

SOME BIOMETRIC DIMENSIONS OF THE FEMALE REPRODUCTIVE TRACT OF THE CAMEL (CAMELUS DROMEDARIUS) IN NORTH WESTERN NIGERIA

M. A. UMARU and U.M. MERA

Department of Veterinary Medicine, Surgery and Theriogenology,
Usmanu Danfodiyo University, Sokoto -- Nigeria.

Abstract

A total of 500 ovaries from 250 female camels (150 non pregnant and 100 pregnant) were measured. In the non pregnant camel, the mean value of the left ovaries were found to be 3.18 ± 0.78 cm in length, 2.23 ± 0.50 cm in breadth, 1.12 ± 0.19 cm in thickness and 4.13 ± 0.63 g in weight. Corresponding values for the right ovaries were 2.96 ± 0.61 cm, 1.89 ± 0.35 cm, 0.94 ± 0.81 cm and 3.0 ± 0.61 g respectively. However, in the pregnant animals, the left ovaries had a mean length of 3.14 ± 0.57 cm, a mean breadth of 2.35 ± 0.58 cm, a mean thickness of 0.97 ± 0.28 cm and weight of 5.48 ± 0.78 g while the right ovaries had mean values of 4.51 ± 0.97 cm, 2.62 ± 0.40 cm, 1.33 ± 0.28 cm and 11.13 ± 0.52 g for length, breadth, thickness and weight respectively. A hundred and fifty animals were used for the dimensional measurements involving the uterine horns, body, cervix and vagina. The mean values for the left non pregnant uterine horns were 9.86 ± 1.38 cm for length and 4.43 ± 2.48 cm for diameter while the values for the right non pregnant uterine horns were 6.56 ± 0.9 cm in length and 3.39 ± 0.7 cm for diameter. However, mean dimensions for the pregnant uterine horns are for the left uterine horns: length 38.2 ± 6.54 cm and diameter 15.8 ± 2.62 cm. While the right uterine horns in the pregnant animal were: length 13.66 ± 4.16 cm and diameter 7.99 ± 1.61 cm. The mean values for the cervix in the non-pregnant camels are: length of cervix 4.92 ± 1.06 cm, length of external os of cervix, 1.95 ± 1.50 cm; diameter of external os, 2.10 ± 0.40 cm and the diameter of internal os, was 0.62 ± 0.20 cm. The mean dimensions of the adult pregnant camel cervix were obtained thus: length of cervix 5.29 ± 1.27 cm, length of external os, 1.16 ± 0.55 cm, length of internal os, 1.98 ± 0.66 cm, and the diameter of internal os, 0.57 ± 0.19 cm. For the uterine body, the non pregnant corpus uteri had a mean length of 9.59 ± 2.27 cm and a width of 4.94 ± 0.56 cm, and the pregnant corpus uteri had a mean length of 43.90 cm, and a mean width of 18.13 ± 5.88 cm. A statistically significant difference was found to exist ($p < 0.05$) in all the various dimensions of the ovaries, uterine horns, uterine body and the cervix for pregnant and non pregnant animals.

Keywords: Biometry. Reproductive Tract. Camel. Nigeria.

Introduction

The biometric study of the anatomical structure of the female reproductive tract provides a very useful tool in the understanding of several physiological and reproductive phenomena in animals. Such a study provides the scientific basis for the proper understanding and identification of any abnormality in the reproductive tract of the camel.

Researchers in several countries have examined the anatomical structures of the female genitalia of the camel and have documented their findings (Shalash, 1965; Chahrasbi *et al.* 1975; Smuts and

Bezuidenhout, 1987; Abdo *et al.* 1986; El-Wishy, 1992; Chen and Yuen, 1984; Nur, 1984; Arthur *et al.* 1982; Mukasa-Mugerwa, 1981).

The fact that such factors like season, age, physiological status, and management systems influence the size of the genital organs of female camels, the results of similar studies carried out elsewhere outside this country may not be totally extrapolated and used for our camels. This forms the rationale for this study which aims at providing some information on the dimension of the reproductive tract of the camel in North Western Nigeria, an information that is not presently

able.

Materials and Method

Reproductive organs from 250 female camels (*C. dromedarius*) were obtained from Sokoto abattoir after severing the ischial arc and carefully removing the organs using a pair of scissors; a scalpel and a blade were used to incise, excise, separate or debride various segments of the reproductive tract for measurements. A plastic measuring tape was used to measure lengths along the tract. Smaller lengths such as length, breadth and thickness of the ovaries were measured using a Draper No.VC6-Vernier calliper, the length and breadth of the internal and external os were also measured with this instrument. The weights were measured using a Mettler P.M. 16-K digital weighing machine.

Ovarian measurements: The length, breadth and thickness of the left and right ovaries of all the organs were taken in centimeters. The length of an ovary was taken as the distance between the anterior and posterior poles of the ovary. The thickness as the distance between the medial and lateral surfaces of the ovary and the breadth as the distance between the attached and the free border of the ovary.

Uterine horns measurements: The length and breadth of the right and left horns were taken. The length being the distance from the middle of the point of bifurcation to the tip of the uterine cornua. The breadth of the lumen is the distance between the two walls of the uterine horn at its midpoint.

Uterine body: The uterine body was measured for

length and breadth. Length is the distance from the tip of the internal Os of the cervix to the point of bifurcation.

Breadth is the distance of greater diameter from the left to the right.

Cervix: Length was measured. The length was taken as the distance between the tip of the cervical folds of the external os and those of the internal os.

External and internal os of cervix: The lengths and the diameters of both were taken. The length is the distance between the tip of the cervical fold on either side to the point of the cervical canal. The diameter of the lumen of the internal os and external os was also taken.

The Student 't' test was used to test the differences between dimensions in pregnant and those of non pregnant animals. The differences between the left and right uterine horns were also tested.

Results

The left ovary in the adult non-pregnant animal is 3.18 ± 0.78 cm in length, 2.23 ± 0.50 cm in breadth, 1.12 ± 0.19 cm in thickness and 4.13 ± 0.63 g in weight. While the right ovary was found to be 2.96 ± 0.61 cm in length, 1.89 ± 0.35 cm in breadth, 0.94 ± 0.18 cm in thickness and 3.00 ± 0.61 g in weight (Table 1). The mean dimensions and weight of right ovaries in the pregnant camels were found to be 3.14 ± 0.57 cm in length, 2.35 ± 0.53 cm in breadth, 0.97 ± 0.28 cm in thickness with a mean weight of 5.48 g and the left was found to be 4.51 ± 0.97 cm, 2.62 ± 0.40 cm, 1.33 ± 0.28 cm and 11.13 ± 0.52 g. (Table 1).

In the non-pregnant camel, the left uterine horn

Table 1: Mean dimensions and weights of ovaries in pregnant and non pregnant camels (*C. dromedarius*)

Dimension	Pregnant (100)*		Non Pregnant (150)*	
	Right Ovary	Left Ovary	Right Ovary	Left Ovary
Length (Cm)	3.14 ± 0.57	4.51 ± 0.97	2.96 ± 0.61	3.18 ± 0.78
Breadth (Cm)	2.35 ± 0.53	2.62 ± 0.40	1.89 ± 0.35	2.23 ± 0.50
Thickness (Cm)	0.97 ± 0.28	1.33 ± 0.28	0.94 ± 0.18	1.12 ± 0.19
Weight (g)	5.48 ± 0.78	11.13 ± 0.52	3.00 ± 0.61	4.13 ± 0.63

* Figures in the brackets indicate the number of camels studied in each group.

There is a statistically significant difference between the pregnant and non pregnant parameters ($p < 0.05$)

is 9.86 ± 1.38 cm in length and 4.43 ± 2.48 cm in diameter. The right uterine horn has a mean length of length 6.56 ± 0.9 cm and diameter of 3.39 ± 0.7 cm. In the pregnant camel on the other hand the left uterine horns measure 38.2 ± 6.5 cm in length and a diameter of 15.8 ± 2.6 cm while right uterine horns have mean a length of 13.66 ± 4.16 cm with a diameter of 7.99 ± 1.61 cm (Table 2).

is of the order of 15mm x 30mm x 35mm and its weight is between 5 and 15gm. It has been said that the size and weight depend to some extent on its activity (Shalash and Nawito, 1964). The left ovaries in this study were found to have a length of 3.18 ± 0.78 cm, breadth of 2.23 ± 0.50 cm, a thickness of 1.12 ± 0.19 cm and a weight of 4.13 ± 0.63 gm, while the right ovaries had a length of 2.96

Table 2: Mean dimensions of uterine horns in pregnant and non pregnant camels (*C. dromedarius*)

Parameter	Pregnant (55)*		Non Pregnant (100)*	
	Right Uterine Horn	Left Uterine Horn	Right Uterine Horn	Left Uterine Horn
Length (cm)	13.66 ± 4.16	38.2 ± 6.54	6.56 ± 0.9	9.86 ± 1.38
Diameter (cm)	7.99 ± 1.61	15.8 ± 2.62	3.39 ± 0.7	4.43 ± 2.48

* Figures in the brackets indicate the number of camels studied in each group.

there is significant difference ($p < 0.05$) between the dimensions in pregnant camels and non pregnant camels also in the dimensions of the right uterine horn compared to those of the left in each group

The mean dimensions of non-pregnant corpus uteri are 9.59 ± 2.27 cm for length and 4.94 ± 0.56 cm for width. The pregnant uteri have a mean length of 43.90 ± 9.03 cm and a width of 18.13 ± 5.38 cm (Table 3). Using the student 't' test a significant difference ($p < 0.05$) was found between the dimensions of the right and left non pregnant uteri and likewise between the pregnant and non uterine dimensions.

The measurements for the cervix are given in Table 4. The length being 4.92 ± 1.06 cm, the length of the external os is 1.95 ± 1.50 cm, the diameter of the external os is 2.10 ± 0.34 cm, the length of the internal os is 0.91 ± 0.40 cm and the diameter of the internal os is 0.62 ± 0.20 cm. The cervix of the pregnant camel measures 5.29 ± 1.27 cm in length. The external os has a length of 1.16 ± 0.55 cm and a diameter of 1.598 ± 0.5925 cm. The internal os has a length of 1.98 ± 0.66 cm and a diameter of 0.57 ± 0.19 cm. A statistically significant difference was found to exist ($p < 0.05$) in the various dimensions of the cervix for the pregnant and non pregnant animals.

Discussion

The ovaries (in the absence of pregnancy) are flattened, lobulated and reddish brown, each enclosed in an ovarian bursa. The size of the ovary

± 0.61 cm, breadth of 1.59 ± 0.35 cm, thickness of 0.94 ± 0.18 cm and a weight of 3.0 ± 0.61 gm.

The above findings are in agreement with the measurements conducted by Ribadu (1988), in which he recorded higher values for the left than for the right ovaries. From the foregoing, it could be seen that the left ovaries gave higher values than the right ovaries. This had also been noted by several workers (Chen and Yuen, 1984; Musa and Abusineina, 1976). In the female camel, the left ovaries appear to be much more active than the right, they are also observed to bear more follicles and corpora lutea than the right. According to Shalash (1965) and Musa and Awa Sineina (1976) about 99% of the pregnancies are from left horn. The left horn is found to be naturally larger than the right in the non-pregnant camel. Moreover, the left uterine horn is reported to be larger even in the foetus. All these are suggestive of the natural activity of the left ovaries and the uterine horns. Hence, the higher values and what have been reported by Shalash (1965), Chahrasbi *et al* (1975), Nur, (1984), Joshi *et al* (1978) and Smut and Bezuidenhout (1987). A statistically significant difference ($p < 0.05$) was observed in this study between the right and the left.

However, it was found in the present study that

availall the dimensions increased during pregnancy. The increase is up to about 300% in the case of the ovarian weight. This of course is due to hormonal activities during pregnancy. In almost all the earlier reports, no deliberate attempt was made to differentiate measurements obtained from the pregnant and non-pregnant animals. There is a need to emphasize here that measurements conducted in this investigation did not classify gestational stage. This could be a limitation of this study. Gravid reproductive tracts were measured without discrimination.

The non-pregnant uterine horn in this study was found to have a dimension 9.86 ± 1.38 cm in length and diameter of 4.43 ± 2.48 cm, while the right uterine horn have a length of 6.5 ± 0.9 cm and a diameter of 3.39 ± 0.70 cm. These values are lower when compared with those of Ribadu (1988) and Shalash (1965). These differences may be due to breed differences and physiological states of the animals. The uterine horn diameters at the base of the horn as reported by Ribadu (1988) was 4.64 ± 1.23 cm for the left horn and 3.79 ± 0.98 cm for the right and are in consonance with values obtained in this study and also agree with the result obtained by Shalash (1965), who gave the left and right uterine horn diameters as 4.29 ± 0.90 cm and 3.73 ± 0.63 cm respectively. Mean dimensions for the pregnant uterine horns show massive extension of the structure during pregnancy with a length of 38.2 ± 6.54 cm and a diameter of 15.8 ± 2.62 cm recorded for the left and for the right a length of 13.66 ± 4.16 cm and a diameter of 1.99 ± 1.66 cm. This increase is enormous (Table 2). The differences in the mean values of the left and right uterine horns may be related to the pregnancy occurring in the left horn and this is in agreement with the findings of Shalash (1965) who reported that most pregnancies in camel are recorded in the left uterine horn.

Mean values obtained in this study for the length and width of the non-pregnant uterine body are higher than the values reported by Ribadu (1988) and Shalash (1965). The uterine diameters recorded in the present study are 4.99 ± 0.01 cm and 3.73 ± 0.63 cm for the left and right horns respectively. The differences may be due to breed differences, for differences do exist between the breeds of camels slaughtered in the Kano area and those slaughtered around the Sokoto basin. Those

slaughtered around the Kano area where Ribadu (1988) conducted his study are mostly heavier breeds, light brown to white in colour while those slaughtered in the Sokoto metropolitan abattoir are lighter, taller and mostly pied in color. The weight of the uterus is greatly increased during period of activity as in pregnancy when compared with periods of inactivity. The pregnant uterus could measure up to 43.90 ± 9.03 cm in length and 18.13 ± 5.88 cm in width as was found in this study. This is an enormous increase in comparison with non-pregnant uteri. Parity is also reported to affect the size of the uterus (Shalash, 1965).

Mean dimensions of the non-pregnant camel cervix in this study agrees with earlier reported measurements by Ribadu (1988) Shalash (1965), and Mukasa-Mugerwa (1981). Only slight variations exist between the values for cervical diameter. No measurements were taken for weight because of apparent difficulty in neatly separating various structures of the reproductive tract.

The vagina was found to have mean length and diameter of 27.5 ± 5.30 cm and 7.35 ± 1.37 cm respectively. These figures are slightly higher than those of Ribadu (1988), but in close agreement with value given by Nur (1984) but slightly lower than value recorded by Tayeb (1953).

Pregnancy has the effect of greatly enlarging almost all parts of the reproductive tract of the female camel, perhaps that explains the significant statistical difference ($p < 0.05$) existing between the pregnant and non pregnant organs in all the samples.

The lasting impressions gestational changes make on these organs are what account for the morphometric differences observed between the genitalia of the primiparas and the pluripara.

It is concluded that the mean values obtained in this study were essentially in agreement with similar studies elsewhere. However, it was observed that some physiological state (pregnancy) and breed of the animal could account for some recorded differences in the measurements taken.

Table 3: Mean dimensions of uterine body in pregnant and adult non pregnant camels (*C. dromedarius*)

Dimension	Pregnant (100)*	Non Pregnant (55)*
Length (cm)	43.90 ± 9.03	9.59 ± 2.27
Diameter (cm)	18.13 ± 5.88	4.94 ± 0.56

* Figures in the brackets indicate the number of camels studied in each group. There is significant difference between the dimensions in pregnant and those of the non pregnant uteri ($p < 0.05$).

Table 4: Mean dimensions of the cervix in pregnant and non pregnant camels (*C. dromedarius*)

Dimension	Pregnant Uteri (55)*		Non Pregnant Corpus Uteri (55)*	
	External Os	Internal Os	External Os	Internal Os
Length (cm)	1.16 ± 0.55	1.98 ± 0.66	4.92 ± 1.06	2.10 ± 0.34
Diameter (cm)	1.60 ± 0.59	0.57 ± 0.19	0.91 ± 0.40	0.62 ± 0.20

* Figures in the brackets indicate the number of camels studied in each group. There is statistically significant difference between the dimensions of the cervix in the pregnant and those of the non pregnant camels ($p < 0.05$).

References

- Abdo, M.S; Al Janabi, A.S. and Al—Kawafi, A.A. (1968). Studies on the Ovaries of the Female Camel during the Reproductive Cycle and in Conditions affected by Cysts. *Cornell Vet.* 59: pp.418-425
- Arthur, G.H; Noakes, Q.E. and Pearson, H. (1982) *Veterinary Reproduction and Obstetrics (Theriogenology)* 5th Ed. Bailliere Tindall, London. pp.483-487.
- Chahrasbi, H; Radmehr, B. and Goubazhagh, F. (1975). Anatomy and Histology of the Reproductive Organs of the Iranian Camel (*C. dromedarius*) I: Ovary. *J. Vet Fac. Univ. Tehran* 30(4) : 42-50.
- Chen, B.X. and Yuen, Z.X. (1984). Pregnancy diagnosis by rectal examination in the Bactrian camel. In: *The Proc. of Khartoum Workshop on Camels. The camelid An all Purpose Animal* vol.1 Dec.1979 Ed. Wross Cockril. Scandinavian institute of African studies, Uppsala.
- El-Wishy, A.B. (1992). Functional Morphology of the Ovaries of the Dromedary. *Proc. 1st Int. Camel Conf.* Dubai 149-154.
- Mukasa—Mugerwa, E. (1981). *The Camel (C. dromedarius). A Bibliographical Review.* LCA, Addis Ababa. pp.1-10
- Musa, B.E. and Abusineina, M.E. (1976). Some Observations on Reproduction in the Female (*Camel dromedarius*). *Acta Vet.* 26, 63-67.
- Nur, H. M. (1984). Some Reproductive Aspects and Breeding Pattern of the Somali Camel In: *Camel Pastoralism in Somalia. Proc. From Workshop, Baydhabo April 8 - 13. Workshop Paper, No. 7.*
- Ribadu, Y. A. (1988). Morphologic, Pathologic and Histologic Studies on the Female Reproductive Tract of the Camel (*C. dromedarius*). A Masters Thesis. Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria, Nigeria.

- Shalash, M. R. (1965). Some Reproductive Aspects in the Female Camel. *W.H. Rev. Anim. Prod.* 4: 103-108.
- Shalash, M. R. and Nawito, M. (1964). Some reproductive aspects in the female camel *Proc. Of the 5th Int. Cong. Anim. Reprod. Art. Insem.* (Trento), Vol. 2: 263-267.
- Smuts, M. M. S. and Bezuidenhout, A. J. (1987). *Anatomy of the Dromedary*. Clarendon Press, Oxford. pp. 25-55.
- Tayeb, M.A.F. (1953). Transl. Blin., P.C. Les organes genitaux de la chamelle. *Rev. Elev. Med. Vet. pays. Trop.* 6: 17-21.