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Gross Anatomical Investigation on Lymphnodes of the Abdominal and Pelvic Regions in Buffaloes (*Bubalus bubalis*)

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ABSTRACT

The present study was carried out to elucidate gross anatomical study of lymph nodes in the abdominal and pelvic regions of buffaloes (B*ubalus bubalis*)" for basic as well as applied purposes. The lymph nodes namely pre-femoral, popliteal, mesenteric and superficial inguinal (scrotal and supramammary) lymph nodes of buffaloes consisted of capsule which covered whole parenchyma except at hilus. The presence of obstructive neighboring tissues close to the lymph nodes, thick skin, and the animal's resistant behaviour were the primary hurdles when palpating these lymph nodes in living animals. Under the skin, the pre-femoral and superficial inguinal lymph nodes were the most clearly defined and easily palpable. The carcass's lymph node position was largely consistent with reports of similar locations in cattle. The lymph nodes were found single on each side but mesenteric lymph node was presented along the mesentery near the jejunum and ilium. However, prefemoral lymph nodes were occasionally found in pairs. The lymph nodes were mostly oval or bean shaped; however some were elongated and flat. The mean biometrical value in respect to length, width, thickness and weight were slightly variable in right and left sides.

Key words – Bubalus bubalis, Lymph nodes etc.

INTRODUCTION

The buffalo is a vital component of the Indian economy, accounting for 54% of the Nation's milk production and 12% of global milk production all by itself (Handbook of animal husbandry, ICAR 2014). The Indian subcontinent's river buffaloes *(Bubalus bubalis)* are raised primarily for their milk, but they are all dual-purpose animals with good meat qualities. Buffalo is the most valuable agricultural animal known for its economical and productive values after milk and the meat. This is the genetically advanced animal entity that has resistance against diseases and the parasites, El-Nahas *et al. (*1998).

The body is protected from illnesses and infections through the lymphatic system. The primary comonents of the immune system are the lymphoid organs, including the spleen, bone marrow lymph nodes, and thymus. Lymph nodes function as a secondary defense mechanism and are recognized as a secondary lymphatic organ. Antigens moving through lymphatics are captured by lymph nodes and they utilize their phagocytic ability to neutralize antigens. Animal health can be accurately assessed by examining the lymph nodes. According to Swenson (1970), these organs usually produce lymphocytes and filters foreign materials. Hemorrhagic septicemia, rinderpest, anthrax, tuberculosis, brucellosis, mycotic and algal granuloma, nematodiasis, cysticercosis are among the disorders in domestic buffaloes that are known to affect the lymph nodes, Cockrill (1974).

MATERALS AND METHODS

The gross anatomical studies was conducted on mesenteric, prefemoral, popliteal and superficial inguinal lymph nodes of abdominal and pelvic region of buffaloes (*Bubalus bubalis).* Twelve samples from each lymph node were collected from apparently healthy buffaloes at slaughter houses situated in and around Udaipur (Figs. 1 and 2). Preferably the samples will be collected from young (1.5 to 3.0 years) and adult (3 to 8 years) buffaloes. The collected samples were carried on

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ice at the Department of Veterinary Anatomy, CVAS, Navania, Vallabhnagar, Udaipur for gross anatomical investigations.

The morphological characteristics of each lymph node were determined. Linear dimensions (length and width) were measured by using the Vernier caliper and the volume was measured by volumetric technique. While weight of lymph nodes was measured by electronic weighing machine at the Department of Veterinary Anatomy CVAS, Navania, Vallabhnagar, Udaipur (Figs. 3 and 4).

RESULTS AND DISCUSSION

Mesenteric lymph nodes

The present study in buffaloes revealed that mesenteric lymph nodes were located along the mesentery, primarily near the jejunum and ileum. These were oval or elongated or even the small button-like shaped structure of variable sizes. They were appeared pale pink to grayish-white in color. Based on size variation, large and small mesenteric lymph nodes were distinguished. Maximum and minimum measurements were for different lymph nodes (Fig.5). The maximum were observed as the length 3.67 ± 0.45 cm, breadth 1.478 ± 0.05 cm, thickness 0.622 ± 0.02 cm, weight 2.146 ± 0.14 gm and volume 2.72 ± 0.093 ml, (measured by water displacement volumetric technique) while the minimum were recorded as 3.607 ± 0.476 cm, 1.475 ± 0.049 cm, 0.616 ± 0.025 cm, 2.11 ± 0.14 gm and 2.525 ± 0.16 ml, respectively (Table 1). The present finding was in uniformity with the findings of Grossman (1953), who reported that mesenteric lymph nodes in ruminants were positioned at the origin of the cranial mesenteric artery, measuring 1.0 to 2.5 cm. additionally, jejunal lymph nodes were dispersed along the mesentery of the jejunum and ileum, varying in size from 0.5 to 2.0 cm. The observed values in the present study were closely corresponds to the Grossman's (1953) findings, confirming the anatomical consistency of mesenteric lymph nodes in ruminants.

Pre-femoral lymph node

The prefemoral lymph node in buffaloes was observed to be located subcutaneously in the prefemoral region, between the tensor fasciae latae and quadriceps femoris muscles, positioned above the stifle joint. The lymph node was single on either side, large and elliptically elongated in adult buffaloes (Fig.6), with variations in size influenced by age and physiological conditions. The measured dimensions of the right prefemoral lymph node were 4.56 ± 0.11 cm in length, 1.97 ± 0.076 cm in breadth, 0.71 ± 0.038 cm in thickness, 7.32 ± 0.369 gm in weight, and 5.71 ± 0.53 ml in volume, whereas the left prefemoral lymph node was 4.98 ± 0.12 cm in length, 2.22 ± 0.08 cm in breadth, 0.77 ± 0.05 cm in thickness, 8.14 ± 0.43 gm in weight and 6.21 ± 0.55 ml in volume (Table 1). The present findings pertaining to location, it was in partial harmony with the findings of Grossman (1953), who described the prefemoral lymph node in ruminants was located near the tensor fasciae latae muscle, dorsal to the patella and positioned on the aponeurosis of the obliquus externus abdominis muscle. However, Grossman reported a greater size range (8 to 10 cm in length and 2.5 cm in width), which was comparatively larger than the present observations in buffaloes. The findings of present study was in accordance with Ducusin *et al*. (2009), who studied Philippine water buffaloes and noted the firm, nodule-shaped structure of the lymph nodes, varying in color from creamy white to reddish. The difference in findings might be attributed to species-specific morphological variations that were not prominently observed in the present study.

Popliteal lymph node

The present study found that the popliteal lymph node in adult buffaloes was large and oval, whereas in calves, it was smaller and rounded. It was located between the muscles biceps femoris and semitendinosus, on the gastrocnemius muscle, caudal to the stifle joint. The lymph node was pale pink to light brown with a smooth, well-defined surface, firm consistency and encapsulated connective tissue (Fig.7). The right popliteal lymph node was measured as 1.84 ± 0.09 cm in length, 1.85 ± 0.05 cm in breadth, 0.71 ± 0.03 cm in thickness, 2.13 ± 0.31 gm in weight and 3.02 ± 0.22 ml in volume, while the left popliteal lymph node was 1.97 ± 0.10 cm in length, 2.03 ± 0.04 cm

in breadth, 0.81 ± 0.03 cm in thickness,2.77±0.38 gm in weight and 4.05±0.27ml in volume (Table 1). These findings were similar with Grossman (1953), who described the popliteal lymph node in ruminants as being smaller, irregularly oval and usually single on each pelvic limb, located deeply on the lateral aspect of the stifle joint or slightly distal along the caudal border of the gastrocnemius muscle. The present finding was in partial harmony with the findings revealed by Rahmoun *et al*. (2020), who reported a larger and more constant ovoid-shaped popliteal lymph node in *camelus dromedaries* (6.70 ± 0.129 cm in length and 3.50 ± 0.147 cm in width), located in the popliteal fossa. These variations could be attributed to species-specific anatomical differences and functional adaptations.

Superficial inguinal lymph node

Due to the anatomical and functional connect of the inguinal and pelvic regions through lymphatic drainage, neural pathways and structural components like the inguinal canal, the superficial inguinal lymph node was considered as the pelvic region lymph node. The superficial inguinal lymph node in adult buffaloes was large and elongated, whereas in calves, it was smaller. In males, it was located at the neck of the scrotum, behind the spermatic cord and in females; it was positioned near the udder in the inguinal region. The node was pale pink to light brown in color, smooth, firm and well-encapsulated (Fig.8). The right superficial inguinal lymph node measured 6.16 ± 0.12 cm in length, 3.65±0.09 cm in breadth, 1.25 ± 0.10 cm in thickness, 17.83 ± 0.76 gm in weight and 15.69 ± 1.64 ml in volume, while the left superficial inguinal lymph node measured 5.47 ± 0.12 cm in length, 3.22 ± 0.09 cm in breadth, 1.10 ± 0.08 cm in thickness, 17.21 ± 0.69 gm in weight and 14.62 ± 1.38 ml in volume (Table 1). These findings were similar with Saar and Getty (1975), who described in bovines that the superficial inguinal lymph nodes were referred as mammary lymph nodes in females and scrotal lymph nodes in males, with a usual presence of two lymph nodes on either side, located above the caudal border of the base of the udder in females. The size range in ruminants was reported as 6 to 10 cm in length, which is consistent with the present study. Furthermore, Barnwal and Dhingra (1978) observed that mammary lymph nodes in buffaloes were measured 5 to 7 cm in length and 2 to 4 cm in breadth, which also closely corresponds to the findings of this study, though slight variations in breadth could be due to the individual anatomical differences and associated physiological factors

Table 1 -: Biometrical Observations of mesenteric, prefemoral, popliteal and superficial Inguinal lymph nodes in the abdominal and pelvic regions of buffaloes (*Bubalus bubalis)*.

Parameter	Mesenteric		Pre-femoral		Popliteal		Super?cial Inguinal	
	Minimum	Maximum	Right	Left	Right	Left	Right	Left
Length (cm)	3.60+0.47	3.67 ± 0.45	4.56+0.11	4.98+0.12	1.83+0.08	1.97+0.10	6.16+0.12	5.47+0.12
Width (cm)	1.47+0.04	1.48 ± 0.05	1.97+0.07	2.22+0.07	1.85+0.05	2.02+0.04	3.65+0.09	3.22+0.09
Thickness (cm)	0.61+0.02	0.62 ± 0.02	0.71+0.03	0.77+0.04	0.71+0.03	0.80+0.03	1.25+0.10	1.10+0.07
Weight (gm)	2.11+0.14	2.14 ± 0.14	7.31+0.36	8.13+0.43	2.12+0.31	2.76+0.38	17.82+0.76	17.21+0.69
Volume (ml)	2.52+0.16	2.72 ± 0.09	5.71+0.53	6.21+0.55	3.01+0.22	4.05+0.27	15.69+1.64	14.61+1.38

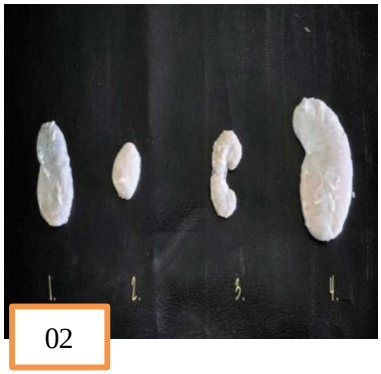
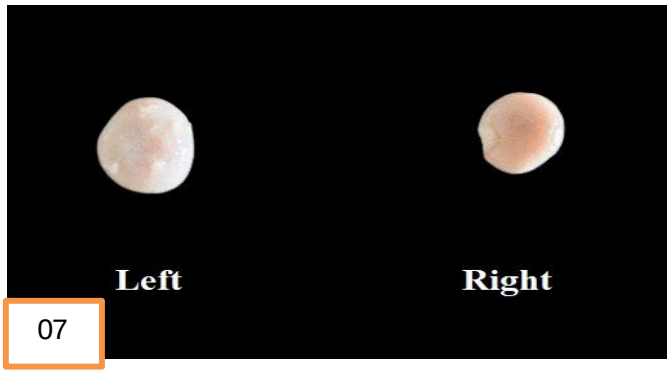


Fig. 1: Photomicrograph showing- Carcass of buffalo at slaughter house.**Fig. 2:** Photomicrograph of Abdominal and pelvic lymph node showing - (1). Pre femoral lymph node (2). Popliteal lymph node (3). Mesenteric lymph node (4). Superficial Inguinal lymph node **Fig.3 :** Photomicrograph showing measuring width of Pre-femoral lymph node.

Fig. 4: Photomicrograph showing measuring the weight of Popliteal lymph node, **Fig. 5:** Photomicrograph showing- Different Mesenteric lymph nodes of buffalo. **Fig. 6:** Photomicrograph showing- medial view of left and right Prefemoral lymph node of buffalo.



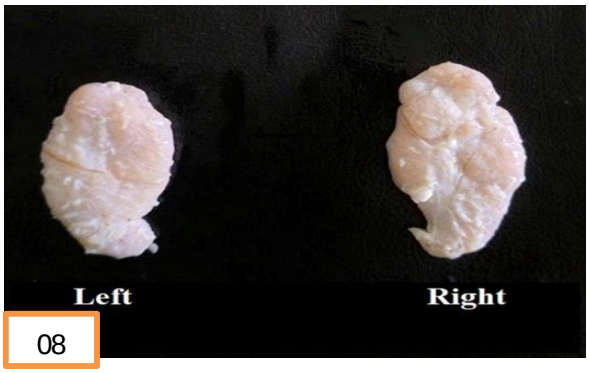


Fig. 7: Photomicrograph showing- medial view of left and right popliteal lymph node of buffalo. **Fig. 8:** Photomicrograph showing- lateral view of left and right superficial inguinal lymph node of buffalo.

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