

OSTEOLOGICAL FEATURES OF HIP BONE FOR DETERMINATION OF SEX OF BLACK BENGAL GOAT (*Capra hircus*)

Sonnet Poddar^{1*}, Tuli Dey² and Abdullah Al Faruq¹

¹Department of Anatomy and Histology, Chittagong Veterinary and Animal Sciences University, Khulshi, Chittagong-4225, Bangladesh

²Department of Medicine and Surgery, Chittagong Veterinary and Animal Sciences University, Khulshi, Chittagong-4225, Bangladesh

Corresponding author:- sonnetcvasu@gmail.com

In this study, fifteen hip bones from known sex of Black Bengal goat were collected to investigate the osteological features to determine sex. The important osteological features of collected hip bone were studied and they were classified into two groups (male and female) on the basis of osteological features. Conjugated diameter of pelvic inlet was more in female (12.09 ± 0.12 cm) compare to male (11.47 ± 0.26 cm) group. Transverse diameter of pelvic inlet was also more in female (9.29 ± 0.19 cm) than male (8.21 ± 0.08 cm) group. Pelvic outlet and ischiatic arch were larger and wider respectively in female than male group. Wideness of ischiatic arch was larger in female (2.94 ± 0.02 cm) compare to male (2.41 ± 0.08 cm). Obturator foramina were smaller in male group. Anteroposterior diameter and mediolateral diameter of obturator foramina were more (3.60 ± 0.08 and 2.01 ± 0.09 cm) in female than male (3.21 ± 0.08 and 1.81 ± 0.08 cm); respectively. Those findings indicate that, the differences of important osteological features between two groups help to determine sex (male and female) in Black Bengal goat.

Keywords: Hip bone, osteological features, sex determination, Black Bengal goat.

Hip bone of Black Bengal goat consists of three large flat bone named ilium, ischium and pubis. Right and left hip bones along with sacrum and first three coccygeal vertebrae form pelvic girdle of pelvic (Getty, 1975). Those two hip bones are joining together by pelvic symphysis side to side. Ilium is largest part and has wing, two surfaces and three borders. It bears the important osteological features like gluteal

line, psoas tubercle, greater ischiatic notch (Getty, 1975; Ghosh, 2012; Neil and May, 1970). Ischium forms the caudal part of floor of the pelvic. It contains important osteological feature like ischiatic arch, lesser ischiatic notch, ischiatic tuberosity and form the medial boundary of obturator foramen. Pubis is smallest part and contains pubic groove, ilio-pubic eminence, ventral pubic tubercle (McLeod, 1964; Neil and May, 1970). Cranial opening of pelvic is called pelvic inlet and caudal end of pelvic is called pelvic outlet. Conjugated diameter and transverse diameter are the distance between body of sacrum to cranial end of pubic symphysis and distance between two psoas tubercle; respectively (Getty, 1975; Ozkan, Z. E., 2004; Neil and May, 1970). Several studies are carried out on axial and appendicular skeleton on black Bengal goat (Mahmud and Mussa, 2016; Siddiqui et al., 2008), fewer studies are carried out on hip bone with emphasized on sex determination. Here the study is planned to execute the osteological features of hip bone with identical differences to provide good knowledge for determination of sex (male and female) of goat.

MATERIALS AND METHODS

The study was conducted on the hip bone of known sex of Black Bengal goat from the period of 10th May to 20th July, 2016. Fifteen hip bones with sacrum and coccygeal vertebrae were collected from Jhowtola Bazar, Khulshi, Chittagong. The bones were grinded for 2 months and excavated out. Those bones were processed as per standard technique (Raghavan, 1964). The bones were divided into two groups according to

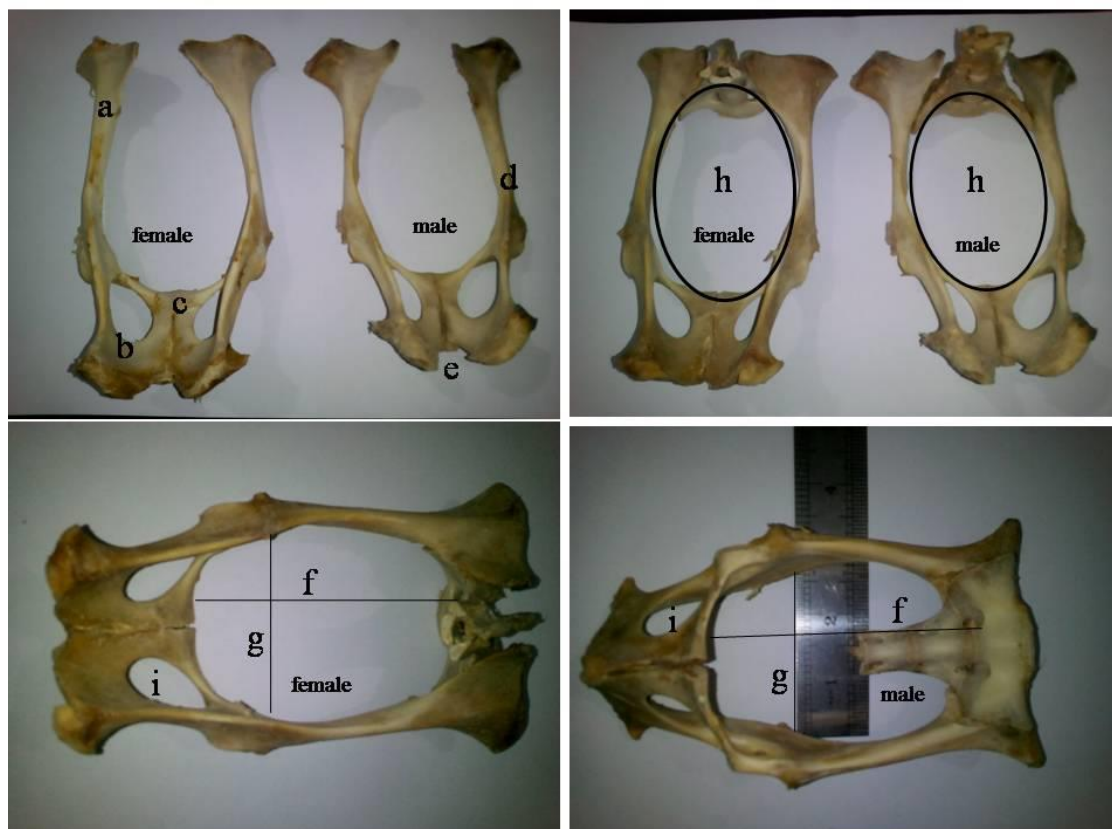


Figure 1: Hip Bone of goat. a) ilium, b)ischium, c)pubis, d) psoas tubercle,e) ischiatic arch, f)conjugated diameter, g)transverse diameter, h) roomy cavity, i)obturator foramen

their sex. All bones were studied to record their osteological features at laboratory of Department of Anatomy and Histology, Chittagong Veterinary and Animal Sciences University (CVASU), Khulshi, Chittagong, Bangladesh. The following studies were conducted on the collected hip bones of known sex of Black Bengal goat

- (a) Ilium, ischium and pubic bones were identified in each hip bone of two groups (Male and female) with their important osteological features.
- (b) Pelvic inlet and pelvic outlet were observed in each bones
- (c) Measurements of important osteological features (like conjugated diameter, transverse diameter, Ischiatic arch's wideness & depth and obturator foramina diameter) of bones were performed.
- (d) Determination and differentiation of sex (Male and female) of Black Bengal goat were performed on the basic of important osteological features of bones

RESULTS AND DISCUSSION

Hip bone was a flat bone and has three parts. Ilium was a triangular bone and situated craniolaterally of pelvic. Ischium was a quadrilateral plate of bone form the caudal part of the pelvic floor. Pubis was smaller and forms the cranial part of the pelvic floor. Those findings were similar with the findings of (Getty, 1975; Ghosh, 2012; McLeod, 1964). Medial surface of ilium bears raised prominence psoas tubercle. Caudal border of ischium formed ischiatic arch in hipe bone. Those findings were similar as the findings of (Getty, 1975; Neil and May, 1970) (Figure 1. a,b,c,d,e). The pelvic inlet was composed dorsally sacrum,laterally shaft of ilium and ventrally pubic bone. Otherwise, the pelvic outlet was composed of dorsally coccygeal vertebrae and ventrally ischiatic arch. The variations were found in conjugated and transverse diameter of inlet. Conjugated diameter of pelvic inlet was more (Figure 1. f) in female (12.09 ± 0.12 cm) compare to male (11.47 ± 0.26 cm) group. Transverse diameter of pelvic inlet was also more (Figure 1.g) in

Table 1: Conjugated diameter, transverse diameter, Ischiatic arch's wideness and obturator foramina diameter of male and female Black Bengal goat (Values are Mean±SD)

Hip bone of Black	Number of Hip	Conjugated diameter	Transverse diameter	Ischiatic arch wideness (cm)		Obturator foramina diameter (cm)	
				Wideness	Depth	AP	ML
Bengal (BB) Goats	Bones	(cm)	(cm)				
Male Black Bengal (BB) Goats	7	11.47±0.26	8.21±0.08	2.41±0.08	3.64±0.05	3.21±0.08	1.81±0.08
Female Black Bengal (BB) Goats	8	12.09±0.12	9.29±0.19	2.94±0.02	3.33±0.06	3.60±0.08	2.01±0.09

Legend: AP: Anteroposterior diameter; ML: Mediolateral diameter, cm: centimeter

female (9.29±0.19 cm) than male (8.21±0.08 cm) group (Table 1). Those finding were almost similar with the findings of (Getty, 1975; Neil and May, 1970; Siddiqui et al., 2008).

The pelvic inlet is larger, oval shape and pelvic outlet is somewhat rounded in shape in case of female group but in male group pelvic inlet was somewhat heart shaped and pelvic outlet was smaller. Those were similar with (Getty, 1975; Neil and May, 1970). Wideness of ischiatic arch was larger in female (2.94±0.02 cm) compare to male (2.41±0.08 cm). The cavity was more roomy in female (Figure 1.h) according to (Getty, 1975); (Ghosh, 2012); (Neil and May, 1970). Here, also the similar findings were investigated. Obturator foramina were smaller in male group (Figure 1.i). Anteroposterior diameter and mediolateral diameter of obturator foramina were more (3.60±0.08 and 2.01±0.09 cm) in female than male (3.21±0.08 and 1.81±0.08 cm); respectively. Those finding were similar with the findings of (Getty, 1975; McLeod, 1964).

CONCLUSION

The difference between hip bone of male and female related to function and body size. Female pelvic is adapted for child birth and it is wider than male pelvic. The important osteological features of hip bone between two group helps to determine the sex (male and female) in Black Bengal goat.

REFERENCES

1. Getty, R. (1975). Session and Grossman's The Anatomy of the

Domestic Animals, 2nd ed. vol.1, W.B.Saunders co. Philadelphia, USA.

2. Ghosh, R.K. (2012). Primary veterinary anatomy, 5th ed. Current books international, Kolkata, India.
3. McLeod, W.M. (1964). Bovine Anatomy, By W.M.McLeod, 2nd ed. Burgers publishing co. England
4. Mahmud, A. A., and Mussa, T., (2016). Comparative macro anatomy of forelimb bones of black Bengal goat and indigenouse dog: an over view. American Journal of Agricultural Science, Engineering and Technology, vol 3(1): 1-10
5. Neil and May, D.S. (1970). Anatomy of the sheep, 2nd ed. Brisbane, University of Queenes land. Australia
6. Ozkan, Z. E., (2004). Macro anatomical investigation on the hedgehog skeleton (erinaceus europaeus), Turkish Journal of Veterinary and Animal Science, 28(1): 271-274
7. Raghavan, D., (1964). Anatomy of ox. Indian Council of Agricultural Research, New Delhi, India. pp: 97-117
8. Siddiqui, M.S.I., Khan, M.Z.I., Sarma, M., Islam, M.N., and Jahan, M. R., (2008). Macro anatomy of the bones of the limb of Black Bengal Goat (*Capra hircus*). Bangladesh journal of Veterinary Medicine, 6(1):59-66.