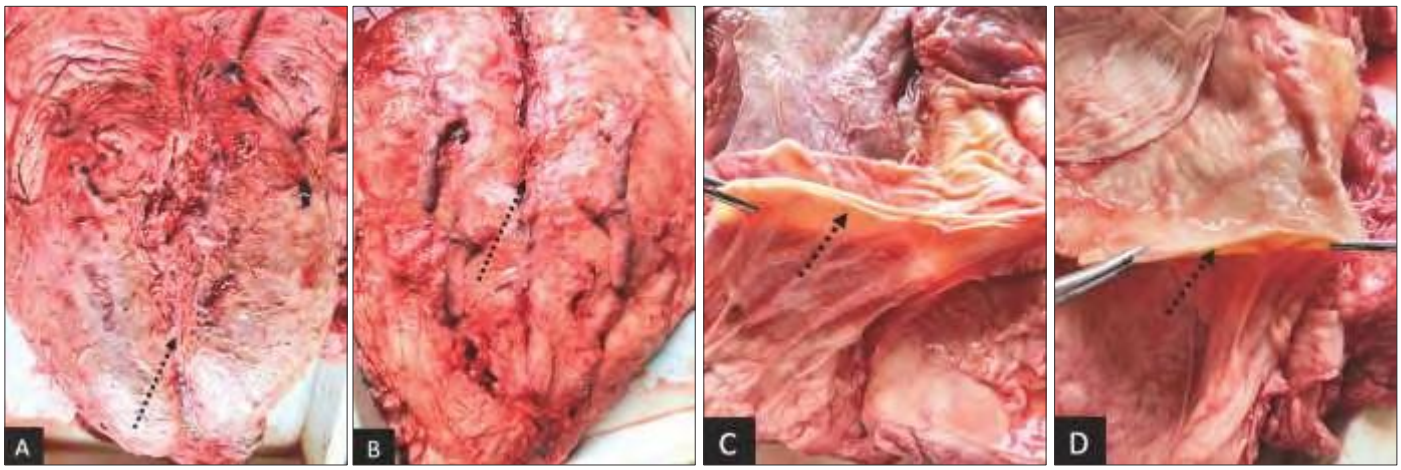

Fig. 3. Gross photographs showing (a) dorsal face of base of udder and separation of right and left halves by median suspensory ligament (arrow), (b) ventral face of udder showing four quarters drained by four teats and prominent separation line between left and right halves (arrow), (c) double layered lateral suspensory ligament, (d) single layered median suspensory ligament in udder of buffalo

it very easily. The presence of hair was only confined to the skin region adhering to the mammary glands in both lactating and non-lactating buffaloes. The mammary quarters were separated from each other laterally by median suspensory ligament into right and left halves (Fig. 3A, B). The gland was divided into smaller fore and larger rear quarters by thin membranes. It was observed that the lactating animals contained bowl shaped udder whereas a pendulous udder was dominant feature in non-lactating animals. Ranjitha *et al.* (2021) reported most commonly occurring udder shape in buffalo was bowl shaped followed by pendulous, globular and goaty.

The ligaments and tissues which helped in suspension of the udder from body played equally crucial role in lactation. This apparatus comprised of various elements imparting different functions. The suspensory system comprised of skin, superficial fascia and connective tissue layer. The lateral suspensory ligament was consisting of two layers superficial and deep whereas the median suspensory ligament was single layered. The skin and superficial fascia covered the udder and provided very little suspensory support to udder. The connective tissue attached the dorsal surface of the front quarters to the abdominal wall helped in keeping the fore quarter in proximity of the body wall provided some support to the udder. This attachment is of importance during evaluation of dairy cattle conformation.

The lateral suspensory ligament originated from the sub-pelvic tendon and was further divided into superficial and deep layers (Fig. 2). The superficial lateral suspensory ligament with fibrous tissue stretched cranio-ventrally from the pubic region towards the udder and enveloped the udder externally running below the skin and adhered to the connective tissue layer. The deep layer of lateral suspensory ligament was also composed of mostly fibrous tissue. But unlike the superficial layer it formed a thicker envelop covering most parts of udder except at the bottom as a result of which centre of the milk filled udder pulled away from the body. Externally the deep layer was attached to the superficial suspensory ligament and internally

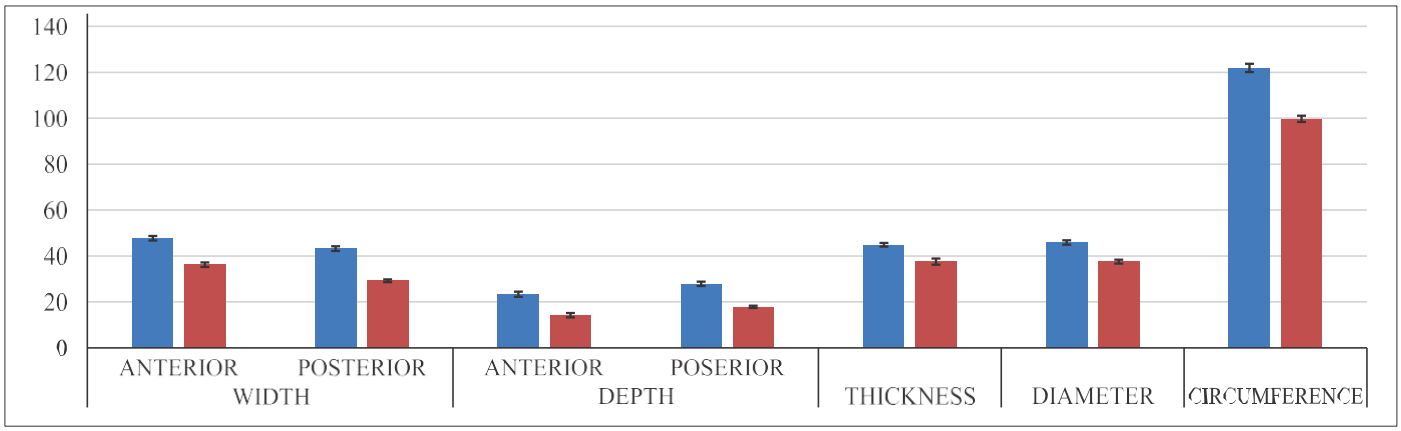

Fig. 4. Graphical representation of various biometrical parameters studied on lactating and non-lactating mammary glands of buffalo

projected lamellae into the glandular part which formed the interstitial framework of the udder. The lateral suspensory ligaments thus formed the major support system of udder (Fig. 3C).

The median suspensory ligament originated from the abdominal wall and extended to the medial surface of left and right halves of udder. Unlike the lateral suspensory ligament median ligament was elastic in nature and formed thick layer of yellow elastic sheet partially separating the left and right halves of the udder (Fig. 3D). The elasticity and tensile strength of this ligament carried the weight of udder when large amount of milk was produced.

According to Schummer *et al.* (1981) the suspensory apparatus of the udder consisted of paired suspensory band located between the udder halves. It consisted of elastic connective tissues and continued from the abdominal tunica flava attaching the udder to the abdominal wall. The suspensory apparatus of the udder consisted of medial and lateral laminae of connective tissue which attached the udder to the ventral abdominal wall and the prepubic tendon.

The biometrical observations recorded for lactating and non-lactating udder showed significant differences. The udder length was measured to be 23.33±1.12 cm and 27.83±0.95 cm in fore and hind quarter of lactating buffaloes and 14.17±0.95 cm and 17.83±0.48 cm in non-lactating buffaloes, respectively. The fore quarter length was significantly less than hind quarter in both stages whereas length of all the lactating quarters were significantly higher than the non-lactating ones. The anterior and posterior width of udder were 47.67 ±0.99 cm and 43.17±1.013 cm in lactating ones and 36.17± 0.98 cm and 29.17±0.60 cm in non-lactating ones (Fig. 4). There was significant difference between the anterior and posterior width in both the physiological stages. The udder length and width of swamp buffalo were 40.56 ± 0.15 cm and 35.11±0.16 cm, respectively (Akhtar *et al.*, 1998). This indicated the udder size was larger in riverine Murrah buffalo as compared to the swamp buffalo. Prasad et al. (2010) investigated mean length and width of udder to be 55.71±0.59 cm and 53.87±0.70 cm in Murrah buffalo respectively which showed a higher value than current findings. In Surti buffalo, the length and width of udder were 45.0± 0.7 cm, 49.4±1.4 cm, respectively (Lavania *et al.*, 2011). The average udder length was 44.8±7.43 cm whereas the depth of fore and hind quarters were 23.7±3.11 cm and 23.6±3.71 cm, respectively in crossbred cows as reported by Deng *et al.* (2012). Naik (2015) measured the length of fore and hind quarters to be 20.91 ± 0.94 cm and 11.75±0.70 cm, respectively, whereas the width of fore quarters and hind quarters were 14.16±1.07cm and 12.66± 0.57 cm, respectively in Gidda cows. In contrast to current findings Khatri *et al.* (2017) found that the buffalo udder was 58.24±0.68 cm in length, 65.45±0.70 cm in width and 23.06±0.34 cm in depth. These values were significantly higher than the present measurements. Similarly, in Gir cows the udder length, width and depth were measured to be 61.95±1.20 cm, 62.99±1.17 cm and 25.62±0.43 cm, respectively (Modh *et al.*, 2017). The average udder length, width and depth were 48.10±0.33 cm, 42.80±0.32 cm and 11.80±0.05 cm, respectively in Murrah buffalo (Ranjitha *et al.*, 2021).

The thickness, anterio-posterior diameter and circumference of udder was 44.83 ± 0.79 cm, 45.83 ± 0.95 cm and 121.83±1.80 cm in lactating buffaloes whereas, 37.50±1.34 cm, 37.5±0.85 cm and 99.67 ± 1.36 cm in non-lactating buffaloes (Fig. 4). The thickness, anterio-posterior diameter and circumference of mammary gland of Gidda cows were 17.66±1.66 cm, 24.83±3.13 cm and 59.00±3.88 cm, respectively as reported by Naik (2015).

All these parameters showed significant higher values in lactating animals as compared to non-lactating ones. Further the shape of udder was found to be bowl shaped in lactating whereas pendulous in non-lactating

udder. Unlike current study Patel and Trivedi (2018) observed the mean values for udder length, width and depth were higher for pendulous udder in crossbred cows whereas current study reported higher values for bowl shaped udder. These findings can be used as a marker for identification of physiological stage of production in buffalo.

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