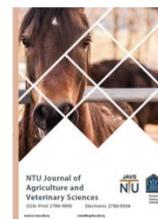




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## Incidence of Reproductive Disorders in Different Animals Treated in Teaching Hospital Related to Veterinary College of Mosul University: Retrospective Data

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### ABSTRACT

The current analysis was conducted to quantify the incidence of reproductive disorders in different animals examined and treated at the University Veterinary Hospital, University of Mosul. Such analysis is important in evaluating the hands-on experiences that local veterinary students obtain in this hospital. For this analysis, data related to the animals examined and treated between January 2018 and December 2022 was retrieved from the records of the Theriogenology section and compiled in Microsoft Excel 2010. Three hundred eighty-five Pregnancy diagnostic cases were received, which represents about 50% of all cases admitted at the hospital. Cows represented 64% of animals admitted for pregnancy diagnosis. Dystocia in ewes, metritis/endometritis, retained fetal membranes, and inactive ovaries in cows, constituted the most frequent obstetrical cases admitted at this hospital. In conclusion, enhancing skills in pregnancy diagnosis, treatment of dystocia and retained fetal membranes, and diagnosis of metritis/endometritis and inactive ovaries should be considered in the training of local students. In general, all reproductive disorders in different animals reported in this analysis can improve student hands-on experiences.



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## Introduction

The University Veterinary Hospital in Mosul, Iraq, formerly known as “The Veterinary Teaching Hospital”, is managed by the College of Veterinary Medicine, University of Mosul. The main objective of this hospital is to train veterinary students in examination skills, diagnosis, and treatment of farm and companion animals in different disciplines including medicine, laboratory diagnostics, surgery, theriogenology, and poultry diseases [1]. This facility has become an important veterinary clinic providing a leading edge in the diagnosis and treatment of animal cases not only in Mosul city but also from different regions of Nineveh governorate. The professionals in this hospital strive to provide the highest standard of education to veterinary students. In particular, the Theriogenology section provides several services related to the reproductive system including pregnancy diagnosis, emergency cesarean sections, diagnosis and treatment of uterine diseases, transcervical insemination, breeding management, infertility examination, and castration.

Several studies have examined and diagnosed numerous reproductive system disorders in animals in Mosul city. A recent study examined the incidence of endometritis in mares based on gray-scale echogenicity [2]. Another study identified different normal and abnormal structures of the reproductive system in cows including different stages of pregnancy, metritis, pyometra, and cystic ovary using ultrasonography [3]. In a different study, repeat breeding in cycling buffalo cows as a function of endometritis has been identified [4]. According to a prior study [5], the prevalence of dystocia in does was 52.9% for fetal reasons and 47.1% for maternal causes. To put it briefly, Mosul's veterinarians can deal with a wide range of normal and abnormal reproductive system disorders in animals.

Selected clinical cases from the University Veterinary Hospital's records have been the subject of a few investigations. For instance, one study analyzed records of 1,280 conditions reported by the internal medicine section of this hospital [1]. Further research has examined the presence and seasonality of blood parasites in various animals using data from the hospital's laboratory [6]. However, there is insufficient data to investigate the theriogenology department's records at this hospital. We hypothesize that analyzing these records is important in identifying the most prevalent reproductive disorders in Mosul City, as well as evaluating the hands-on training that the local veterinary students obtain in this hospital. Therefore, the current analysis was performed to quantify the incidence of reproductive disorders in different animals examined and treated at the University Veterinary Hospital, University of Mosul.

## Materials and Methods

### Data Retrieving

The data was retrieved from the records of the Theriogenology section. These records were paper-based and included information about each case as the following: owner's name and address, date of examination, animal description (type, breed, color, sex, and age), case history, clinical examination, and case diagnosis. In this analysis, animals examined and treated between January 2018 and December 2022 were considered for inclusion in this study. The data were compiled in Microsoft Excel 2010 (Microsoft Office Professional Plus 2010, Microsoft Corp., Redmond, WA, USA).

### Pregnancy Diagnosis

In study animals, pregnancy diagnosis and reproductive system disorders were examined, diagnosed, and/or treated by an attendee faculty member of the Theriogenology section at the College of Veterinary Medicine, University of Mosul, following standard methods. In short, pregnancy diagnosis was achieved using ultrasonography (KX5100V palm ultrasound scanner, KeeboMed, Inc., Mt. Prospect, IL, USA). In large animals (i.e., mares, cows, and buffalo cows), transrectal sonography was conducted in addition to transabdominal sonography. Pseudo-pregnancy in felines and canines was reported when a cat or bitch exhibited most of the pregnancy signs whereas she was not pregnant [7]. Termination of the pregnancy was conducted using hormonal methods in some cases, such as life-threatening situations or upon the owner's request.

### Cases Definition

In this study, dystocia represented a prolonged and difficult parturition that required assistance [8]. The owners reported the animal's duration in a prolonged and difficult parturition. A retained fetal membrane was identified when the expulsion of the fetal membranes and placenta was extended to 12 to 24 hours after parturition [9]. The vaginal or uterine prolapse was diagnosed visually when a part or entire of the organ protruded from the vulva [10]. The vaginitis represented a firm and congested vagina at the clinical examination [11]. The metritis and/or endometritis represented an inflammation of the uterus where only the endometrium was involved in the endometritis, whereas all layers of the uterus were involved in the metritis identified by ultrasonography and laboratory testing [12]. An inactive ovary was reported when there was a history of no signs of estrus with flat, small, and smooth ovaries on per-rectal palpation and no cystic structure on ultrasonography in two successive examinations at intervals of 7 days [13]. The luteal cystic ovary was recognized by ultrasonography as an ovulatory follicle > 2.5 cm in diameter and

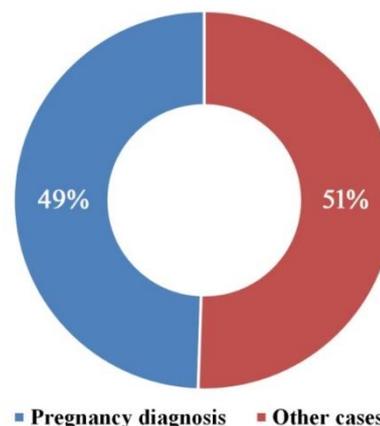
partially luteinized [14]. The repeat breeder cow was clinically normal cow failed to conceive  $\geq 3$  services [15]. The delayed ovulation was a clinically normal cow with failure of ovulation at the estrus phase [16]. Early embryonic death was reported when a female animal returned to the cycle within 42 days after she was previously confirmed pregnant, whereas a mummified fetus was diagnosed by ultrasonography when the fetal fluid was absorbed, and the fetal membranes were shriveled and dried [8]. Finally, Freemartin represented a female animal with a history of being a twin to a male and having non-functioning ovaries and masculinized behavior [17].

### Data Analysis

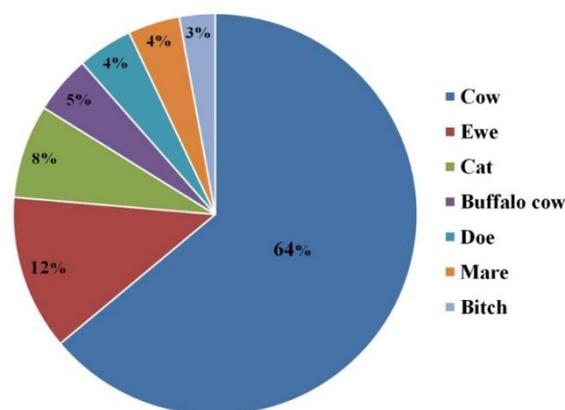
In this study, we examined the cases' frequencies. The pregnancy diagnosis data was initially separated from other case data and then classified by animal species. We additionally examined the frequencies of the pregnancy diagnosis cases according to the study years to explore the consistency of students training. Furthermore, the frequencies of the cases other than pregnancy diagnosis were examined and categorized according to the type of animal. All frequencies were represented using figures created via Microsoft Excel 2010 (Microsoft Office Professional Plus 2010, Microsoft Corp., Redmond, WA, USA) and GraphPad Prism 10.1.1 (GraphPad Software, LLC).

### Results

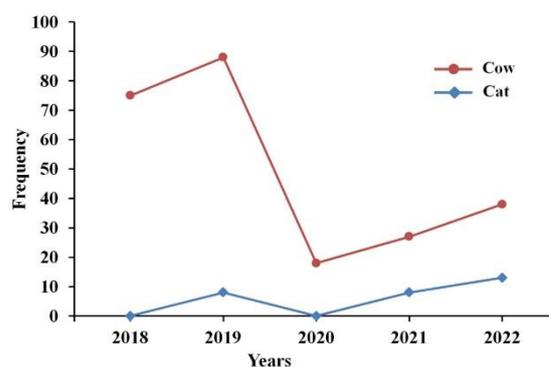
The total number of cases admitted at the Veterinary Hospital, University of Mosul, from January 2018 to the end of December 2022 was 778 cases, where pregnancy diagnosis constituted 49% of the cases ( $n = 385$ ; Fig. 1). Two cases of bitch were pseudopregnancy. The majority of the animals (64%) admitted at the hospital for pregnancy diagnosis were cows (Fig. 2), with an average of 57 cows per year, excluding the year 2020. We specifically examined frequencies of pregnancy diagnosis of cows and cats according to the admitting years, and revealed that the cases were increasing by the years, although they dropped during COVID pandemic (Fig. 3). This trend was the same for all animals examined at the hospital; however, an apparent increase in the number of cats admitted at the hospital started in 2021.



**Figure 1.** Proportion of pregnancy diagnosis and other cases admitted at the Veterinary Hospital, University of Mosul from January 2018 to December 2022.



**Figure 2.** Proportion of animals admitted pregnancy diagnosis at the Veterinary Hospital, University of Mosul from January 2018 to December 2022.



**Figure 3.** Frequency of pregnancy diagnosis conducted for cows and cats at the Veterinary Hospital, University of Mosul from January 2018 to December 2022.

Frequencies of cases other than pregnancy diagnosis-related cases received between 2018 and 2022 were summarized in Figure 4. The most prevalent reproductive case was dystocia,

representing 71% of ewes' cases, 61% of does, 50% of cats, 22% of buffalo cows, and 8% of cows. The most cases of dystocia were in ewes (65%), followed by does (17%) and cows (12%). The average number of dystocia cases in ewes was 19 per year, excluding the year 2020. On the other hand, the second most prevalent case was metritis and/or endometritis in cows (64%) followed by ewes (16%). Cases of retained fetal membranes were also prevalent in cows (85%), followed by ewes (13%).

Other cases were also reported in different frequencies, where cows represented the most cases, particularly inactive ovaries (Fig. 4). Finally, cases received at the hospital were increased through study years as those observed in pregnancy diagnosis, although they dropped during the COVID pandemic.

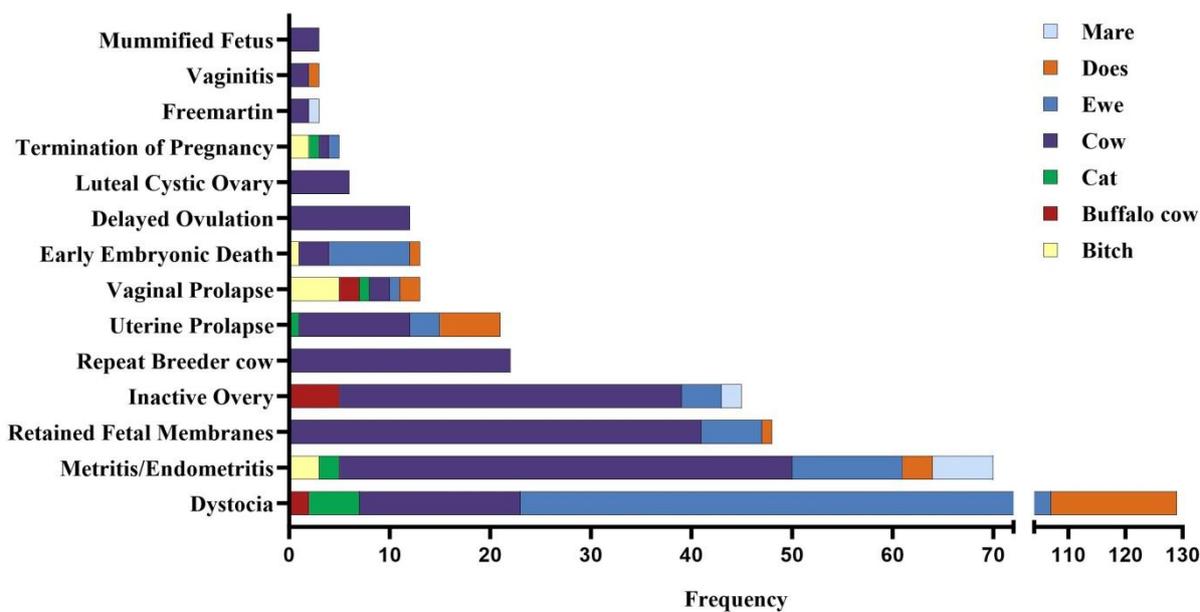


Figure 4. Frequency of cases other than pregnancy diagnosis received at the Veterinary Hospital, University of Mosul from January 2018 to December 2022.

## Discussion

The study conducted here was the first analysis of the cases examined, diagnosed, and treated in the Theriogenology section at the University Veterinary Hospital, University of Mosul, and the first evaluation of the hands-on training of the reproductive system-related cases the local veterinary students obtain in this hospital. One of the challenges in veterinary teaching is building students' clinical skills, including the know-how of conducting a procedure in addition to the technical performing of that procedure [18]. Therefore, it was important to analyze the data under our hands to open the doors toward improving local students' clinical skills in managing reproductive system-related cases. That is, successful reproductive management is crucial to veterinary practice because it can satisfy both producers and veterinarians [19].

The current analysis revealed that pregnancy diagnosis represented approximately 50% of cases admitted at this hospital. It is important for veterinary students to obtain good training in pregnancy diagnosis, particularly in cows, regardless of whether the training is conducted with

live cow or simulator or in combination, using per-rectal palpation or ultrasonography or both, and on-site at the hospital or privately owned farms [20]. Taking into consideration that the current hospital relies on on-site training without simulators, local students miss an important part of training for building clinical skills. In addition, the current analysis revealed that the students received 57 cases of pregnancy diagnosis for cows when the hospital was normally operated, i.e., excluding the year 2020 when the pandemic happened. This number is considered low for veterinary students to achieve a competence level in pregnancy diagnosis [21, 22]. In addition, the contribution of the students in most cases is observational based [19], which is also true for students in the current study hospital; therefore, more efforts from the instructors are needed to involve all students in the training throughout the year, including training options of using other than live cows. The most admitted case other than pregnancy diagnosis was dystocia in sheep.

Dystocia is considered a common issue in ewes [23] and can represent more than 50% of obstetric disorders in sheep, mostly observed in their first and second parities [24]. Several factors can contribute

to dystocia in animals [23, 25]; however, its causes were not reported in the study hospital records, which is considered a limitation. Failure of cervical dilation, narrow pelvis, fetal malposition, and fetal monster were the most common causes of dystocia in local ewes [26]. In Duhok province, a province next to Mosul, fetal causes of dystocia, particularly fetal malposition, represented the most frequent cause of dystocia [27]. Therefore, improving skills in treating dystocia in ewes, regardless of the cause, should be taken into account for local student training. Additional potential training attentions include metritis, endometritis, retained fetal membranes, and inactive ovary in cows because they represented the most frequent cases in the current analysis.

## Conclusion

The current analysis concluded that building clinical skills of local veterinary students in pregnancy diagnosis, treatment of dystocia and retained fetal membranes, and diagnosis of metritis/endometritis and inactive ovaries is important. However, it does not mean overlooking training in treating obstetrical cases other than the aforementioned issues. Using different training options other than live animals is important. Effective reproductive management is critical to veterinary practice as it satisfies both producers and veterinarians.

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## Conflict of interest

The authors declare that there is no conflict of interest in this research.

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