

Prevalence of female genital tract disorders of ovaries and fallopian tubes in one-humped camels in Maiduguri, Nigeria using abattoir samples

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ABSTRACT

The present study examined a total of one hundred and fifty (150) genital tracts of female dromedary camels (*Camelus dromedarius*) in Maiduguri abattoir for ovarian and fallopian tube disorders and different pathological lesions recorded were 27 cases, equivalent to 18.0% prevalence. Assessment and measurement of the genital tracts identified obvious gross lesions based on appearances, type of lesion, location and frequency of occurrence. Luteal cysts, catarrhal salpingitis, hemorrhagic cyst, ovarian hydro-bursitis and suspected case of granulosa cell tumour were detected. Follicular tube cysts both as unilateral and bilateral and as singles or multiples were also detected. Four of the cysts were observed on the left ovary, one on the right ovary and a multifocal was observed on both ovaries. The luteal cysts were thick walled. The luteal cysts were mostly seen in the left ovary representing 12 of the 16 cases while the remaining 4 cases were associated with the right ovary. A case of hemorrhagic cyst was recorded. Ovarian hydro-bursitis was recorded as a single case. A suspected granulosa cell tumor was observed in the left ovary. The study affirmed that ovarian and fallopian tube abnormalities are common findings in one-humped female camels although camels can withstand lots of stress associated with infectious and non-infectious diseases. These pathologies are possible causes of reduced fertility in one-humped camel in the study area.

Keywords: Camel, disorder, fallopian tube, female, one-humped, ovary

INTRODUCTION

Dromedaries are domesticated animals, mostly living in the Horn of Africa, the Sahel margin of the Middle East and South Africa. The Horn of Africa region alone has the largest concentration of camel in the world. In Nigeria, camels are found mainly in the Semi-arid Northern part including Borno, Yobe, Jigawa, Katsina, Sokoto, Kebbi and Zamfara States (Abdussamad *et al.*, 2011). According to an estimate by Yadav *et al.* (2015), the percentages of most camels are one-hump camel (*Camelus dromedarius*) while the two-hump camel (*Camelus bactrianus*) represent a lesser percentage. North and West Africa as well as Asia of hot desert are natural habitats of the dromedary camel, while Bactrian camel inhabited mostly the cold desert of Asia.

The reproductive tracts disorders in dromedary camels are of great economic importance in Camelidae industry as it contributes to infertility. Genital tract disorders are usually associated with repeat breeding, early embryonic death, foetal loss, and abortion (Wajid, 2015). The reproductive tract abnormalities have high impact on sexual activity and fertility in female dromedary camels and adequate

knowledge of factors related to the reproductive disorders is so important towards understanding the variability, prevalence and features of these anomalies. The reproductive importance of camels depends on proper management; adequate nutrition and more weight whereas infertility of the female dromedary camel has been attributed to the pathological issues (Wajid, 2015). However, dromedary camel reproductive efficiency is low compared to other domesticated species (Dawood & Hameed, 2018). This is probably due to recurrence of disorders of the reproductive tract in this species of animals. It has been reported that female camels in poor condition are prone to ovarian pathologies and low fertility especially under harsh environmental conditions (Wajid, 2015).

Ovarian hydro-bursitis is an abnormality of the ovarian bursa characterized by accumulation of variable amount of fluid with encapsulation of the ovary. Ovarian hydro-bursitis is responsible for a long-standing infertility problem in the ovary (Tibary & Anouassi 2000; Ali *et al.*, 2011). Fallopian tube is a component of normal female reproductive tract. Disorders of fallopian tube result in the occlusion of the

lumen preventing fertilization or creating an undesirable environment for fertilization. A unilateral disorder of the fallopian tube results in infertility. However bilateral disorders result in the sterility of the animal affected. Disorders of the oviduct include Salpingitis, hydrosalpinx, pyosalpinx and adhesion (Rhaman *et al.*, 2012). Salpingitis refers to the inflammation in one or both fallopian tube and is a common cause of female infertility because it often results in blockage of the tube. The term hydrosalpinx refer to the condition in which fluid is filled with inflammatory fluid and end result is pelvic infection. Due to these infections, the tube becomes inflamed which even after treatment, it may be blocked due to the presence of residual fluid inside. The build-up of fluid continuously over time dilates the tube more resulting in hydrosalpinx of various sizes (Kovacs, 2022).

An ovarian cyst occurs when fluid accumulates within a thin membrane inside the ovary. The fluid field sac of the ovary is known as ovarian cyst (William *et al.*, 2018). Ovarian cysts are described according to the structure involved and the appearance (Tibary & Anouassi, 2000). These are fluid filled structures located in the broad ligament near the ovary or oviduct. Para ovarian cyst is suspected to arise from persistent embryonic structures which are vestige of Wolffian duct. Paraovarian cysts are remnant of the mesonephric duct that is occasionally found around the ovaries and fallopian tubes, attached in the broad ligament (Russo *et al.*, 2010). Reproductive diseases are considered essential factors that contribute to decline of fertility potential in large farm animals. Generally, highest incidence of fertility result in decrease milk production, treatment cost, extra labour and increase rate of culling (Mohammed *et al.*, 2014). Animals considered seasonal breeders with peak sexual activity are usually recorded from November to February in the northern hemisphere. Proper nutrition and good management may help dominate seasonal effects of infertility and allow breeding to occur throughout the year (Monaco *et al.*, 2015). Healthy sex organ play an important role in the successful reproductive functioning in all mammalian species including one-humped camel (Wajid, 2015). It is therefore essential to undertake a survey on common ovarian and fallopian tube abnormalities to establish the health status of these organs established as vital for effective and efficiency of fertility in one-humped camels in Maiduguri and environs. The objective of the study is to determine the prevalence of female genital tract disorders of ovaries and fallopian tubes in one-humped camels in Maiduguri, Nigeria using abattoir samples.

MATERIALS AND METHODS

STUDY AREA

The current study was carried out in Maiduguri, the Borno State capital located in the North-eastern Nigeria. Maiduguri

has a total area of 15.1Km² and lies between latitudes 11^o and 14^oN and longitudes 10^o and 14^oE with a population density of 1,738 people per square kilometer. The temperature ranges from 35-40^oC for most part of the year with a mean annual rainfall of about 647mm.

MATERIALS USED FOR THIS STUDY

Accessories and materials used during the study included still camera used for making snapshots during sample collection and assessment. Measuring tape was used as a guide for assessing the size of the sample pictured, disposable gloves were used as protective materials during sample handling, sterile swap sticks were used for swab sample collection for microscopy, microscope was used for screening of samples taken. White coloured tampon, glass slides were used for making smears, post-mortem knives and sterile scissors were used for making incisions during sample examination. Others included nutrient broth, incubator, wire loop, gas burner, crystal violet, iodine, alcohol, safranin, water, ice packs, sterile containers, and immersion oil all for processing of microbiological samples.

METHODOLOGY

A total of 150 female dromedary genitalia were collected from Maiduguri abattoir located in the outskirts of Maiduguri Metropolitan Council bordering the shores of River Ngadda that traverse through the State capital to the north emptying into the lake Chad part of the river. Complete female genital tracts of the one-humped camels were collected and examined after making dorsal incisions starting from the vulva up to the uterine horns. Any abnormally accumulated fluid or pus were intended for collection if present. Afterwards, examination of each of the genitalia with emphasis at the regions of the ovaries and the fallopian tubes was made and values were recorded for abnormal detection. The observed abnormalities with obvious gross lesion were noted based on their appearances, type, location, and frequency of occurrence. Some samples were collected in a vacuum flask containing ice packs and transported to the research laboratory in the Department of Veterinary Medicine, University of Maiduguri for further investigations and storage in formaldehyde solution after examination.

RESULTS

One hundred and fifty (150) genital tracts of female dromedary camels (*Camelus dromedarius*) slaughtered at Maiduguri central abattoir were examined for ovarian and fallopian tube disorders. The results revealed a prevalence of 27 (18%) cases of various pathological lesions detected with different degrees of occurrences (Plates I-IX). Luteal cysts (Plate IX) recorded as 16 (10.7 %) cases were the most frequently observed abnormalities. This was followed by follicular cyst (Plate VII) with records of 6 (4.0 %) cases. Catarrhal Salpingitis was the third abnormal condition

recorded in terms of frequency of occurrence with two (2) numbers of cases and accounting for 1.3 %. This was followed by hemorrhagic cyst, ovarian hydro-bursitis and granulosa cell tumour each with a single case of occurrence and each accounting for 0.7 % of case. Details of the observed lesion types and their frequencies of occurrence are shown in the Table1 below.

The abnormal follicular cysts represented as 6 (59.3%) cases were both unilateral and bilateral cases. Similarly follicular cysts recorded were both as singles and as multiples. The cysts were thin walled slightly opaque and filled with coloured serous fluids and four of the cysts were observed on the left ovary, one on the right ovary and a multifocal was observed on both ovaries. The observed luteal cysts represented as 16 (10.6%) cases were thick walled with some appearing as slightly opaque while others are opaque and tense in consistency with grayish yellow color. The left ovary was mostly affected with 12 cases in genitalia examined and abnormalities associated with the right ovary accounted for the remaining four cases making a total of 16 genitalia recorded with luteal cysts. A case of observed hemorrhagic cyst accounts for 3.7 %. The hemorrhagic cysts were characterized as double thick wall structures unilaterally located and contained bloody follicular fluid. Ovarian hydro bursitis observed was also a single case which accounts for 0.7% was characterized by accumulated straw coloured fluid located on the left ovary of the genitalia. Suspected granulosa cell tumor observed in the ovary was represented as 1 (0.7%) case only. The suspected granulosa cell tumour was identified as a large mass of tissue associated with irregularity in shape. The suspected granular cell tumour was found on the left ovary in the affected genital tract.

et al. (2012) who recorded 56 different cases after examining 322 female camels in Maiduguri municipal abattoir. Although lower numbers were recorded compared to that of Mshelia *et al.*, (2012), it is however substantial because the findings in the present studies recorded abnormalities relating to ovaries and fallopian tubes only while that of Mshelia *et al.*, (2012) were abnormalities across the whole of the genital tracts. In addition to this, there was a wider coverage in terms of sample size of up to 322 in Mshelia *et al.*, (2012) as compared to 150 samples examined in the present studies. However, the records of ovarian abnormalities of 27 cases in the present study is higher compared to the findings of Dawood *et al.* (2018) who examined 500 dromedary camels in El-Bassatain slaughterhouse and recorded 7%. However, a comparison of the ovarian abnormalities in the current study with the findings of Wajid, (2015) who examined 80 camels in an abattoir in Iraq and recorded 12.5%, revealed that the findings in the later was low. On the contrary, the findings of Hussein, (2016) who examined 2,158 camels at Tamboul abattoir and recorded 87.37% was higher compared to the findings in the present study where only 27 cases of ovarian and fallopian tube abnormalities were recorded after examining only 150 female genital tracts. It is however essential to emphasize that most of findings by other researchers were from surveys on the whole genital tracts of one-humped female camels which was contrary to investigations in the present studies which limits the search only to ovarian and fallopian tube abnormalities.

As follicular and luteal cysts are one amongst the recorded cases under ovarian abnormalities in the present study with six (6) and sixteen (16) number of occurrences and respectively accounted for 4.0% and 10.7% after examining

Table 1: Different Ovarian and fallopian tube disorders from the genital tracts of one-humped camel (*Camelus dromedarius*) slaughtered in Maiduguri central abattoir

S/N	Type of lesions	Site of Occurrence	Number affected	Frequency of Occurrence
1.	Follicular cyst	Left hand side	06	4.0 %
2.	Luteal cyst	Bilateral	16	10.7 %
3.	Hemorrhagic cyst	Bilateral	01	0.7 %
4.	Ovarian hydro-bursitis	Right hand side	01	0.7 %
5.	Catarrhal Salpingitis	Left hand side	02	1.3 %
6.	Granulosa cell tumour	Right hand side	01	0.7 %
Total			27	18.0 %

DISCUSSIONS

An examination of one hundred and fifty (150) female genital tracts from dromedary camels in Maiduguri central abattoir as reported in the present study revealed the prevalence of 27 (18.1%) of the total abnormalities detected relating to these anatomical locations. The findings in the present study are lower when compared with that of Mshelia

150 female genital tracts of one-humped camels in Maiduguri abattoir, these findings are however higher when compared to the findings of Dawood and Hameed (2018) who although examined higher number of up to five hundred (500) genital tracts of female camels in El-Bassatein slaughter house in Cairo and Nahia slaughter house recorded 15 and 5 cases of follicular and luteal cysts which accounted for 3% and 1% respectively. Although the current study only recorded a case of granulosa cell tumor after examining one hundred and fifty (150) dromedary female camels slaughtered in Maiduguri abattoir, detection of these tumor is important as it paves a way for



Plate I: Cystic lesions on the left fallopian tube of Female genital tract of one-humped camel slaughtered in Maiduguri central abattoir

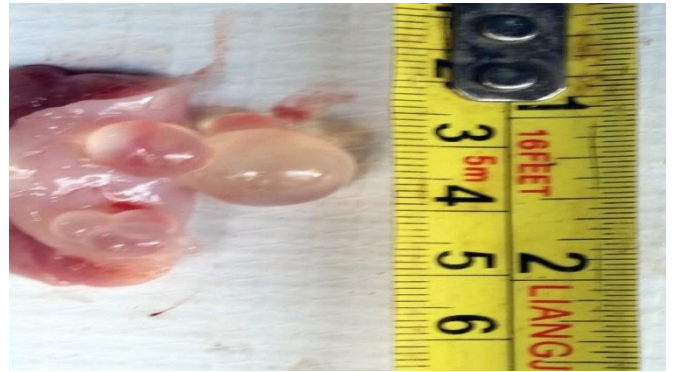


Plate II: Clear ovarian cysts dissected from female genital tract of one-humped camel (*Camelus dromedaries*) slaughtered red in Maiduguri central abattoir



Plate III: A case of ovarian hydro-bursitis identified from the genital tract of one-humped camel (*Camelus dromedaries*) slaughtered in Maiduguri central abattoir



Plate IV: A case of cystic ovary in the right -hand side of genital tract of one-humped camel (*Camelus dromedarius*) Slaughtered in Maiduguri central Abattoir.



Plate V. A case of luteal cyst from genital tract of one-humped camel slaughtered in Maiduguri Central abattoir



Plate VI: A case of luteal cyst on the genital tract of one-humped camel slaughtered in Maiduguri central abattoir.



Plate VII. A case luteal cyst on the left -hand side of genital tract of one-humped camel slaughtered in Maiduguri central abattoir



Plate VIII. A case of luteal cyst on the left -hand side of genital tract of one-humped camel (*Camelus dromedarius*)slaughtered in Maiduguri central abattoir.

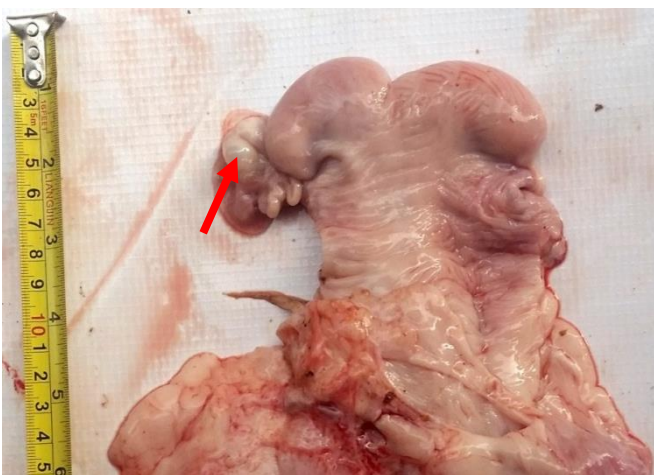


Plate IX. A case of follicular cyst on the left ovary in a single humped camel (*Camelus dromedarius*)slaughtered in Maiduguri central abattoir

diagnosis of causes of infertility in this animal. These tallied with the findings of Ali *et al.* (2013) who for the first time reported the occurrence of granulosa cell tumor in female dromedary camels and asserted that it helps in diagnosis and

treatment of such types of ovarian tumors. These observations were strongly supported by the assertions of Anderson *et al.* (2010) who reported the exhibition of three types of behaviors in mares with granulosa cell tumor established upon the types and number of hormones produced. These behaviours could be prolonged anoestrus, persistent or intermittent oestrus behaviours (nymphomania) or stallion-like behaviours which all lead to infertility in the long run.

The findings of the present study also recorded higher percentages of 0.7% of granuloma cell tumor in dromedary camel when compared with that of Martines *et al.* (2004) who reported the occurrence of 0.3% of granuloma cell tumor in cattle after an abattoir examination of 1,113 cows. The findings of the present studies affirmed the outcome of a similar investigation conducted by Mohammed *et al.* (2014) that reproductive diseases can be considered as essential factors contributing to the decline of fertility potential in large farm animals. Further emphasis highlighted that generally in large animals, the highest incidence of infertility result in various setbacks such as negative milk production, increase in treatment cost, extra cost of labour and frequent culling of animal considered seasonal breeders associated with peak sexual activity as was recorded in the work of Mohammed *et al.* (2014) conducted from the month of November to February in the northern hemisphere. However, Monaco *et al.* (2015) stressed that proper nutritional and good management may help override seasonal effects of infertility and allow breeding to occur throughout the year. Wajid, (2015) also emphasized that healthy sex organs play an important role in the successful reproductive functioning of the female one-humped camel (*Camelus dromedarius*) and therefore validated the importance of taking precautionary measures against recording ovarian and fallopian tube abnormalities as presented by findings of the present studies.

The follicular, luteal, and haemorrhagic cysts were the most common ovarian abnormalities recorded in ovaries and play major roles on ovarian dysfunction (Hamouda *et al.*, 2011). It is generally accepted that disruption of hypothalamo-pituitary-gonadal axis by endogenous and exogenous factors causes cyst formation. Ovarian cyst was the prevalent pathology among the recorded ovarian abnormalities and is represented mostly by follicular cyst, followed by luteal cyst and then hemorrhagic cyst and these conditions and abnormalities play a role on ovarian dysfunction, poor reproductive performance and infertility in dromedary camel as pointed out by Dawood & Hameed (2018). Similar observations were recorded in the current survey where follicular cyst, luteal cyst and haemorrhagic cysts were identified with varied occurrences. Although some other defects of the genitalia which include cystic ovaries and

ovarian bursal adhesion were relatively rare in camels, cases of ovarian cysts but not ovarian bursal adhesions were recorded in the present studies. However, the term cystic ovaries do not apply to Camelidae because large proportion of the females developed some forms of follicular cysts if not bred within a given time and therefore ovulation in these species is induced as reported by Tibary & Anouassi (2000). Cystic corpus luteum (CL) has a soft, mushy core area due to the presence of fluid from degenerating blood clot. In addition, the cystic CL as well as the typical CL may or may not have an ovulation crown or papilla at its apex. When ovulation crown or papilla is absent, it should not be considered diagnostic of cystic condition because 10-20% of functional, normal CL fails to develop this feature. The persistent CL is rare in female Camelidae, however, the condition has been suspected based on prolonged elevated plasma progesterone level in the absence of pregnancy (Tibary & Anouassi, 2000). Probably, this was the reason for no detection of persistent corpus luteum in the present study. However, many luteal cysts were detected and were even the highest ovarian abnormality detected in the present study.

CONCLUSION

In conclusion, the study therefore affirmed that ovarian abnormalities are common findings in one-humped female camels despite a fact that camels have been identified as animal capable of withstanding lots of stress including those caused by infectious and non-infectious diseases. Adequate facilities for diagnosing common diseases associated with female genital tracts should be made available in most especially Government owned veterinary clinics and abattoirs across the country such that female camels can be screened earlier to enable prompt interventions of these condition to facilitate optimum reproduction in this species.

CONFLICT OF INTEREST

The authors have declared no conflict of interest.

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