

# Clinico-Diagnostic Confirmatory and Therapeutic Investigation of Canine Pyometra

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## ABSTRACT

A clinical study was conducted on 14 canine pyometra cases to evaluate clinico-physiological, haemato-biochemical, radiographic, and ultrasonographic changes, bacteriological findings and treatment outcomes. Most cases occurred in dogs aged 6-10 years (64.28%), with Spitz being the most commonly affected breed. Open-cervix pyometra (78.57%) was more prevalent than closed-cervix pyometra. Common clinical signs included inappetence (92.85%), vaginal discharge (78.57%), polydipsia (78.57%), and polyuria (64.28%). The elevated rectal temperature, total leukocyte count, neutrophil percentage, serum creatinine, AST, and ALT levels were significantly reduced after surgical treatment. Ultrasonography proved more reliable than radiography for diagnosis, successfully identifying all cases. Bacterial culture revealed predominance of Gram-negative bacilli (64.28%), with the highest antibiotic sensitivity to levofloxacin (57.14%) and chloramphenicol (50%). Ovariohysterectomy was the most effective treatment. Medical therapy alone was inadequate. Post-operative complications included wound dehiscence, ecchymosis, and two fatalities due to systemic complications.

**Key words:** Canine, Haematology, Ovariohysterectomy, Pyometra, USG, Vaginal discharge.

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## INTRODUCTION

Pyometra is a common illness in intact female adult dogs. The condition is typified by uterine bacterial infection, inflammation, and pus accumulation with systemic illness that is life-threatening in severe cases (Fransson, 2003). Pyometra or chronic purulent endometritis is a common, metestral disease mainly affecting bitches over 8 years of age. The disease generally occurs following estrus and generally during the luteal phase primary hormonal imbalance or abnormal response to normal concentrations of oestrogens, and progesterone affects the epithelial cells of the uterus and facilitates bacterial adherence, colonisation and growth. The uterine response to the presence of bacteria is largely based on innate immunity. The most effective medical treatment with minor side effects seems to be the repeated administration of aglepristone with or without the additional treatment with low doses of prostaglandins (Fieni *et al.*, 2014).

The diagnosis of the pyometra is best achieved with the aid of ultrasonography, apart from varying degrees of clinico-haemato-biochemical alterations, and the USG findings typically include enlarged uterine horns filled with anechoic to echogenic fluid with or without thickened endometrium with cystic structures, which is diagnostic for cystic endometrial hyperplasia (Bigliardi *et al.*, 2004). Medicinal treatment is often risky and not always successful; hence, surgical ovario-hysterectomy is still regarded as the safest and most effective course of action because the infection source is eliminated directly and prevents recurrence (Fieni *et al.*, 2014). This study was aimed to investigate in detail the clinico-diagnostic, confirmatory USG and histopathological changes in the uterus, and therapeutic outcome of canine pyometra.

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## MATERIALS AND METHODS

During the study period, we subjected cases with anamnesis, clinical examination, haematological and biochemical analysis, ultrasonography and radiography, antibiotic

sensitivity testing of vaginal discharge/uterine content, and histopathology as needed. Based on the diagnosis and need of cases, appropriate surgical management was instituted and the cases were followed up to the 15<sup>th</sup> day after treatment.

### Clinico-Physiological and Haemato-Biochemical Examination

Physiological parameters like rectal temperature (°F), respiration rate (breath/min), heart rate (beats/min), colour of the visible mucous membrane and capillary refill time (sec) were recorded on day 0, 7<sup>th</sup> and 15<sup>th</sup> post-treatment days.

Haematological parameters investigated on days 0, 7<sup>th</sup> and 15<sup>th</sup> post-treatment using autoblood analyser (Abacus ABJ Vet-5) included haemoglobin, packed cell volume, total erythrocytes count, total leukocytes count, differential leukocytes count, and Platelets count. Along with these, serum creatinine, BUN, AST, and ALT concentrations were also determined using assay kits and semi-auto-biochemistry analyser (LW C100).

### Radiography and Ultrasonography

In pyometra cases, radiographs of the abdomen were taken in lateral or ventro-dorsal recumbency for better visualization of the uterine structure. The radiographic exposure factors varied based on the size of the patient with a constant focal film distance (FFD) of 90 cm. Transabdominal ultrasonography of the abdomen was also done with the animal positioned in lateral (right and left) recumbency to scan uterine structure.

### Surgical Management

The animals selected for the surgical management were kept off feed and off water for 12 h and 6 h, respectively, prior to surgery. Animals were stabilised with balanced fluid therapy, broad-spectrum antibiotics, and analgesics prior to the surgery to prevent electrolyte imbalances. Mid-ventral site was prepared for aseptic surgery. All patients were given Inj. Atropine sulphate @ 0.04 mg/kg, SC as a pre-anaesthetic 15 min prior to the surgery, followed by induction of general anaesthesia with a combination of Inj. Ketamine hydrochloride @ 5-10 mg/kg, IV and Inj. Diazepam @ 0.5-1 mg/kg, IV. All the animals were maintained on isoflurane with oxygen during the surgery. All the dogs underwent standard ovario-hysterectomy, particularly closed pyometra cases as an emergency under supine position.

After cutting through the fascia, linea alba, and peritoneum, the abdominal cavity was exposed. The uterine horns and body were gently exteriorized avoiding rupturing the uterus. Ovarian pedicle was ligated through double ligature using absorbable suture material, Vicryl 0 or Catgut 0 and transected between the artery forceps and ovary. By applying cranial traction on the uterus, a trans-ligation was done between cervix and vagina, the uterine body was transected, thoroughly lavaged and the vaginal stump was closed. The abdomen was lavaged using inj. metronidazole and the laparotomy incision was closed in a routine standard

manner. The post-operative management was adopted as usual with antibiotics, analgesics, antiemetics, fluid therapy and wound dressing. Stitches were removed on day 14 after surgery.

### Bacterial Culture, Sensitivity Testing and Histopathology

Vaginal and uterine swabs were collected from cases of open and closed pyometra for cultural isolation of bacterial pathogens, and their antibiotic sensitivity testing against standard antibiotics using disc diffusion technique. The uterine tissue samples were collected in 10% neutral buffered formalin, and after sectioning, processed for histopathological examination using haematoxylin and eosin stain.

### Statistical Analysis

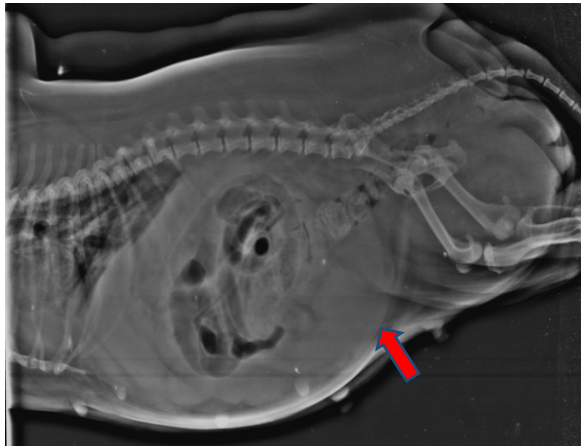
Means and standard error were calculated using descriptive statistics. The alteration of various blood, serum and vital parameters at different time period were analysed using one-way ANOVA and mean difference were compared by Duncan's *post hoc* multiple range test at significance level of  $p < 0.05$ .

## RESULTS AND DISCUSSION

Among a total of 14 cases of pyometra presented during the study period, the highest incidence was recorded in age group of 6-10 years (9 cases, 64.28%) followed by 11-15 years (3 cases, 21.42%) and 0-5 years (2 cases, 14.28%). Similarly, Martins *et al.* (2015) also reported pyometra more frequently in dogs between the ages of 6 to 9 years, while Pitroda *et al.* (2025) found increased incidence with a mean age of  $5.6 \pm 0.2$  years. Pyometra seen more common in middle-aged to older female dogs (6-10 years old), might be due to gradual hormonal and structural changes in the uterus over repeated estrous cycles, and lack of awareness of spaying in female dogs, which increases the risk of pyometra.

During the study, pyometra was found most frequently in Spitz (28.57%) dogs followed by Labrador retriever (21.42%) and German shepherd, Rottweiler (14.28% each). Similar findings were reported by Martin *et al.* (2015), who observed higher incidence in Spitz (37%) and German shepherd (19%). Goyal (2022) noted the highest incidence in Non-descript (37.50%) and lowest in Labrador and Dachshund (6.25%) breed. Highest incidence of pyometra in Spitz and Labrador retriever might be due to higher population of these breeds in the area as well as more number of cases presented at the clinic during the study period.

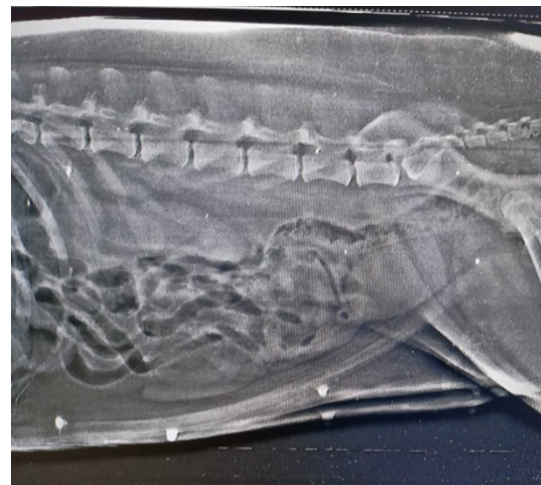
During the study period, open cervix pyometra was recorded in 11 (78.57%) cases and rest of 3 (21.42%) cases presented with close cervix pyometra. Jitpean *et al.* (2016) also noted open-cervix pyometra in 54% of cases, while closed-cervix pyometra was accounted in 44% of cases. Closed pyometra was less frequent than open pyometra.



A) Distended uterus appears as a tubular, fluid-filled soft tissue opacity in the caudal abdomen



B) No clear uterine structure, Visible as a soft tissue mass, in the region of the mammary glands



C) No clear uterine structure visible. The intestines are distended with gas or ingesta

**Plate 1:** Representative radiographs of pyometra

Delayed diagnosis of closed pyometra can lead to serious complications, including damage to the kidneys, liver, and other internal organs, and it may also be misdiagnosed by clinicians due to its subtle or non-specific signs.

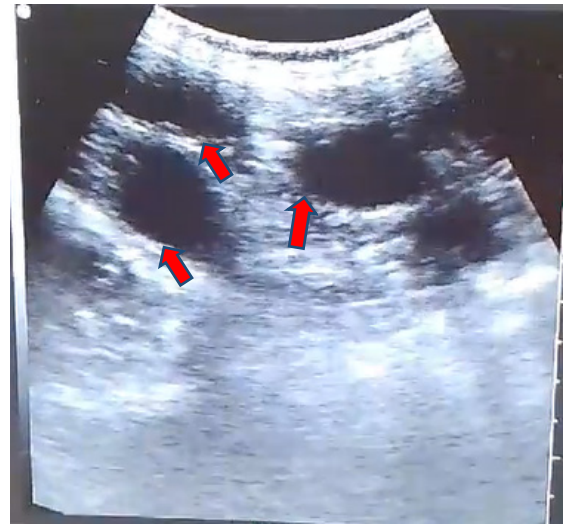
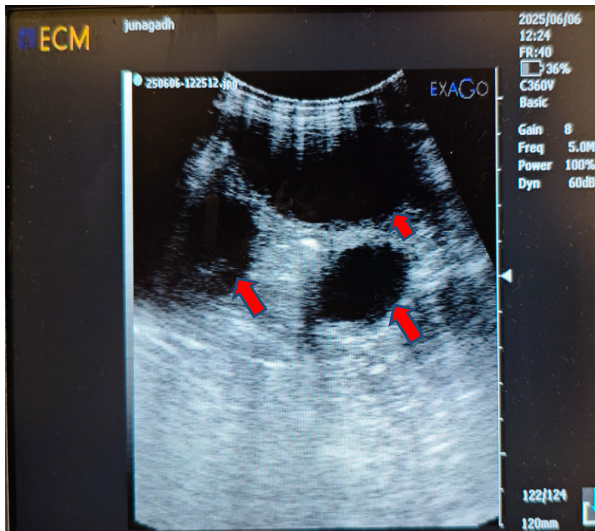
**Clinical Signs**

Among 14 dogs, inappetence was noticed in 13 (92.85%), while only one dog (7.14%) had normal water and feed intake. Moreover, 11 (78.57%) dogs had vaginal discharge, which indicated that they had open pyometra, while 3 (21.42%) had closed pyometra. Out of 11 cases of the open pyometra, the discharge was purulent in 7 cases and haemorrhagic in 4 cases. At the time of presentation, polydipsia was observed in 11 (78.57%) cases, polyuria in 9 (64.28%), enlarged abdomen in 5 (35.71%) and vomiting in 3 (21.42%) dogs. Abdominal enlargement in advanced cases of closed pyometra might be due to the accumulation of a large volume of pus within the uterus. Jitpean *et al.* (2016) noted that vaginal discharge is an

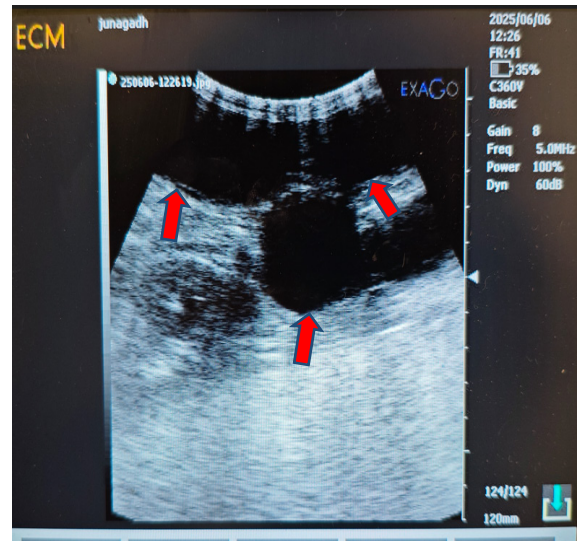
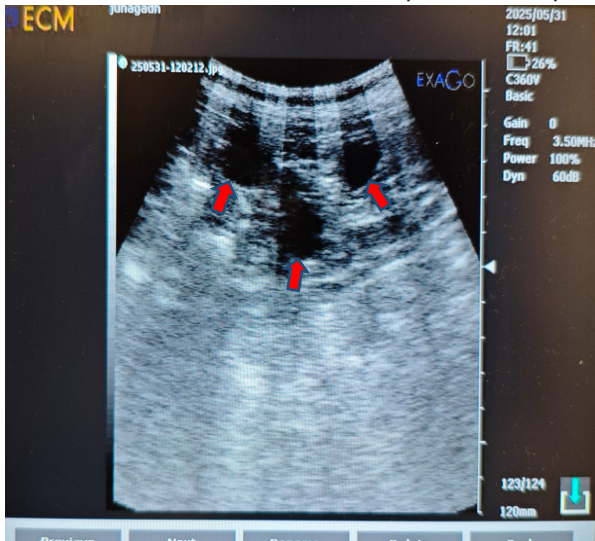
indicator clinical sign of open pyometra in dogs. Verstegen *et al.* (2008) identified vaginal discharge, which could range from serosanguinous to mucopurulent in nature, the most common clinical symptom of canine pyometra.

High rectal temperature noted on the day of presentation might be due to underlying infection, inflammation, systemic influence of endotoxins or sepsis. Following surgical treatment, a significant decrease in rectal temperature to normal levels was observed, likely due to the removal of the infectious source and inflamed uterus. There were no significant differences in heart rates and respiration rates between the pre- and post-operative days and remained within normal physiological range. Anusha (2021) and Gouru *et al.* (2024) observed increased physiological parameters like respiration rate and rectal temperature in pyometra-affected female dogs, which decreased significantly after treatment, whereas the heart rate did not show any change.

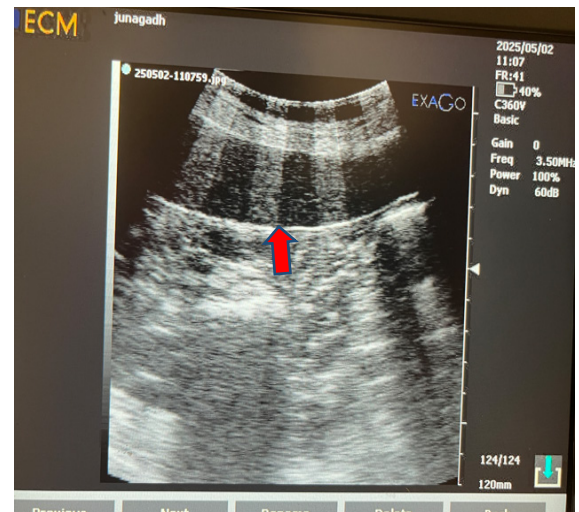
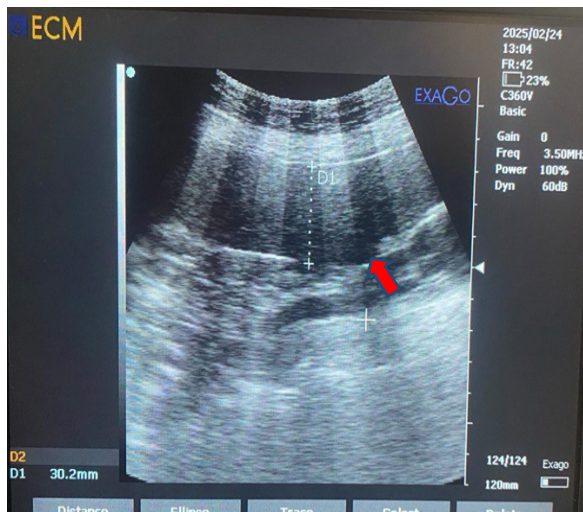




A) Multiple anechoic pocket with distended uterine lumen



B) Anechoic to hypoechoic "string of pearls" suggestive for saccular pyometra



C) Uterine loop of 30.2 mm filled with heterogenous substance

Plate 2: Representative ultrasound of canine pyometra

### Haemato-Biochemical Alterations

There was a non-significant decrease in value of haemoglobin, total erythrocyte counts and packed cell volume on 7<sup>th</sup> and 15<sup>th</sup> post-operative day as compared to day of presentation. The elevated values of these parameters at the time of presentation might be due to haemoconcentration due to possible dehydration. There was moderate to severe leucocytosis on the day of presentation, which became normal after treatment. Paudel *et al.* (2023) also reported similar findings. The reason behind the leukocytosis in pyometra might be due to the accumulation of pus which distends the uterus and stimulates the immune system to produce more leukocytes. On day zero, the neutrophil count was found higher than normal physiological limits, which indicates a stress and presence of genital tract infection because of pyometra, which became normal after surgical and therapeutic treatment. Gouru *et al.* (2024) noted leucocytosis with neutrophilia shift to left, lymphopenia and monocytosis as the most consistent finding in canine pyometra. Talukdar *et al.* (2022) revealed reduced haemoglobin, PCV and TLC in the bitches affected with pyometra and the leucogram showed leucocytosis with neutrophilia.

Elevated creatinine and BUN noted in pyometra cases may result from either renal dysfunction due to dehydration or sepsis induced acute kidney infection. A significant decrease in creatinine and BUN levels was observed following surgery towards normal physiological limits. ALT and AST levels were significantly higher than normal limit on 0 day as compared to 7<sup>th</sup> and 15<sup>th</sup> post-operative days. A significant decrease in these enzymes observed after treatment typically reflects recovery from systemic illness, resolution of liver or muscle stress. Gouru *et al.* (2024) also reported the elevated levels of serum creatinine, blood urea nitrogen, alkaline phosphatase and aspartate transaminase in the pyometra-affected bitches which reduced significantly after treatment.

### Radiography

During the radiography, out of 14 dogs, 08 (57.14%) dogs revealed the distended uterus as tubular, fluid-filled soft tissue opacity in caudal abdomen (Plate 1A). In 06 (42.85%) dogs with pyometra the uterine structure was visible and the intestines were distended with ingesta or gas (Plate 1B, 1C), which might be due to small amount of pus or drainage of uterine contents through the vagina making uterus non-visible in plain radiography.

### Ultrasonography

In the present clinical study, among 14 dogs having pyometra, in 09 dogs uterine lumen was found distended and filled with multiple heterogeneous pockets during an ultrasonographic examination (Plate 2A, 2B). Although in remaining 05 cases, the luminal contents were uniform, they appeared thick, with an increased uterine lumen diameter filled with heterogeneous substance (Plate 2C). Similarly, Kumar *et al.*

(2023) observed enlarged, distended tubular structure filled with anechoic to hypoechoic contents in pyometra affected dogs. Manokaran *et al.* (2018) also reported that the uterine wall thickness was significantly increased in dogs affected by pyometra. In healthy bitches the average uterine wall thickness was 2.56 mm, while the thickness increased from 8.92 mm to 18.23 mm in cystic endometrial hyperplasia-pyometra-affected bitches. In our study, ultrasonography successfully diagnosed all cases of pyometra, which clearly visualizing both small and large diameters of the pus-filled uterus. In contrast, radiography was only effective in identifying some cases of closed pyometra with a large accumulation of pus and not reliable for diagnosing all cases.

### Vaginal Cytology

Vaginal cytology of dogs revealed a large number of neutrophils and Gram-negative bacilli in the 09 cases of open pyometra (Plate 3A, 3B). Similarly, Llazani *et al.* (2021) observed increased number of parabasal and intermediate cells in vaginal cytology.

### Bacterial Isolates and Antibiotic Sensitivity

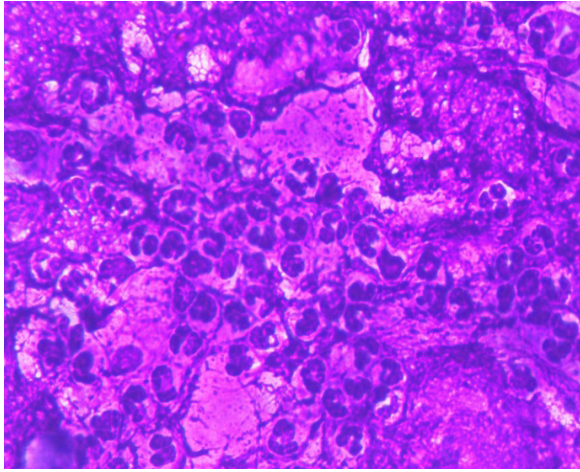
Of the 14 cases, Gram-negative bacilli were identified in 9 cases (64.28%), while *Staphylococcus* species were found in 5 cases (35.71%) through bacterial culture. The most sensitive antibiotics against the isolated bacteria were levofloxacin (57.14%) and chloramphenicol (50%), followed by ceftizoxime, oxytetracycline, and cefoperazone (35.71% each), cefpodoxime (28.57%), and ampicillin-sulbactam and gentamicin (21.42% each). Similarly, Lee *et al.* (2000) found enrofloxacin, norfloxacin as the most effective antibiotics in controlling pathogenic bacteria followed by chloramphenicol and gentamicin the case of canine pyometra.

### Surgical Management

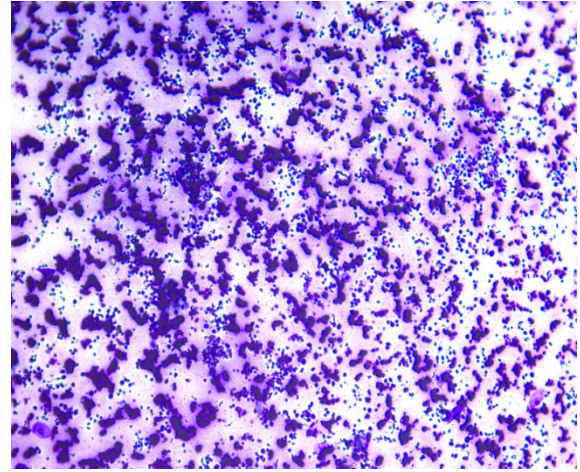
In all 14 cases ovariohysterectomy was performed using a ventral midline incision and managed without major complications. Out of 14 cases, four were initially managed therapeutically using Inj. Ceftriaxone and Tazobactam @ 20 mg/kg IV, Inj. Flunixin meglumine @ 1 mg/kg IM, Inj. Metronidazole @ 20 mg/kg IV, and Tab. Cabergoline @ 5 µg/kg PO once daily for at least five days. However, they did not show clinical improvement and surgical management was subsequently undertaken. Karabolovski *et al.* (2023) reported ovario-hysterectomy as the most effective treatment for canine pyometra. In our study, therapeutic management alone was ineffective for the complete treatment of canine pyometra. This approach carries a significant risk of uterine rupture, particularly in cases of closed-cervix pyometra. In canine pyometra cases, surgical intervention proved to be more effective than medical management in achieving complete resolution.

In one case, wound dehiscence of the suture line occurred due to infection. Another dog developed extensive





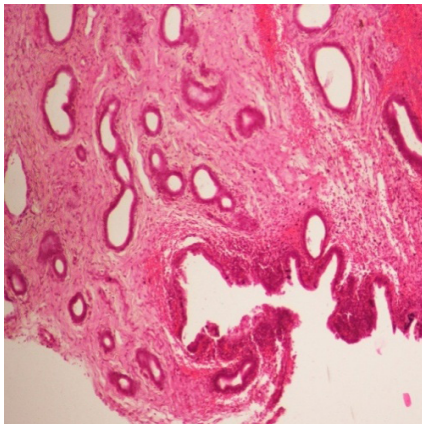
**Plate 3A:** Large number of neutrophils found in vaginal cytology of open pyometra



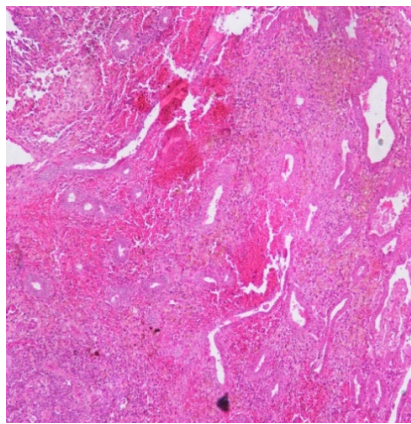
**Plate 3B:** Large number of leucocyte and gram negative bacilli



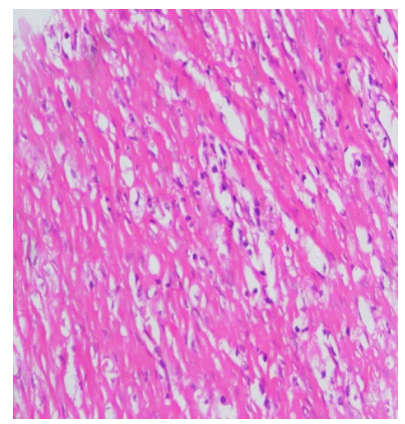
**Plate 4:** Gross photographs of uterine horns and uterine body of pyometra affected dogs



A) Endometrium showing the endometriosis and dilation of endometrial glands along with mucosa that was infiltrated with PMN cells. The lining epithelium of the endometrial glands was also distorted with multifocal haemorrhages (H & E Stain x 40)



B) Narrowing of lumen of endometrial gland, also filled with mixed inflammatory exudates, myometrium severely infiltrated by inflammatory cells like neutrophils, mononuclear cells along with multifocal area of congestion and haemorrhages (H & E Stain x 40)



C) Infiltration of inflammatory cells predominantly neutrophils in the myometrium (H & E Stain x 40)

**Plate 5:** Representative histopathology of uterine tissue of canine pyometra

bruising (ecchymosis) associated with thrombocytopenia (low platelet count). The condition was managed with oral suspension Advaplate @ 1 tsp BID, resulting in complete resolution of clinical signs within five days of treatment. The two cases (14.28%) succumbed in which one dog had developed pneumonia four days after surgery, while the other succumbed due to complications related to kidney and liver dysfunction.

### Gross and Histopathological Findings

The gross changes in the uterus of pyometic bitches are depicted in Plates 4A, 4B, 4C. Histopathological examination of the uterine tissues of pyometra-affected dogs showed the endometriosis and dilation of the endometrial gland in the myometrium along with the mucosa infiltrated with polymorphonuclear cells. The lining epithelium of the endometrial glands was also distorted and multifocal haemorrhages were noted (H & E Stain 40X). Infiltration of inflammatory cells predominantly neutrophils in the myometrium were noticed (Plate 5A, 5B, 5C). Ali *et al.* (2023) found chronic suppurative endometritis or metritis associated with purulent and mucopurulent inflammatory exudates in the uterine lumen, focal epithelial sloughing, endometrial hyperplasia and fibrosis, cystic dilatation of the endometrial gland and infiltration of the endometrial stroma by mixed inflammatory reaction consisting of mononuclear and neutrophilic polymorphonuclear inflammatory cells.

### CONCLUSION

Open pyometra was the most common surgical condition which was characterised by vaginal discharge and the most affected breed was the spitz. The most sensitive antibiotics against isolated bacteria from pyometra cases were levofloxacin (57.14%) and chloramphenicol (50%). In cases of pyometra, elevated levels of total leucocyte count, neutrophils, serum creatinine, AST and ALT are mainly due to the multiple organ involvement. Ultrasonography was found to be more effective diagnostic method in canine pyometra as compared to radiography.

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