

# Morphometric Studies on the One-Humped Camel Foetus (*Camelus dromedarius*)

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## Abstract

The relationships between the body dimensions, age and weight in the eighty-seven foetuses were determined. Each foetus was weighed and its body dimensions were measured using a string and a measuring tape. The sexes of the foetuses were determined by observing and recording the gonad type in the ventral caudal area. The age of each foetus was determined by measuring the crown-rump length. The mean ( $\pm$  SEM) weight of the foetuses ranged from  $50.7 \pm 7.4$  g -  $14350 \pm 3372$  g. The crown-rump length and body length of the foetuses varied from  $15.8 \pm 1.2$  cm -  $104 \pm 8.5$  cm and  $20.5 \pm 1.7$  cm -  $137 \pm 11.7$  cm, respectively. The tail length and neck length ranged from  $3.3 \pm 0.2$  cm -  $24.5 \pm 2.4$  cm and  $5.7 \pm 0.5$  cm -  $36.9 \pm 2.6$  cm, respectively. The relationships between the mean crown-rump length and body length of the foetuses were highly significant ( $P < 0.001$ ). The mean

crown-rump length of the foetuses were significant ( $P < 0.001$ ) correlated with age, body weight, body length, tail length and neck length. Body length was significantly ( $P < 0.001$ ) related to age, weight, tail length and neck length. The increase in tail length to neck length occurred at a fairly constant ratio of 1:8.

**Keywords:** Morphometric, Camel (*Camelus dromedarius*), Kano abattoir.

## Introduction

The camel (*Camelus dromedarius*) belongs to the family, *Camelidae*. This family is divided into three genera. The old-world camels-(i) genus *Camelus* the new world camel-(ii) genus *Lama* and (iii) genus *Vicugna* (Wilson and Reeder, 2005).

The mean gestation period of the camel is between 315-360 days (Puschmann, 1989) and May be up

to 370-375 days (Fazil and Hofmann, 1981; Arthur, 1992).

The dromedary camel (one-humped camel) is the most important animal to man in the semi-arid areas of Northern and Eastern Africa as well as in the deserts of the Arabian Peninsula. It is a multi-purpose animal, used for its supply of milk, meat, hides and for transport (Schwartz and Dioli, 1992; Farah, 2004; Kane *et al.*, 2005; Kadim *et al.*, 2008).

There is paucity of information on the developmental morphology of organs in the camels, including the lung

This study was conducted to determine the anatomical data of the camel foetus using readily available abattoir specimen.

## Materials and Methods

**Study area:** The study was carried out in Kano State. It is located in the North-Western part of Nigeria and covers an area of 20,131 km<sup>2</sup>. Kano State borders Katsina to the north-west, Jigawa State to the north-east, and Bauchi and Kaduna States to the south (Roger, 2009).

**Experimental Animals:** Eighty-seven foetuses were used for the study. They were collected immediately after their dam were slaughtered and the sex of each foetus was recorded.

**Morphometric Studies:** Foetuses were weighed to the nearest 0.1 g with weighing balance after being carefully dried with a clean towel. The following body dimensions were measured to the nearest 0.1 cm for each foetus using a string and a measuring tape.

Crown-rump

length

Body weight

Body length of the foetus

Tail length

Neck length

**Foetal Age Estimation:** The gestational age of each foetus was estimated using a formula described by Elwisy *et al.*, (1981) as follows:  $GA = (CRL + 23.99)/0.366$ . Where GA = Gestational age; CRL = Crown – rump length.

**Data Analyses:** All recorded values were expressed as means  $\pm$  standard errors of mean. The statistical package used was Graphpad prism Software, San Diego, California, USA

([WWW.Graphpad.com](http://WWW.Graphpad.com))

[WWW.Graphpad.co](http://WWW.Graphpad.co)). Values of  $P < 0.05$  were considered significant.

## Results

The age varied from  $108.7 \pm 3.3$  days to  $349.3 \pm 23.3$  days. The body length ranged from  $20.5 \pm 1.7$  cm to  $137 \pm 11.7$  cm, the crown-rump length ranged from  $15.8 \pm 1.2$  cm to

104 ± 8.5 cm while the weight of the foetuses ranged from 50.7 ± 7.4 g to 14350 ± 3372 g.

The tail length varied from 3.3 ± 0.2 cm to 24.5 ± 2.4 cm and the neck length ranged from 5.7 ± 0.5 to 36.9 ± 2.6 cm. (Table 1). In addition to the increase in age, body length and body weight, regular increase in tail length to neck length was observed at a fairly constant ratio of 1:8 (Table 3).

The crown-rump length and body length were significantly ( $P < 0.001$ ) and directly correlated. The crown-rump length of the camel foetus was significantly ( $P < 0.001$ ) and positively correlated with age, body length, body weight, tail length and neck length (Table 2).

## Discussion

The mean crown-rump length of the camel foetus ranging between 15.8 ± 1.2 cm to 104 ± 8.5 cm obtained in this study is less than that of 17.3 ± 0.4 cm to 116.7 ± 1.8 cm, reported by Hussein *et al.*, (1991). The mean body length of the camel foetus, which ranged between 20.5 ± 1.7 cm to 137 ± 11.7 cm in the present study, is less than the range of 22.4 ± 0.5 cm to 154.7 ± 3.2 cm, reported by Hussein *et al.* (1991). The body weight of the camel foetus was 48.6 ± 4.0 g to 20933.3 ± 2547.1 g and the values were different ( $P < 0.05$ ) from

the mean body weight of camel foetus (50.7 ± 7.4 g to 14350 ± 3372 g) obtained in this study. The differences in the dimension obtained in the present study and that of Hussein *et al.* (1991) may be due to the variation in size of the animals, environmental condition and nutritional factors (Sivachelvan *et al.*, 1996).

Body measurements steadily increased in the present study with increasing gestational age, and the crown-rump length was highly correlated ( $P < 0.01$ ) with gestational age ( $r = 0.9546$ ,  $P < 0.001$ ).

Therefore, the developmental age may be estimated from foetus crown-rump length. In addition, since the correlation obtained between crown-rump length and body length was high, body length may also be used to estimate camel foetal age. This finding is in agreement with the findings of Elwishy *et al.* (1981) and Hussein *et al.* (1991) who obtained a highly significant correlation between gestational age and body measurements, and showed that the estimation of foetal age is possible with a fair degree of accuracy. Elwishy *et al.* (1981) suggested equations that were used to estimate the age of the camel foetus in days (X) from a known body dimension.

The result obtained by Hussein *et al.* (1991) in the one-humped camel showed that the ratio of radius to tibia

lengths indicates that the rate of the growth of the bones remains constant in relation to one another throughout the period of gestation. However, in this study, in addition to increase in the crown-rump length, body length, age and body weight, regular increase in tail length and neck length were observed at a fairly constant ratio of 1:8. The result obtained in the present study demonstrated, for the first time, the relationships between the morphometric parameters of the one-humped camel in the foetus, and that the parameters are directly related. The findings of the present study have demonstrated that the morphometric parameters of the foetus in the camel may be used to determine not only the size of the foetus, but also many morphometric anatomical parameters that are of value in the determination of the age of the foetus, crown-rump length, body length, body weight, tail length and neck length, using the regression equations obtained. Of particular clinical significance is the determination of body weight and age of the foetus using the regression equations generated from the present study. Besides the clinical value of the equations, the data obtained in the present study may be of value in forensic veterinary medicine, involving the determination of some unknown morphometric anatomical data of the

foetus, especially the age in the camel.

## Conclusion

Base-line anatomical data of the camel foetus on weight, body length, crown-rump length, tail length and neck length were obtained to the best of our knowledge in Nigeria.

Body weight of camel foetus and other body dimension studied were highly correlated.

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**Table (1): Crown-rump, Body Weight, Body Length, Tail Length and Neck Length Length of the Camel Foetus (Mean  $\pm$  SEM)**

Crown-rump length Range	n	Crown-rump length (cm)	Age (Days)	Body length (cm)	Body weight (g)	Tail length (cm)	Neck length (cm)
10.5-19	7	15.8 $\pm$ 1.2 <sup>a</sup>	108.7 $\pm$ 3.3	20.5 $\pm$ 1.7	50.7 $\pm$ 7.4	3.3 $\pm$ 0.2	5.7 $\pm$ 0.5
20-25	9	23.1 $\pm$ 0.4 <sup>a</sup>	128.6 $\pm$ 1.1	30.9 $\pm$ 1.1	135.6 $\pm$ 13.3	5.1 $\pm$ 0.2	8.9 $\pm$ 0.4
26-37	29	33.6 $\pm$ 0.7 <sup>b</sup>	157.3 $\pm$ 1.9	43.3 $\pm$ 0.9	425.2 $\pm$ 29.1	7.0 $\pm$ 0.1	12.6 $\pm$ 0.4
38-44	14	42.0 $\pm$ 0.6 <sup>c</sup>	251.6 $\pm$ 71.4	54.2 $\pm$ 1.0	766.1 $\pm$ 50.2	9.0 $\pm$ 0.3	16.1 $\pm$ 0.3
45-54	12	49.0 $\pm$ 0.9 <sup>d</sup>	199.2 $\pm$ 2.5	64.0 $\pm$ 1.2	1427 $\pm$ 123.9	10.3 $\pm$ 0.3	18.9 $\pm$ 0.5
55-65	5	61.9 $\pm$ 1.1 <sup>a</sup>	234.4 $\pm$ 3.0	81.6 $\pm$ 1.7	2590 $\pm$ 202.1	13.5 $\pm$ 0.7	24.3 $\pm$ 1.3
66-80	5	71.1 $\pm$ 2.2 <sup>a</sup>	259.6 $\pm$ 5.7	93.2 $\pm$ 3.0	4360 $\pm$ 567.3	16.4 $\pm$ 1.1	27.7 $\pm$ 1.0
81-90	3	83.2 $\pm$ 1.4 <sup>e</sup>	293.6 $\pm$ 3.6	109.7 $\pm$ 2.0	7283 $\pm$ 683.9	20.5 $\pm$ 0.9	33.1 $\pm$ 1.0
91-125	3	104 $\pm$ 8.5 <sup>f</sup>	349.3 $\pm$ 23.3	137 $\pm$ 11.7	14350 $\pm$ 3372	24.5 $\pm$ 2.4	36.9 $\pm$ 2.6

a,b,c,d,e and f= Values with different superscript letters within the same column are statistically ( $P < 0.05$ ) significant.

n = Number of camel fetuses sampled

**Table (2): Relationships between Age and Body Dimension of the Foetus of the one-humped Camel (*Camelus dromedarius*) (n = 87)**

Correlated parameters	Correlation coefficients
Crown-rump length and age	0.9546***
Crown-rump length and body length	0.9999***
Crown-rump length and body weight	0.9170***
Crown-rump length and tail length	0.9968***
Crown-rump length and neck length	0.9948***
Body length and age	0.9523***
Body length and weight	0.9186***
Body length and tail length	0.9971***
Body length and neck length	0.9947***
Body length and crown-rump length	0.9999***

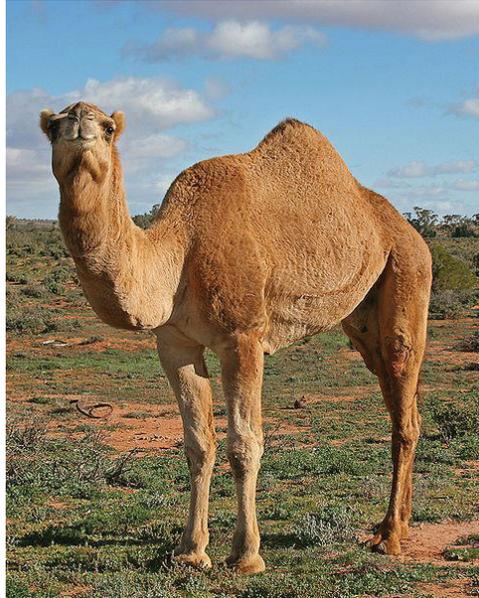
\*\*\* =  $P < 0.001$

**Table (3): Length of the Neck and Tail and the Neck:Tail Ratio during the Developmental Stages of One-humped Camel (*Camelus dromedarius*) Foetus.**

Range of Crown-rump Length (cm)	N	Average length		Neck: Tail Ratio
		Neck (cm)	Tail (cm)	
10.5 – 19	7	5.7 ± 0.5	3.3 ± 0.2	1.7
20 – 25	9	5.1 ± 0.2	8.9 ± 0.4	1.7
26 – 37	29	7.0 ± 0.1	12.6 ± 0.4	1.8
38 – 44	14	9.0 ± 0.3	16.1 ± 0.3	1.8
45 – 54	12	10.3 ± 0.3	18.9 ± 0.5	1.8
55 – 65	5	13.5 ± 0.7	24.3 ± 1.3	1.8
66 – 80	5	16.4 ± 1.1	27.7 ± 1.0	1.7
81 – 90	3	20.5 ± 0.9	33.1 ± 1.0	1.6
91 – 125	3	24.5 ± 2.4	36.9 ± 2.6	1.5

## Animal species in this issue

### One-humped came (*Camelus dromedaries*)



Kingdom: Animalia, Phylum: Chordata, Class: Mammalia, Oder: Artiodactyla. Family: Camelidae, Genus: *Camelus*

**Camel** is an even-toed ungulate within the genus ***Camelus***, bearing distinctive fatty deposits known as humps on its back. There are two species of camels: the dromedary or Arabian camel has a single hump, and the Bactrian camel has two humps. They are native to the dry desert areas of West Asia, and Central and East Asia, respectively. Both species are domesticated to provide milk and meat, and as beasts of burden.

The average life expectancy of a camel is 40 to 50 years. A fully grown adult camel stands 1.85 m at the shoulder and 2.15 m at the hump. The hump rises about 30 inches (76.20 cm) out of its body. Camels can run at up to 65 km/h (40 mph) in short bursts and sustain speeds of up to 40 km/h (25 mph).

Fossil evidence indicates that the ancestors of modern camels evolved in North America during the Palaeogene period, and later spread to most parts of Asia. Humans first domesticated camels before 2000 BC.

Camels are able to withstand changes in body temperature and water content that would kill most other animals. Their temperature ranges from 34 °C at night and up to 41 °C during the day, and only above this threshold will they begin to sweat.