

# COMPARATIVE ANATOMY OF LONG BONES OF THE APPENDICULAR SKELETON OF YANKASSA SHEEP AND RED SOKOTO GOAT IN ZARIA METROPOLIS.

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## ABSTRACT.

Morphometry of the long bones of the forelimbs and hindlimbs were studied in Yankassa sheep and Red sokoto goat. A total of 10 goats and 10 sheep were used for the study. The lengths, and weights of the bones as well as the diameters of the proximal, distal extremities and mid-shaft were determined and compared between the two species using student's 't' test.

The results indicated that the bones of the Yankassa sheep were heavier and longer, with greater diameter than those of the Red Sokoto goats of the same age. The differences were not statistically significant ( $P > 0.05$ ). The result of the study also provided some basic anatomical data on the long bones of these species of ruminants and could be applied in approximating the sizes of intramedullary pins required for fixation of fractures.

KEY WORDS: Anatomy, small ruminant, Appendicular skeleton.

## INTRODUCTION

Bones are usually classified based on their structure (Sisson's and Grossman 1975). Long bones are typically of elongated cylindrical form with enlarged extremities. The cylindrical part of these bones called the shaft or body is tubular and encloses the medullary cavity, which contains the bone marrow (Banks, 1986). This portion of the bone is usually involved in one type of accident or the other. Repair of fractures resulting from such accidents usually involve the use of intramedullary pins (Bojrab, 1975).

Many workers have studied the anatomy of bones of ruminants (Forgarty and Thompson, 1974; Ema, 1976; Nowicki, 1974; Ojo, 1977). However, there are still limited information on the morphometry of the long bones of sheep and goat in general and Yankassa sheep and Red Sokoto goat in particular. Although it may seem easy to

identify the sheep from goat in the barnyard the same cannot be said of their dressed carcasses; thus the need for this study.

## MATERIALS AND METHODS

Pectoral and pelvic limbs of 10 goats (5 males and 5 females) and 10 sheep (5 males and 5 females) of about 24 months of age were collected from abattoir and necropsy rooms. The abattoir samples (5 goats and 5 sheep) were collected immediately after slaughter when the muscles (meat) might have been removed from the bones. While the samples collected from necropsy rooms (5 goats and 5 sheep) were from animals that died of diseases that have no apparent effect on the bones. The aging was based on dentition, using the eruption time and the rate of wear of the teeth as described by Clair,

(1960). The sheep were of Yankassa specie and the goats of Red Sokoto. These are the commonest species around Zaria in Northern Nigeria.

The limbs were cleansed by removing muscles fascia and tendons from the bone by severing their origins and insertions using scalpel blade, and strapping them out thereafter.

#### Processing of specimen:

Two macerating buckets – one for goats and the other for the sheep were used. The buckets were filled to the brim using tap water. This was allowed to stand for two weeks, after which the water was changed. Ten grams of calcium chloride was dissolved in each of the macerating buckets, which were refilled with water. This was left for another two weeks. The bones were collected and washed thoroughly with water. They were then allowed to dry for two days under the sun and thereafter boiled three times at a temperature of 100°C for five hours each time to remove the marrow and fats. They were again washed with vim using brush and were allowed to dry under the sun for three days.

Diameters of all the bones were measured at three different points – the proximal and distal extremities and the midshaft using vienier sliding calipers.

The lengths of the bones were measured using a thread and thereafter spreading the thread against a meter rule. While the weights were taken using a balance-ohaus scale. The lengths, weights and diameters of the long bones were compared between the two species using student's 't' test.

#### RESULTS

The values of the weights of the various bones are presented in table I, while the values of the lengths of the bones are presented in table II. The values of the diameters of the long bones are presented in table III. The values are given as means and standard error

#### TABLES

Table I: Weights of the Long bones of the Pectoral and Pelvic Limbs:

Weight (g) Mean $\pm$ SE Given		
	SHEEP	GOAT
Humerus	35.59 $\pm$ 0.001	29.81 $\pm$ 0.04
Radius/Ulna	34.11 $\pm$ 0.19	26.26 $\pm$ 0.41
Metacarpus	19.21 $\pm$ 0.88	12.26 $\pm$ 0.21
Femur	42.32 $\pm$ 0.99	32.25 $\pm$ 0.25
Tibia	35.51 $\pm$ 1.10	30.41 $\pm$ 0.05
Tarsus	22.41 $\pm$ 0.02	13.14 $\pm$ 0.03

Table II: Lengths of the Long Bone in Sheep and Goat

Length (cm) Mean $\pm$ SE Given		
	SHEEP	GOAT
Humerus	14.4 $\pm$ 0.99	13.0 $\pm$ 0.25
Radius/Ulna	20.02 $\pm$ 0.39	17.2 $\pm$ 0.29
Metacarpus	13.92 $\pm$ 0.33	9.56 $\pm$ 0.13
Femur	16.86 $\pm$ 0.16	15.48 $\pm$ 0.08
Tibia	10.81 $\pm$ 0.04	10.28 $\pm$ 0.14
Tarsus	13.78 $\pm$ 0.18	10.92 $\pm$ 0.32

of the mean.

#### Weight of the Bones:

The weights of the respective long bones in the Yankassa sheep were found to be heavier than that of the corresponding bones in the Red Sokoto goats. The differences were not statistically significant ( $P > 0.05$ ). Table I.

#### Length of the Bones:

The mean values of the lengths of the bones in the Yankassa sheep were higher than

Table III: Diameters of the Proximal, Distal Extremities and Midshaft

	Diameter (cm) Mean $\pm$ SE Given					
	SHEEP			GOAT		
	Proximal	Distal	Midshaft	Proximal	Distal	Midshaft
Humerus	2.3 $\pm$ 0.21	2.4 $\pm$ 0.11	1.71 $\pm$ 0.05	1.98 $\pm$ 0.06	1.96 $\pm$ 0.25	1.32 $\pm$ 0.11
Radius/Ulna	2.4 $\pm$ 0.03	2.5 $\pm$ 0.09	1.42 $\pm$ 0.08	1.96 $\pm$ 0.10	2.17 $\pm$ 0.13	1.38 $\pm$ 0.10
Metacarpus	1.98 $\pm$ 0.05	2.3 $\pm$ 0.15	1.16 $\pm$ 0.19	1.72 $\pm$ 0.28	2.22 $\pm$ 0.16	1.28 $\pm$ 0.09
Femur	2.26 $\pm$ 0.14	2.26 $\pm$ 0.12	1.56 $\pm$ 0.39	1.64 $\pm$ 0.83	1.68 $\pm$ 0.51	1.33 $\pm$ 0.44
Tibia	2.16 $\pm$ 0.12	1.96 $\pm$ 0.11	1.32 $\pm$ 0.67	1.76 $\pm$ 0.19	1.48 $\pm$ 0.22	1.21 $\pm$ 0.32
Tarsus	1.78 $\pm$ 0.06	2.14 $\pm$ 0.08	1.12 $\pm$ 0.33	1.29 $\pm$ 0.04	1.10 $\pm$ 0.21	0.99 $\pm$ 0.22

that of the corresponding bones in the Red Sokoto goat. These differences were not found to be statistically significant ( $P > 0.05$ ). Table II.

#### Diameters of the Bones:

The diameters of the proximal extremity, distal extremity and midshaft of the bones of the sheep were found to be higher than that of the corresponding bones in the goat. The differences were not statistically significant ( $P > 0.05$ ). Table III.

## DISCUSSION

In interpreting these results, it has to be emphasized that the animals were obtained from different sources without prior standardization.

The weights of the bones depend primarily on the electrolyte concentrations especially calcium and phosphorous. These electrolytes are not synthesized in the body, and will therefore depend on the mineral content of the feed, the level of feed intake and the availability of the mineral (Church and Kellems, 1988; Palson 1955). Since these two species are from the same environment and are both ruminants, the weight differences may be

related to differences in feed conversion efficiency among the species, which may be genetically explained. Littledike and Golf, (1987), reported that the availability of these minerals in the body depend on absorption from the gut, metabolic usage, homeostasis and excretion. Although these two animal species are ruminants, they may have different adaptation and food habit thus the differences in weight.

The differences so observed in the length of the long bones were determined by the closure time of the epiphyseal plate which is controlled by hormones and other genetic factors (Banks, 1986). From the result of the study, one may suggest that the growth plate of Red Sokoto goats close faster than that of the Yankassa sheep in Zaria environment. Further study need to be carried out to elucidate this assertion.

The diameter of the bone is dependent on the size of the bone. This study has provided the basic anatomical data on the length, weight, and diameter of the long bones of the forelimbs, and hindlimbs of the Red Sokoto goat and Yankassa sheep. If more work is done in this area of animal science, by attempting to establish the relationship between the weight, length, diameter of long

bones and size of the medullary cavity, it could be possible to establish readily, the sizes of intramedullary pins for these two species in cases of fixation of fractures.

The results obtained from this study indicate that the bones of Yankassa sheep are heavier, longer and with greater diameter than those of Red Sokoto goats.

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