Morphometric Study on the Developing Female Reproductive System of the Dromedary (Camelus dromedarius)

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Abstract

The study was conducted to understand the normal morphometry of the development of female reproductive organs of the dromedary (Camelus dromedarius). Reproductive organs of apparently normal fetuses (n = 24) were collected from Maidaiguri metropolitan abattoir after the slaughter of pregnant dromedary cows. The fetus was aged and grouped into 2–4 months, 4–7 months, 7–10 months, and 10–13 months, representing quarters of pregnancy. The reproductive systems were dissected out of the fetuses, and all the organs were measured by using standard measurement techniques. All the parameters measured increased chronologically. In the fourth quarter, the left and right horn measured 7.50 ± 0.79 cm, and 5.80 ± 0.79 cm, respectively, the uterine body, cervix, vagina, and vestibule measured 4.28 ± 0.17 cm, 4.69 ± 0.09 cm, 6.75 ± 0.21 cm, and 3.68 ± 0.19 cm, respectively, whereas the whole reproductive tract measured 57.73 ± 1.04 cm. The uterine body and uterine horn had the longest and shortest lengths. The developmental pattern of the female reproductive organs in the dromedary camel reported in this study is the first of its kind. The knowledge of the developmental pattern of the reproductive structures will aid in understanding reproductive cycles, congenital anomalies, and their etiology so that the anomalies can be treated.

Keywords: Camel, cervix, fetus, ovary, uterus, vagina

Introduction

Camels belong to the family Camelidae and the genera Camelus (the old-world camel), Lama (the new-world camel), and Vicugna (Wilson & Reeder, 2005). The genus Camelus comprises two species Camelus dromedarius (one-humped or Arabian camel) and Camelus bactrianus (two-humped camel). The one-humped camel, also called the dromedary, is well adapted to the climatic conditions of arid steppes and deserts and can go several days without water by concentrating its urine (Gebreyohanes & Assen, 2017).

Camel population in the world has been estimated at 25 million heads (FAOSTAT, 2009), the bulk (>80%) of which is found in Africa (Faye, 2015). There had been a steady increase in the number of camels in Nigeria especially in the Northern region where their importance as traditional means of transportation and agricultural production cannot be overlooked despite modern transportation systems and machineries (Nwosu et al., 2003). The population of dromedary in Nigeria was 20,500 heads of camel (FAOSTAT, 2013).

There has been increasing interest in camel research lately, due to its ability to survive and reproduce in harsh and hostile environments. Proper documentation on its breeding characteristics, pregnancy, and parturition and components of the female reproductive system have been studied (Elwishy, 1988). However, there has been little information on the prenatal development of this system. Therefore, this study was aimed at documenting information on the developing female reproductive system of the dromedary.

Methods

A total of 24 fetal dromedaries from apparently healthy pregnant dromedary cows were collected from the Maidaiguri metropolitan abattoir after slaughter. Their body weights (kg) and crown-rump length (cm) were measured using the diamond spring balance, 100% spun polyester sewing thread (Two birds brand®) and a superior tailoring rule (Butterfly brand®), respectively. Each fetus was aged and assigned to its appropriate age group using the crown-rump length and body weight measurements and developmental horizons adopted from Jaji et al. (2011).
The developing reproductive organs were collected immediately after evisceration. Scalpels and blades were used to incise, excise, separate, and debride the organs. One hundred percent spun polyester sewing thread (Two birds brand®) and a superior tailoring rule (Butterfly brand®) were used to measure lengths along the ovaries, uteri, vagina, and vestibules, as adopted from Jaji et al. (2012).

Results

It was evident from the present study that the sex of the female dromedary fetus could be well identified by its external features as early as the first phase of development (2–4 months of intrauterine life). During this stage, separate vulvar and anal openings as well as prominent clitoris could be seen (Figure 1). The caudal row of its mammary gland teats has started bulging (Figure 2). Internally, the fetal tubular genitalia were well established by 4–7 months (Figure 3) but functionally immature. Before birth, the ovaries descended from below the kidneys to the pelvic brim adjacent to the uterine tubes. The cervix had definite transverse folds, and the vagina contained much mucus within its cavity. The prenatal ovaries studied were observed to be ovoid (Figure 3). The lengths of right and left ovaries, respectively, measured $1.18 \pm 0.10$ cm and $1.13 \pm 0.06$ cm in the first phase of prenatal life. These sizes significantly increased ($p < .05$ and .005) during the remaining phases. However, the right ovary recorded a relatively insignificant increase in size during the second phase of development (Table 1).

In the same vein, the ovarian diameters of the right and left ovaries showed the same levels of significance in their increases along the phases of development, from the initial respective $1.04 \pm 0.07$ cm and $0.86 \pm 0.09$ cm recorded for the first phase of intrauterine life. The left and right ovaries showed a significant increase ($p < .005$) in weight till full term from the initial $0.15 \pm 0.02$ cm and $0.13 \pm 0.03$, recorded for the first phase of intrauterine life. Segments of the tubular reproductive tract studied (from the uterine horns to the vestibule) also showed a similar pattern of increase in size (Table 2).

Discussion, Conclusion, and Recommendations

This study documented the morphometry of the developing reproductive system of the female dromedary fetus. Without giving consideration to time events, the pattern of development of the female reproductive tract of the dromedary fetuses in this study has some
The knowledge of the developmental pattern of the reproductive organs in the dromedary camel reported in this study is the first of its kind. The developmental pattern of the female reproductive organs in the Buffalo (El-Ghannam & El-Naggar, 1974). A similar age-related morphology of prenatal ovaries has been observed (Abdel-Elrazik et al., 2013) who grossly observed that the prenatal ovaries observed were similar to the report of Srikandakumar et al. (2003), and these folds facilitate the function of the cervix and prevent access of foreign bodies such as bacteria and viruses into the uterus (Prange & Duby, 2007). In this study, the uterine body had the shortest length, which disagrees with the work of Srikandakumar et al. (2003) who reported cervix anomalies, and their etiology so that the anomalies can be treated (Abdel-Elrazik et al., 2013).

Table 1
Morphometrics and Weights of Fetal Dromedary Ovaries

<table>
<thead>
<tr>
<th>Approx. Age in Months</th>
<th>Left Ovary</th>
<th>Right Ovary</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Length (cm)</td>
<td>Diameter (cm)</td>
</tr>
<tr>
<td>2–4</td>
<td>1.18 ± 0.10</td>
<td>1.04 ± 0.07</td>
</tr>
<tr>
<td>4–7</td>
<td>1.46 ± 0.06*</td>
<td>1.21 ± 0.05*</td>
</tr>
<tr>
<td>7–10</td>
<td>1.52 ± 0.12**</td>
<td>1.45 ± 0.11**</td>
</tr>
<tr>
<td>10–13</td>
<td>1.82 ± 0.23**</td>
<td>1.60 ± 0.13**</td>
</tr>
</tbody>
</table>

Note: *Significant at .05. **Significant at .005.

Table 2
Morphometric of Fetal Female Reproductive Tract in Dromedaries

<table>
<thead>
<tr>
<th>Approx. Age in Months</th>
<th>Uterine Horn (cm)</th>
<th>Uterine Body (cm)</th>
<th>Cervix (cm)</th>
<th>Vagina (cm)</th>
<th>Vestibule (cm)</th>
<th>Whole Tract (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2–4</td>
<td>4.10 ± 0.06</td>
<td>3.66 ± 0.15</td>
<td>2.56 ± 0.10</td>
<td>3.07 ± 0.10</td>
<td>4.95 ± 0.15</td>
<td>2.47 ± 0.10</td>
</tr>
<tr>
<td>4–7</td>
<td>4.44 ± 0.17**</td>
<td>4.15 ± 0.15**</td>
<td>2.85 ± 0.11*</td>
<td>3.15 ± 0.10</td>
<td>5.20 ± 0.09*</td>
<td>2.70 ± 0.14*</td>
</tr>
<tr>
<td>7–10</td>
<td>6.33 ± 0.37**</td>
<td>6.22 ± 0.57**</td>
<td>3.66 ± 0.40**</td>
<td>4.23 ± 0.25**</td>
<td>6.23 ± 0.08**</td>
<td>3.35 ± 0.14**</td>
</tr>
<tr>
<td>10–13</td>
<td>7.50 ± 0.86**</td>
<td>5.80 ± 0.79**</td>
<td>4.28 ± 0.17**</td>
<td>4.69 ± 0.09**</td>
<td>6.75 ± 0.21**</td>
<td>3.68 ± 0.19**</td>
</tr>
</tbody>
</table>

Note: *Significant at .05. **Significant at .005.

The ovoid prenatal ovaries observed were similar to the report of Abdel-Elrazik et al. (2013) who grossly observed that the prenatal camel gonads are of three forms that could not be sexually determined: oval, circular, or bean-shaped. The last two are seen in older ages. A similar age-related morphology of prenatal ovaries has been observed in the Buffalo (El-Ghannam & El-Naggar, 1974).

The developmental pattern of the female reproductive organs in the dromedary camel reported in this study is the first of its kind. The knowledge of the developmental pattern of the reproductive structures will aid in understanding reproductive cycles, congenital anomalies, and their etiology so that the anomalies can be treated (Abdel-Elrazik et al., 2013).

Ethics Committee Approval: This study was approved by the Institutional Animal Care and Use Committee, University of Ilorin. (Date: January 10, 2019, Ref.: FVERC/W0Q9/11).

Peer Review: Externally peer-reviewed.


Conflict of Interest: The authors have no conflicts of interest to declare.

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References

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