

## GROSS MORPHOMETRICAL STUDIES ON BONES OF HINDLIMB OF GREAT INDIAN RHINOCEROS (*RHINOCEROS UNICORNIS*)

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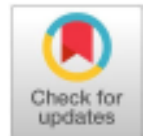
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**ABSTRACT :** Hind limb of the animals are playing major role to bear the weight as they are playing important role in locomotion and gait determination. Present study was designed to elucidate the gross morphological characteristics of bones of Gluteal, Thigh, Stifle, Crural and Pes region of a female calf of Indian Rhinoceros. Bony pelvis was formed by the right and left hip bones consisted of three bones Ilium, Ischium and Pubis. Ilium was a triangular bone situated at the craniaolateral aspect of the pelvis. Ischium was roughly quadrilateral plate of bone situated behind the pubis and forms part of the pelvic floor. Pubis was a small triangular plate of bone situated at the antero medial aspect of the pelvic floor. Femur was largest bone in the skeleton directed downward and forward in an oblique manner. This bone articulate with the hip bone above to form hip joint and with tibia, fibula and patella to form the stifle joint. Third trochanter was present at the lateral part of the lateral border, in the form of an extra prominence curved anteriorly. Lateral border of the lateral groove of tibia attached with the distal end of the fibula. Fibula was long and thin bone extended the whole length of the tibia. There were six tarsals, three metatarsals, three digits bearing three phalanges each.

**Key words :** Bones, gluteal, morphometrical, pelvis and rhinoceros.

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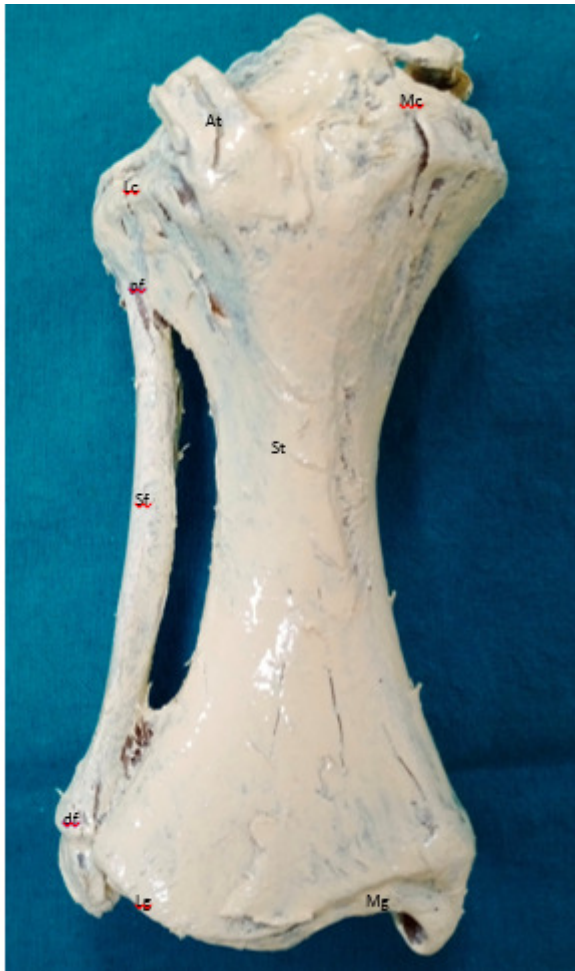
### INTRODUCTION

There are five distinct species of rhinoceros, within the group Perissodactyla (odd-toed ungulates), white (*Ceratotherium simum*), black (*Diceros bicornis*), Sumatran (*Dicerorhinus sumatrensis*), Javan (*Rhinoceros sondaicus*) and greater one-horned (*Rhinoceros unicornis*). All five species are listed on the International Union for the Conservation of Nature Red List of threatened species, at varying levels of vulnerability. Four of the five species are kept in captivity, where they are not only a popular zoo or safari park attraction but also fulfill important roles in education and conservation Rhino Resource Center (2011). The white Rhinoceros and the black Rhinoceros (*Diceros bicornis*) both live in sub-Saharan Africa, whereas the Indian Rhinoceros (*R. unicornis*) the Javan Rhinoceros (*R. sondaicus*) and the Sumatran Rhinoceros (*Dicerorhinus sumatrensis*) survive in India and Nepal, Java and Sumatra, respectively (Dinerstein, 2011). Population census of Greater Rhinoceros in Rajiv Gandhi Orange National Park Assam done by Dutta and Kakati (2019).

Studies on skeleton has been done on Rhinoceros by Laurie *et al* (1983), Pfistermuller *et al* (2011) and Panagiotopoulou *et al* (2019). Craniometrical study on one horned Rhinoceros done by Kalita *et al* (2003) and study on Parathyroid, Thyroid and Recurrent Laryngeal nerve by Udelsman *et al* (2017). But the information about the bones of appendicular skeleton of Rhinoceros is scanty as the bones of hindlimb are important part of gait and balance determination of the body Caiaffo *et al*, 2019 and Ghosh, 2015). So present study was designed to evaluate the morphometrical features about bones of gluteal, thigh, stifle, crural and pes region of the hindlimb.

### MATERIALS AND METHODS

The specimen was obtained from 08 Month old female calf of great Indian Rhinoceros (*Rhinoceros Unicornis*), brought from wildlife Section of IVRI, Izzatnagar, Bareilly (UP) after the post-mortem examination. Bones were collected through burial method as described by Agrawal *et al* (2016). After that the specimens were cleaned and utilized for gross morphometrical studies at Section of Veterinary Anatomy, IVRI, Izzatnagar, Bareilly (UP). All



**Fig. 6 :** Photograph of anterior view of tibia and fibula of calf Indian Rhinoceros showing expanded proximal extremity presenting two condyle, lateral condyle (Lc) attached with proximal end of tibia (pf) and medial condyle (Mc) one bearing meniscus (m), anterior tuberosity (At), shaft of tibia (St), shaft of fibula (Sf), distal extremity presenting two grooves medial groove (mg) and lateral groove (Lg), articulated with distal end of fibula (df) laterally.

tarsal, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> tarsals (Fig. 7). Metatarsal and phalanges were similar to those of forelimb. There were three metatarsal bones representing II, III and IV as reported by Ghose (2015) in Rhinoceros (Fig. 7). The shaft of each metacarpal was cylindrical presenting two surface, the anterior surface was convex while posterior was concave. The proximal end of each metacarpal presents articular facets for tarsal bones while distal ends of all three metatarsal bone in the form of condyle divided by a cleft at the middle and each metatarsal joined with corresponding digits, each digit representing (II, III and IV) were with three phalanges represented as first phalanx, second phalanx and distally third phalanx (Fig. 7). First phalanx in each digit was short bone situated between the metatarsal and second phalanx in downward and forward in direction (Fig. 7). The anterior and lateral surface were continuous, second phalanx was also short



**Fig. 7 :** Photograph of anterior view of tarsal arranged as two rows tibial (T), fibular (F), central (C) and second (2), third (3) and fourth (4), three metatarsals I, II and III and three digits bearing 3 phalanges each 1P, 2P and 3P.

bone situated between first and third phalanx in downward and forward direction. Third phalanx was proximally articulated with the distal end of the second phalanx and its solar surface was concave and flat (Fig. 7). Middle digit was comparatively massive and strong; these findings were similar to the findings of Ghose (2015) and Galateanu *et al* (2014) in Rhinoceros.

## CONCLUSION

It was concluded from the present study, that the bones of hindlimb in calf of Rhinoceros showing various morphological features which will be helpful to explore anatomical knowledge as well as provide information in forensic wild life anatomy for identification of species of the animals.

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