

Genital Tract Pathologies of Cows Slaughtered at El-Harrach Abattoir in Algeria

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Abstract

The aim of this study was to determine genital organ disorders in 2025 cows at El-Harrach abattoir in the capital of Algeria and to describe the microscopic changes associated with these cases. The results obtained showed a high incidence of slaughtered pregnant cows (16.49%). Majority of these cases were at the early gestation. The most frequently encountered defects were ovarian cyst, uterine infection, and inflammatory salpinx, which proved that contamination and infection are always present in the cowsheds from where animals were brought. Other observed abnormalities were cervicitis, mucometra, double cervix, unicornis uterus, horn malformation, uterine tumour, triple cervix (which is a new finding in the world), salpinx adhesion, pyosalpinx, hydrosalpinx, ovarobursal adhesion, ovarian inactivity, ovarian inflammatory changes, ovarian tumour and parovarian cysts.

Keywords: Uterus, Oviduct, Ovary, Pathology, Histology, Abattoir

Cezayir'de El-Harrach Kesimevinde Kesilen İneklerdeki Genital Kanal Patolojileri

Özet

Bu çalışmanın amacı Cezayir'in başşehirinde yer alan El-Harrach kesimevinde kesilen 2025 inekte gözlenen genital kanal bozukluklarını belirlemek ve bu vakalarla alakalı mikroskopik değişiklikleri tanımlamaktır. Sonuçlar çok sayıda gebe hayvanın (%16.49) kesime gönderildiğini ortaya koymuştur. Bu vakaların da çoğu gebeliğin erken dönemlerindedir. En sık karşılaşılan bozukluklar ovaryum kistleri, uterus enfeksiyonu ve salfinks yangısıdır. Bu durum kesim için getirilen hayvanların getirildikleri ahırlarda enfeksiyonun ve kontaminasyonun sürekli olduğunu göstermekteydi. Diğer gözlenen bozukluklar servisit, mukometra, çift serviks, unicornis uterus, rahim boynuz malformasyonları, uterus tümörü, triple serviks (yeni bir bulgu olarak), salfinks yapışması, pyosalfinks, hidrosalfinks, ovarobursal yapışma, ovaryum inaktivitesi, ovaryumun yangısal değişimleri, ovaryum tümörü ve parovarian kistler olarak kaydedildi.

Anahtar sözcükler: Uterus, Ovidukt, Ovaryum, Patoloji, Histoloji, Kesimhane

INTRODUCTION

The causes of low fertility can be multifactorial and complex. Malnutrition, infections, management errors, ovulatory or hormonal imbalances, and congenital ^[1] or acquired defects ^[2] can play significant roles in the failure of bovine breeding. To be able to minimize the economic losses, it is important to determine the incidence of the various genital pathologies especially those found at the slaughter-house since it constitutes a true source of study and provides a great deal of information ^[2,3]. Many

studies about genital pathologies of cows were performed worldwide ^[4-6]. Some researchers reported that the most frequent lesion was uterine infection ^[4,7] while others noted that the incidence of ovaribursal adhesion was the highest, followed by endometritis and cystic ovary ^[3].

The present study was performed to investigate the incidence of reproductive tract abnormalities and pregnant cows at a slaughter house in Algiers (Capital of Algeria) and to describe the histological changes associated with these defects.



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MATERIAL and METHODS

Animals

Samples were obtained from an abattoir at which the genital tracts of 2025 cows and heifers of various breeds (Holstein, Montbeliard, Fleickveih, native and cross-breeds) were examined. The samples were collected between 01/01/2010 and 29/06/2014 (pregnant specimens were also collected), placed in separate plastic bags and transported to the laboratory as soon as possible.

Examination Procedures

Macroscopic Examination: In the external inspection, the cervix and the horns were measured (diameter and length). To note the existence of a volume modification and asymmetry between the two uterine horns, a difference >5 cm was regarded as asymmetry. After this examination, cervix and horns were incised in order to note the presence of possible abnormal intra-uterine secretions as well as congestion of the mucous membranes. -Cases of pregnancy were also noted after incision of the horns-. Attention to possible adhesion and modifications of volume, size, color and the content of the oviduct were also given. Inspection and palpation of the ovaries were performed in order to detect any various abnormal formations as well as the possible existence of ovaribursal adhesion. Macroscopic Aspect Of Cystic Ovary Was Also Studied.

Microscopic Examination: Microscopic examination of samples was carried out at the pathological anatomy laboratories of the NHSV (National High School of Veterinary) and of UHC (University Hospital Center) Mustapha Basha in Algiers. Samples of ovary, oviduct and uterus were fixed in 10% buffered formalin and embedded in paraffin wax. Sections cut at 5 µm thickness were stained with Hematoxylin and Eosin (H&E), and evaluated under a light microscope.

Statistical Analysis

Data were presented in percentages and the analysis was conducted using STATISTICA (Version 10, Stat Soft France, 2003). Differences in the position, nature of wall and number of cystic ovary were evaluated by Chi-square test. The level of significance was set at $P < 0.05$.

RESULTS

It was observed that 334 (16.49%) out of 2025 cows inspected, were pregnant with one case of twin pregnancy, and 1691 (83.51%) cases were not pregnant. Of the non-pregnant cases 790 (46.72%) did not show any visible abnormality in the ovaries, the oviducts or the uteri. The remainder 53.28% had lesions that are described below.

As also shown in *Fig. 1*, corpus luteum was found in 85.14% of the cases with 57.03% on the right ovary and 42.97% on the left ovary. The incidence of cavitory corpus luteum was 7.76% (*Fig. 2*). The frequency of the double ovulation was 7.09% with 53.12% of the cases were noted on the left ovary and 46.87% on the right ovary.

Macroscopic Abnormalities

Uterine Lesions: The macroscopic lesions were noted on those cases with infection (inflammatory signs and/or presence of abnormal secretions) and congenital defects. The results showed that uterine infection presented the highest frequency (12.47%) followed by cervicitis (3.84%), mucometra (1.18%), double cervix (0.71%) and uterine tumors (0.29%). The other abnormalities were presented in 0.06% of the cases (malformation and triple cervix) except the uterus unicornis (0.12%) (*Table 1*) (*Fig. 3, Fig. 4*).

Oviduct Lesions: In *Table 2*, the list of various lesions observed on oviducts was shown.

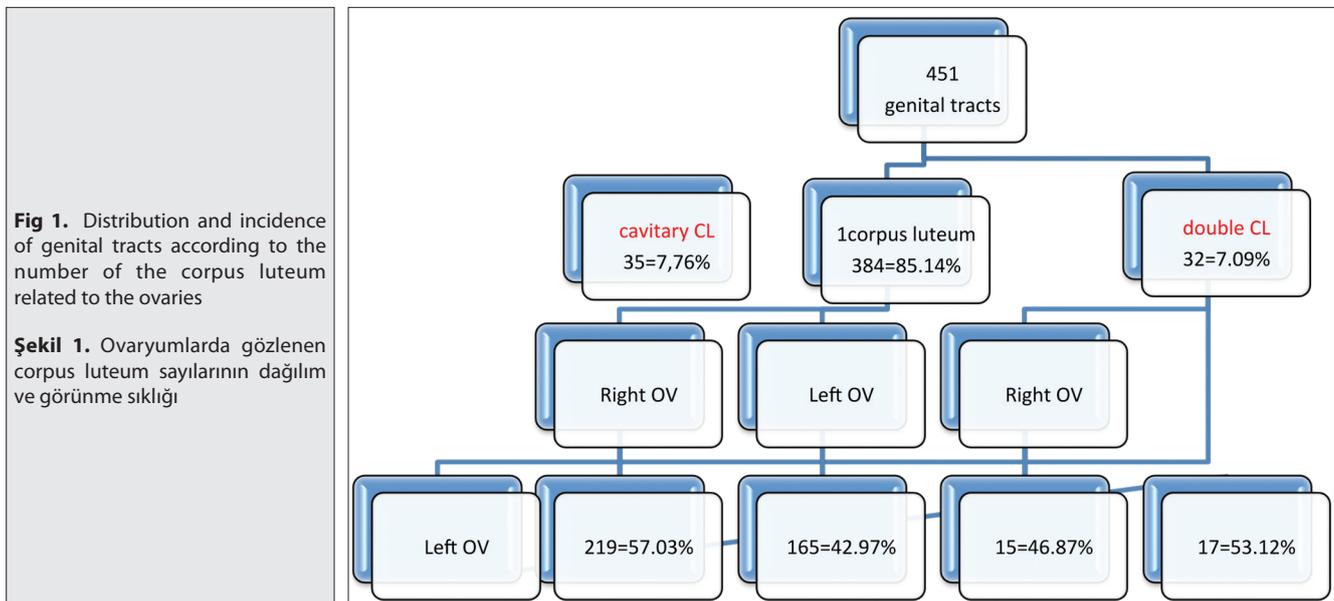




Fig 2. Cavitory corpus luteum
Şekil 2. Kaviter korpus luteum

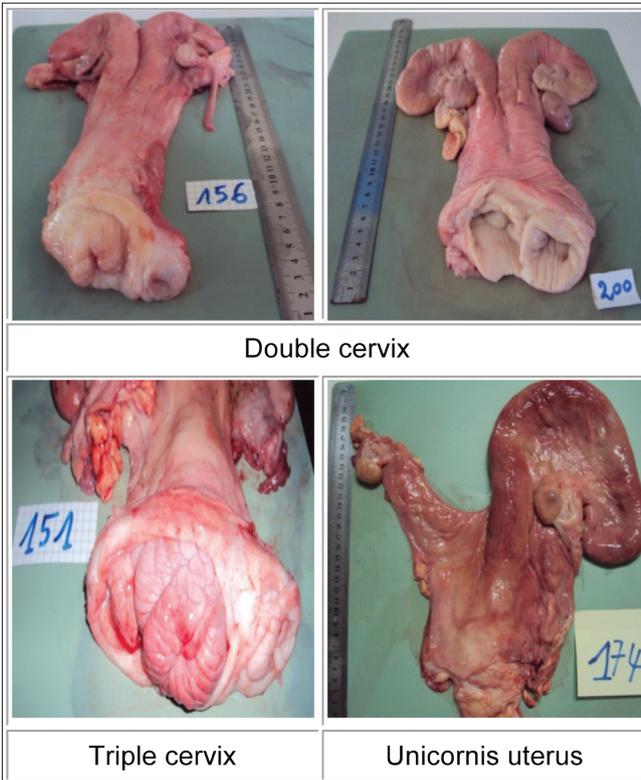


Fig 3. Uterine congenital pathologies
Şekil 3. Uterusda rastlanan konjenital patolojiler

Inflammatory salpinx and pyosalpinx were the most noteworthy lesions (5.20% and 4.26%, respectively). Adhesion and hydrosalpinx showed the least frequencies with 1.54% and 1.30%, respectively.

Ovarian Lesions: The meticulous examination of the ovaries revealed the presence of several pathological changes as shown in [Table 3](#).

Ovarian cyst was the most frequent lesion (14.25%)

Table 1. Number & incidence of uteri presenting various macroscopic disorders

Tablo 1. Çeşitli makroskopik bozuklukları içeren uterus sayı ve sıklık oranları

| Lesion* | Number | Percentage (%) |
|-------------------|--------|----------------|
| Uterine infection | 211 | 12.47 |
| Cervicitis | 65 | 3.84 |
| Mucometer | 20 | 1.18 |
| Tumour | 5 | 0.29 |
| Double cervix | 12 | 0.71 |
| Triple cervix | 1 | 0.06 |
| Uterus unicornis | 2 | 0.12 |
| Horn malformation | 1 | 0.06 |

* More than one lesion occurred in some cases

Table 2. Repartition of the genital tracts according to lesions revealed on the oviducts

Tablo 2. Ovidukta gözlenen lezyonlara göre vakaların ayırımı

| Lesion* | Number | Percentage (%) |
|--------------|--------|----------------|
| Inflammation | 88 | 5.20 |
| Hydrosalpinx | 22 | 1.30 |
| Pyosalpinx | 72 | 4.26 |
| Adhesion | 26 | 1.54 |

* More than one lesion occurred in some cases

Table 3. Repartition of the genital tracts according to the ovarian lesions

Tablo 3. Ovaryumda gözlenen lezyonlara göre vakaların ayırımı

| Lesion* | Number | Percentage (%) |
|----------------------|--------|----------------|
| Ovarian cysts | 241 | 14.25 |
| Smooth ovaries | 33 | 1.95 |
| Ovarobursal adhesion | 91 | 5.38 |
| Ovarian tumours | 4 | 0.24 |
| Inflammatory changes | 4 | 0.24 |
| Parovarian cysts | 2 | 0.18 |

* More than one lesion occurred in some cases

Table 4. Distribution and incidence of cysts according to macroscopic aspect

Tablo 4. Makroskopik bakıda gözlenen kistik yapıların dağılım ve sıklığı

| Macroscopic Aspect of Cysts | | n | % |
|-----------------------------|------------------------|-----|----------|
| Side | Right | 156 | 64.73 |
| | Left | 70 | 29.05 |
| | Right and left | 15 | 6.22*** |
| Wall | Thin | 170 | 70.54 |
| | Thick | 70 | 29.05 |
| | Hemorrhagic | 1 | 0.41*** |
| Number | Single | 204 | 84.65 |
| | Polycystic (3 or plus) | 37 | 15.35*** |

*** P<0.001

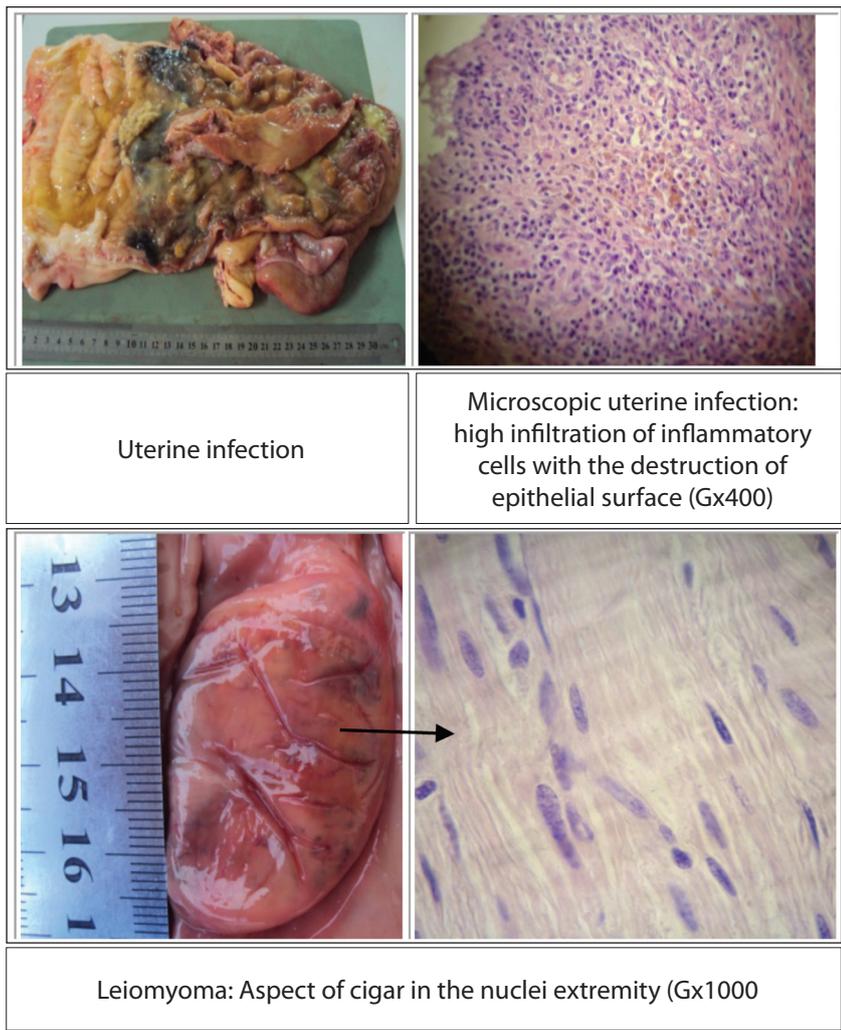


Fig 4. Uterine abnormalities
Şekil 4. Uterus anomalileri

Fig 5. Ovarian cysts (left), Microcystic hemorrhagic ovary (right)
Şekil 5. Yumurtalık kistleri (sol), Mikrokistik hemorajik ovaryum (sağ)



followed by ovariobursal adhesion (5.38%) and smooth and small ovaries (01.95%) (Fig. 5). The the least lesions noted in this study were inflammatory changes (0.24%), ovarian tumour (0.24%) (Fig. 6) and parovarian cysts (0.18%).

In this present study, cases of 241 cystic ovaries diagnosed are described in Table 4. The right ovary was the mostly affected (64.73%). Incidence in left ovary was 29.05%. The incidence of the 2 ovaries affected at the same time were 6.22% (P<0.001). The wall of cysts was thin in

70% (follicular cyst) whereas 29.05% of cysts had a thick wall (luteal cyst). In one case (0.41%), the wall was typically hemorrhagic microcystic (P<0.001). The cyst was single on the ovary in the majority of the cases (84.65%) and the polycystic ovary was found in 15.35% of the cases (P<0.001).

DISCUSSION

Usually, cows with reproductive problems and low

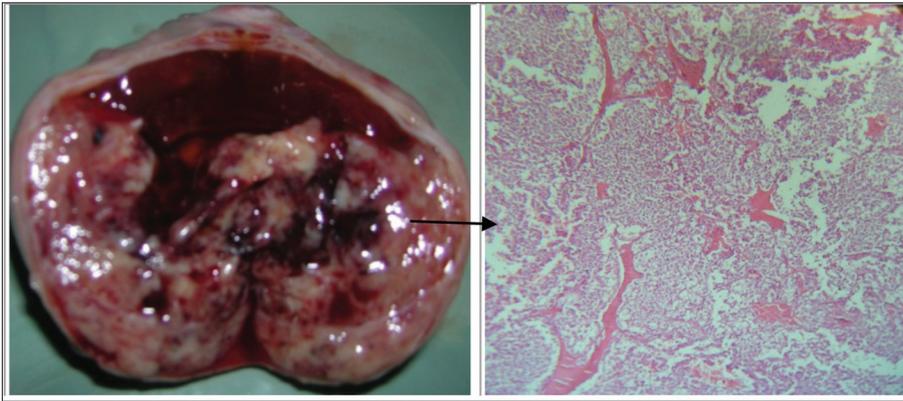


Fig 6. Ovarian tumor. Granulosa Cell Tumour (GCT): necrotic and hemorrhagic areas, uniform population of maldelimited cells, resembling granulosa cells, cytoplasm slightly mottled (GX 400)

Şekil 6. Yumurtalık tumörü. Granulosa hücre tumörü: Nekrotik ve hemorajik alanlar, granulosa hücrelerine benzeyen uniform yapıli hücre popülasyonu, sitoplazma az benekli görünümü

milk production will be sold or sent to slaughterhouse. So, it is important that disorders of genital organs and their incidence must be defined to reduce the financial losses.

Among the 2025 reformed cows examined in this study, 16.49% were pregnant. The majority of the cases were at their beginning (less than 2 months), some cases were between 2 and 7 months. Concerning gestations of less than 2 months, it has been considered that these animals could not be diagnosed pregnant and that proves that the veterinary surgeons of the slaughterhouse find difficulties of establishing an early diagnosis of pregnancy per transrectal palpation. The finding of pregnancy cases in this study is between that reported by Al-Dahash and David [8] (23.36%) and that noted by Kaidi [9], which was 10.27%. The divergence of the results can be explained by the difference in the population of the examined cows, the areas of study and the material placed at the disposal of the veterinary surgeons at the slaughterhouse.

Double ovulation was noted on 7.07% of the non-pregnant genital tracts. Kidder et al. [10] and Lopez-Gatius et al. [11] reported high incidence (13.1% and 15.5%, respectively).

In the present study, any corpus luteum containing a cavity higher than 10mm of diameter and containing a liquid is regarded as cavitory. It was met in 7.76% of the cases. Few Studies reported the incidence of the cavitory corpus luteum, may be because it is not pathological and does not deteriorate the normal cycle of the cow [12,13]. So, "corpus luteum with a cavity" has been suggested to replace the classical term "cystic corpus luteum" [12].

Of the 1691 empty genital tracts examined in this macroscopic study, 53.28% presented abnormalities (at the level of the uterus, the oviducts or the ovaries). This incidence is lower than that reported by Elmarimi [14], which was 64.03%, but definitely higher than other findings in the literature, in which several authors reported varied frequencies. It was 11.9% by Perkins et al. [15], 8.4% by David et al. [16], and 9.78% by Nash et al. [17]. A similar frequency (9%) was noted by Drennan and Macpherson [18], in Canada. This difference could be due to the population of animals examined.

In the present study, the most common uterine disorder was the presence of infection (12.47%). The frequency of infection is lower than that obtained by Vallet et al. [19] who found 32.9% cases in 2024 cows. Result here was close to findings by Steffan [20] 17.2% and Elmarimi [14] who noted 6.30% of metritis and 7.50% of endometritis. Very low frequencies were reported by other authors; 1.23% [21], 2.5% [22] and 1.26% [7]. This divergence of results is surely due to the epidemiologic factors varied and different from an area to another, the number of examined animals and the time and criteria of diagnosis used by these authors. Endometritis was accompanied by inflammatory changes of other parts of the reproductive tract in some cases. These findings have supported some authors' opinions [7,23], that infectious agents in the vagina passing to cervix and uterine lumina may result in cervicitis and endometritis. In these cases, inflammatory lesions may have resulted from inadequate hygienic condition in the postpartum period and during parturition, retained placenta and traumatic laceration due to dystocia as reported by Jubb et al. [24]. Any congestion observed may also be due to the transrectal palpations carried out by the veterinary students during practical work.

The incidence of the congenital abnormalities was 0.95%. These included:

Twelve cases of double cervix (0.71%) in 4 cases, cervical canals were opened separately into the uterus. This result is higher than that noted by Hatipoglu et al. [7] (0.18%). According to Arthur et al. [25], these cases should conceive normally, but may generate dystocia due to a fetal limb entering each cervical canal.

One very rare case of triple cervix (0.06%), which has never been reported in the literature.

Unicornis uterus was detected in two cases (0.12%). Generally, this abnormality is known in the pathology as White Heifer Disease (WHD).

Malformation that resembles an obstruction at the level of the left horn was found in one case (0.06%).

The frequency of these abnormalities is in conformity

with those reported by Alam^[4] and Kaidi^[9].

Mucometra represents accumulation of strongly viscous aseptic liquid in uterine lumina^[17]. It is associated with an anatomical lesion of the genital tract (congenital abnormality, abnormal long or tortuous cervix, adhesion, occlusion or obstruction) or with an ovarian pathology (especially the cystic ovary)^[26]. In the present study, mucometra was found in 1.18% of cases and was associated with a tortuous cervix in six cases and in the rest with the ovarian cysts.

Leiomyoma is a uterine tumour with a nodular aspect, maroon, noninvasive, being able to reach 10-12 cm in diameter and is reported in cow, cat and especially bitch. Histologically, this tumour is formed by smooth muscle fibers with anarchistic disposition in the stroma^[27]. This tumor was found in five cases (0.29%), with one case noted in the cervix.

The most common oviduct disorder was inflammatory changes (5.20%). The signs of inflammation (congestion and/or hypertrophy) were the basis for diagnosis. This disorder may be due to repeated transrectal palpations, realized by the veterinary students during their practical work on the cows whose genital apparatuses were the subject of this study. Presence of pus in oviduct was estimated by an incidence of 4.26% and it was associated in more than half of the cases with pyometra, which means ascending infection of the oviduct, in agreement with the report of McEntée^[23]. The frequency of the hydrosalpinx was 0.30%. This lesion is associated with ovariobursal adhesion. It was bilateral in 12 cases, associated with cystic ovary. Oviduct adhesion was detected in 1.54% of the cases.

Ovariobursal adhesion is a structure constituted by fibrous bands between the surface of the ovary and the ovarian bursa and caused by an excessive follicular hemorrhage during ovulation, trauma by rectal examination and an infection from the uterus^[28]. It can prevent the fertilization process when the fallopian tubes are blocked^[29]. It was found in 5.38% of the genital apparatuses. Other results reported were 1.1% by David et al.^[16], 2.7% by Roine^[30], and 5.62% by Alam^[4].

Smooth ovaries were regarded as the small ovaries on the 2 sides, right and left, with a surface which does not have any structure and having a congenital or acquired origin^[31]. In the present study, these were found in 33 genital tracts with an incidence of 1.95%, not really close to that noted by David et al.^[16] (0.33%), whereas it is definitely lower than that reported by Elmarimi^[14] who found an incidence of 51.20%.

The microscopic examination performed on the fragments of four ovarian tumours found in this study revealed that in three cases, it was the Granulosa Cell Tumour (GCT), which is a type of sex cord-stromal tumour,

composed primarily of neoplastic granulosa cells^[32], and it is the most common bovine ovarian tumour in cattle^[32-35]. In one case, it was the cystadenoma. This tumour is comparatively rare in domestic mammals and it has been mainly described in the bitch, sow and mare^[36]. Pérez-Martínez et al.^[34] reported a GCT frequency of 0.74% in 1489 reformed cows.

Typical purulent ovaries were observed (0.23%). The yellowish white aspect of the pus, recalling caseous necrosis pathognomonic of tuberculosis, presented in the different parts of genital tracts enabled us to pose the diagnosis of ovarian and endometritis tuberculosis. The low frequency noted was similar to the data in the literature^[37].

Parovarian cysts are cystic structures that occur in the broad ligament close to the ovaries and the uterine tubes^[15]. The parovarian cysts were noted by a weak frequency, in conformity with the results reported by some authors^[3,38].

Follicular cysts in cows are hypertrophic follicles which do not ovulate in the estrus period^[39]. They are involved in reduced fertility of dairy cows^[40]. It is significant to note that the cystic follicles which exceeded 2.5 cm in diameter (except for the hemorrhagic microcystic ovary) were gathered under this pathology. Ovarian cyst was found in 241 cases (14.25%). This frequency is close to that reported by Silva et al.^[41] which was 11% knowing that it always remains in the average reported in the literature which is 10 to 15%^[42,43]. The factors which return in question of this difference in frequencies are mainly the methods and the criteria used to diagnose the cystic ovary, the epidemiological factors and the number of the examined animals.

According to the present study, the right ovary was more affected by ovarian cyst than the left one, which is in conformity with the result of Kaikimi et al.^[44]. In the majority of the cases, the cyst was single (84.65%) whereas polycystic ovaries were found in 15.35%. The incidence of the latter recorded by Silvia et al.^[45] exceeded our result (47%). Incidence of follicular cyst (FC) with thin wall was 70.57%. Luteal cysts (LC) were diagnosed in 29.05%. That is in conformity with the data of the literature^[43] (70% FC and 30% LC).

The interpretation of the results obtained following the macroscopic and microscopic studies that were realized here on genital apparatuses recovered at the slaughterhouse in Algeria, enabled the following: A high frequency of the reformed pregnant cows; majority of these cases were at their beginning. Among the reproductive abnormalities, incidence of the ovarian cyst is the most significant followed by that of uterine infection, which proves that conditions of contamination leading to uterine infection are always present in the cowsheds and that anarchistic use of the treatments (synchronization and/or induction of estrus) and underfeeding would be probably the causes of ovarian cysts found in the present study. So, these results

will be important to the cattle breeders and clinicians. The majority of ovarian cysts diagnosed in this study had a thin wall macroscopically, and were classified as follicular cyst. In the authors' opinion, the discovery of the triple cervix opens the door for researchers to find more new abnormalities in the genital tracts.

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