# Sonographic, radiographic, clinicopathological investigation of canine pyometra

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*IN PARTIAL FULFILMENT OF THE REQUIREMENT*
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***IN***

***ANIMAL REPRODUCTION, GYNAECOLOGY AND OBSTETRICS***

**By**

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# CERTIFICATE-I

This is to certify that the thesis entitled **"Sonographic , radiographic, clinico-pathological invesatigation of canine pyometra"** submitted in partial fulfilment of the requirements for the award of the degree of **Master of Veterinary Science (Animal Reproduction, Gynaecology and Obstetrics)** to the Odisha University of Agriculture and Technology is a faithful record of bonafide and original research work carried out by **Subhankari Sudeshna Dash**, **Adm. No. 18192C03** under my guidance and supervision. No part of this thesis has been submitted for any other degree or diploma.

It is further certified that the assistance and help received by her from various sources during the course of investigation has been duly acknowledged.

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**ADVISORY COMMITTEE**

# CERTIFICATE-II

This is to certify that the thesis entitled **"Sonographic, radiographic, clinico-pathological investigation of canine pyometra "** submitted by **Subhankari Sudeshna Dash**, **Adm. No. 18192C03** to the Odisha University of Agriculture and Technology, Bhubaneswar in partial fulfilment of the requirements for the degree of **Master of Veterinary Science (Animal Reproduction, Gynaecology and Obstetrics)** has been approved/disapproved by the students' advisory committee and the external examiner.

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**Place: Bhubaneswar**

**Date:** **(Dr. Subhankari Sudeshna Dash)**

# CONTENTS

# LISTS OF FIGURES

# LISTS OF TABLES

# LIST OF CHARTS AND GRAPHS

# ABBREVIATIONS

| | | |
|---|---|---|
| % | : | Per cent |
| & | : | And |
| µl | : | Microliter |
| DC | : | Differential Count |
| dl | : | Deciliters |
| DLC | : | Differential Leukocyte Count |
| Fig. | : | Figure |
| Hb | : | Haemoglobin |
| ml | : | Mililiter |
| CEH | : | Cystic Endometrial Hyperplasia |
| MCV | : | Mean Corpuscular Volume |
| MCH | : | Mean Corpuscular haemoglobin |
| PCV | : | Packed Cell Volume (PCV) |
| MCHC | : | Mean corpuscular Haemoglobin concentration |
| SPSS | : | Statistical Package for the Social Sciences |
| TLC | : | Total Leucocyte Count |

# ABSTRACT

The place of study was at Teaching Veterinary Clinical Complex, College of Veterinary science and animal husbandry, OUAT, Bhubaneswar for determination the percentage of pyometra, to find out blood parameters, sonographic and radiographic examination along with description of the lesions in pyometra of female dogs. The place of study was Department of Animal reproduction, Gynaecology and Obstetrics, Teaching Veterinary Clinical Complex (TVCC). 170 bitches presented to for reporting of various problems. Diagnosis was done by examination done clinically, radiography and ultrasonography imaging along with various samples collection were done. They were examined for forward investigation in the course of period of study. The percentage of pyometra is the highest (70%) was found in the group of age 6-10 years and The age in mean was 8.05 ± 0.61. Among the breeds, the breed was mostly affected pomerian (35%) followed by (30%) labrador, (15%) spitz, (10%) german shepherd and Boxer and Pug breeds (5% each). Nulliparous bitches (65%) were mostly affected followed by primiparous (25%) and pleuriparous (10%) animals.

Patency of cervix was taken as basis for Open (50%) and closed (50%) bitches were in diestrus all cases. Most of the cases having loss of appetite, weekness, vomition and normal temperature to increased temperature in most bitches. In cases of open pyometra vaginal discharges ranging from mucopurulent to hemorrhagic with abnormal colour and odour were observed. The mean of PCV, Hb and TRBC values were significantly decreased in pyometric bitches from the normal animals in comparison. MCV, MCH and MCHC was not showing significantly decreased and a result was normocytic, normochromic anemia. Leucocytosis with shifts to left in all open pyometra cases decreased significantly.

The animals were grouped according to the presence or absence of vaginal discharege and also on the basis of patency of cervix. Grossly, uniformly distension of uterine horn and revealed superficial cysts that creamy pus exudation ranging to haemorrhagic. Infiltration of polymorphonuclear cells along cystic glandular hyperplasia was observed histopathologically. Sacculations of uterine horns is observed in open type of pyometra grossly. Focal hemorrhagic ulceration on cut section were seen along with annular constrictions, whitish cysts. Infiltration of polymorphs markedly and within glandular lumen along with polymorphonuclear infiltration in the endometrial stroma was the consistent finding. Necrotic mass in endometrial glands showed along the uterine lumen with the fibrosis in the periglandular region seen prominently. In myometrium fibrosed and atrophied. Uterus showing distended especially horn at the ovarian end lesion was noticed. Endometrial granular surface and creamy consistency having white fluidic consistency materials were seen. Endometrial layer very thin with cystic hyprplasia of the glands, mononuclear stromal infiltration atrophied and fibrosis were observed in myometrial layer.

The uterine exudates ranging from blood to in nature. Cystic hyperplasia in endometrial surface in investigation through transabdominally done ultrasonography Clearly evaluated endometrial integrity, uterine wall thickness in ultrasound examination showed that distension of uterus and cystic hyperplasia endometrial glands. Within the endometrium anechoic areas (1–2 mm) are increased on the basis of size and number. The study has shown to depend upon the severity of clinical signs and extent of uterine lesions. The ultrasonography is a confirmatory diagnosis of the uterus of pyometric suspected bitches. The radiography is a tentative diagnosis of the suspected cases.

# INTRODUCTION

Pyometra is a mostly encountered in the places where elective spaying of the bitches are not done. Pathogenesis of the disease fundamentally is hormonal imbalance and bacterial infection, that proves itself as very potent and life threatening complications in female dogs. The most effective treatment is surgical hysterectomy. Laparoscopically assisted methods used in the surgical procedures of selected cases shortens the duration of post-operative hospitalization. Promising results were also tested in the improved medical alternatives. Optimizing therapy and increasing survival can be done by predicting presence of complications early along with their outcomes. Valuable clinical practice is helpful for doing the early diagnosis. Useful as predictive markers in the diagnosis are results of clinical and laboratory investigations have been done in the suspected early cases. Increased risk of peritonitis along with leucopoenia associated with is the outcome of surgical treatrment. Post-operative hospitalization with a prolonged monitoring of the vitals of the patient is a must required after surgical hysterctomy. Highly valuable diagnostic test in clinical practice when it will be in the side of cage, rapidily and cost-effectively done. An early detection of upregulated genes in the uterus in pyometra is a potential diagnostic tool.

Diseases of the uterus in intact, occurs in 4 weeks to 4 months after estrous in sexually mature bitches (Smith,2006). Common charecteristics are bacterial infection with pus accumulation in uterine cavity along with systemic illness. In the early stage disease shows subtle changes. The diagnosis in the disease process is always late. Pyometra and nulliparity of bitches were related and bitches of more than 4 year of age are most common.

Variety of clinical symptomps along in several cases it becomes life threatning in nature. The veterinary medicine focuses on the research since 1920(Moller Sorensen,1929). Complex aetiology and pathogenesis of disease are undiscovered till now.

Etiological factors of pyometra is very complex. Hormonal imbalance in the uterine environment along with infecting bacteria are two fundamental causes. To bacterial and inflammatory products the individual sensitivity along with the general combating ability of the bitch against the infection causes pathogenesis of pyometra in

involves estrogen dominance. Endometrial proliferation, uterine glandular secretions is increased by progesterone dominance along with decreased myometrial contractions. Pyometra is usually seen with age of 9 years in median, in bitches between 9 months and 18 years of age. Nulliparous bitches are more succeptibe and in a risk of pyometra is higher as compared to primiparous animals and multiparous animals (Nisakanen and Thrusfield, 1998). Closed and open cervix pyometra are classified on the basis of the patency of the cervix in the pyometric animals. They can be distinguished on the basis of the clinical signs vary with cervical patency (Shukla, 2012). Some cases become acute and severe within a week or two and require immediate and early attention to save patient's life. In other cases, especially those with an open cervix from which pus is draining, the disease may run a course of a month or more. Onset of clinical signs progresses gradually and insidiously. The most obvious sign noticed by owners is vaginal discharge with a nature varying from serosanguinous, haemohorragic to mucopurulent in nature. Other signs include depression, inappetance, polyuria, polydipsia and vomition. The diagnosis of pyometra is established on the basis of the history, stage of estrous cycle, physical examination, laboratory and radiologic imaging abnormalities. Ultrasonography is useful in differentiating fetal structures, solid masses and luminal fluids.

A considerable alteration occurs in clinico-haematological and blood biochemical profiles of pyometra affected bitches. Regenerative shift to left and monocytosis along with leucocytosis and neutrophilia with are observed in case of closed cervix pyometra and (Shukla, 2012). But that is marked lessly in open cervix pyometra cases because of prolonged pyometra, liver and kidney disorders occur that may be determined by serum biochemical profile viz.Aspartate Aminotransferase (AST), Alanine Aminotransferase (ALT) levels for liver and Blood Urea Nitrogen (BUN) and creatinine for kidney function. The characteristic uterine pathology includes enlarged uterus with accumulation of pus grossly (Greene, 2011) and endometrial glands having enlarged and cystic nature with inflammatory cells flowing into the glandular and uterine lumen areas microscopically (Kempisty *et al.*, 2013). Although pyometra is a unique condition, it can be triggered by different bacterial genera. The most commonly isolated bacterium in dogs with pyometra is Escherichia coli (Dhaliwal et al., 1998). However, other gram-negative as well as gram-positive bacteria are also associated with pyometra in bitches (Rekha and Krishnappa, 2001 and

Bigliardi et al.,2004). Perusal of the available literature revealed various reports on canine pyometra in India and abroad. However, the reports mostly pertained to the clinical, diagnostic and treatment aspects of pyometra whereas reports on the pathological changes of uterus in affected bitches were scanty especially in the area under study. Hence, keeping this in view, proposed with the following objectives in the present study:

1. To know the incidence of pyometra in canines.
2. To carry out hematological studies in cases of canine pyometra.
3. To carry out radiography and ultrasonography
4. To compare the uterine measurements in gross samples and ultrasonography.
5. To study the gross and histopathological lesions in the uterus of hysterectomised bitches diagnosed with pyometra.

▼▼▼

# REVIEW LITERATURE

## 2.1Incidence of pyometra

It is reported by Niskanen and Thrusfield (1998) that in pyometra the dogs median age of 9 years at diagnosis with a range in between 9 months and 18 years of age. Nulliparous bitches are in moderately higher risk of pyometra compared to the bitches of primiparous and multiparous breeding history.

Where no routine performance of elective spaying are absent. Pyometra is commonly encountered disease in those countries. 19% on average of all intact bitches before attaining the age of 10 years are affected by the pyometra was reported by (Jitpean *et al.*, 2012). This leads to a slightly higher lifetime proportion of 20% approximately are diagnosed at an older age was reported by (Jitpean, Ström- Holst *et al.,* 2014)

Simon *et al*. (2011) analysed the incidence of pyometra in different breeds of bitches and in different age groups. A total of 278 cases were recorded of which pyometra was more common in Spitz (39.56%), followed by Labrador (12.94 %), Alsatian (11.87 %), non-descript dogs (11.51%), Doberman Pinscher (7.19%), Boxer (3.95%), Dachshund and Pomeranian (2.87%), Rottweiler (2.51%), Lhasa Apso (2.15%), Beagle and Dalmatian (1.79% ) and less than 1% incidence in Golden Retriever, Cocker Spaniel, Poodles and Irish Setter breeds. Incidence was more (17.26%) in seven to eight years old dogs followed by three to five years (16.18%), nine to ten years (14.74%), eight to nine years (13.66%), under three years (12.94%) and in above ten and five to seven years (12.58%) groups.

Ahamed *et al.* (2015) studied canine pyometra in 20 clinical cases at Kolkata and the mean age of the affected animals was found to be 8.54 ± 0.77 years. The most affected breed was Labrador (35%) and the least affected were German Shepherd (5%) and Mongrel (5%).

Open and closed types of pyometra was studied by Shah *et al*. (2017) and they studied in 8 bitche and the affected bitches was found to have a 7.6 years ranging (5-12) in the outcome of study.

In Sweden, pyometra in insured dogs was studied by Egenvall *et al*. (2001). Breeds named Cavalier King, Collies, Charles Spaniels, Rottweilers, Golden Retrievers, Bernese Mountain Dogs along with English Cocker Spaniels have higher risk inherently. Lower risk inherently present in Drevers, Miniature Dachshunds, German Shepherd Dogs, Dachshunds (normal size) and Swedish Hounds.

Fukuda (2001) observed 15.2% of pyometra in Beagle dogs having the age of more than 4 years.

Breed and age of bitches influencing on onset of pyometra was examined by Stancic *et al*. (2008).

The risk of pyometra was found to increase significantly next to 5 years of age and significant effect on the age caused by the breed in which pyometra occurs. In Egypt, bitches with related ovarian alterations in CEH-Pyometra was undertaken by Younis *et al. (*2014) by ultrasonography and pathological evaluation.

In a beagle colony Pyometra in up to 15.2% reported by Fakuda (2001). Egenvell *et al*. (2001) and Hagman (2004) reported that the bitches 10 years of age developed pyometra are of 25%.

**2.2Age and Parity**

Reporting age of 7.25 years in mean opined by the reports of Johnston *et al*. (2001). In the study he observed that bitches that have undergone repeated estrus are affected by pyometra and it typically affects cycling and matured bitches.

Treated medically for pyometra 192 bitches that were studied by Feldmen and Nelson (2004). In the study they reported having 2.4 years was the mean age of occurence. Onset of pyometra mostly in the average age of 9.36± 0.35 years was reported by Smith (2006).

18 (4.03%) were suffering from pyometra out of the 446 dogs screened by Kashinath *et al.* (2009). The age group of 6-9 years has incidence of pyometra higher and found in 10(55.55%). From the of 18 bitches 14 were nulliparous bitches

(77.77 %) proving pyometra occurance incidence was prevelant in the in matured middle aged group with the nulliparous bitches.

**2.3Breed**

Eganvall *et al.* (2001) report shows that shows age, breed, and geographic location are the basis of variation in the occurrence of pyometra. Incidence and occurrence of the pyometra in rough Collies, Rottweilers, Cavalier King Charles Spaniels, Golden Retrievers, Bernese Mountain Dogs, and English Cocker Spaniels compared with baseline (all other breeds, along with the mixed breed dogs) was showed to be increased (identified using multivariate models). With a low risk of developing the disease in Drevers, German Shepherd Dogs, Miniature Dachshunds, Dachshunds (normal size), and Swedish Hounds Breeds. In a average 23-24% of the bitches in the databases show survival Experienced pyometra by 10 years of age. Clinically relevant problem in the report of the study of intact bitches breeds, between 10 and 54% proportion range. Differences in breed and age related along with proportion in study of this disease was taken into the account of the study.

Sweden has the record of the high risk of to pyometra predisposition in Collie (rough-haired) along with the base population ofRottweiler, Bernese, Mountain Dog, Cavalier King, and Golden Retriver reported in study that was conducted by Hagman (2004). Lower risk in sweedish hound, Dachshund and German Shefered dog in developing pyometra has been reported.

Smith (2006) studied that Rottweiler, Saint Bernard, Chow Chow, Golden Retriever, Miniature Schnauzer, Irish Terrier, Mountain dog, Airedale Terrier, Cavalier King Charles Spaniel, Rough Collie, and breeds predisposed to pyometra. Kashinath *et al.* (2009) studied and reported that the highest cases were in Spitz are in majority, followed by German Shepherd, Cocker Spaniel, Doberman Pomeranian and LhasaApso in breed wise study of pyometra. It was also proven more succeptibility of smaller breeds towards pyometra.

Pyometra is most often observed in eight years of age in relation to cycle of estrous previously. Anestrous stage of cycle of reproduction in bitches Noakes *et al.*

(2001) reported that can be diagnosed with pyometra although mostly a disease of diestrus in the intact bitches.

Verstegen *et al*. (2008) reported in the study that proportion of anestrous bitches from the total cases, that showed one-third in proportion. Uncertain about the shortening of the luteal phase prematurely or there is observation of animal just after the luteal phase ends normally. Like in other species due to premature shortening induction of the luteal phase is done by in response to the uterine inflammation production of prostaglandin endogenously observed.

From a range of 4 weeks to 4 months after the finish of cycle of estrus presented to the clinician was studied by Smith (2006) out of that most bitches were with pyometra. Older bitches with, that their bitch has undergone menopause no recent estrus activity were most common misconception.

Interval with a mean of 5.7 weeks from previous estrous was reported by Pretzer (2008). He has reported onset of pyometra and cycle of estrous and bitches presented in between 12 weeks after the start of the previous cycle mostly suspected for pyometra.

**2.4 Hormonal component**

Circulating hormones and the relation of it in development of disease has been discussed, as most of the time concentrations of hormone in the circulations proved to be same with the normal bitches at similar stages of the estrous cycle. Same circulating levels compared in normal and affected bitches. (Gultiken, Yarim, Yarim, Gacar, & Mason, 2016).

Common factor associated with changes of degeneration, CEH along with the infective sites by the occurrence showing there of numerous type of crypts and cysts that where proliferating bacteria can be found. This makes the cause for the reduction in the local immunity of the uterine tissues (periglandular fibrosis, glandular cystic distension) were suggested for establishment of uterine infections provide conditions that are opportunistic and this association is reflected as ‘Cystic Endometrium-Pyometra Complex’ were reported in the naming of the condition by the study of De Bosschere *et al*. (2001).

## 2.5 Pathogenesis of pyometra

(Leitner, Aurich, Galabova, Aurich, & Walter, 2003; Gabriel, Becher-Deichsel, Hlavaty, Mair, & Walter, 2016) reported the factors and receptors differently expressed can be a cause of enhancement of bacterial attachment in pyometra.

Progesterone exprees a inhibiting effect on the of antigen- presenting dendritic cells in the process of their maturation causes a special contribution to a diminished uterine local immune defence was reported by (Wijewardana *et al*., 2015).

Enhanced effect upon the uterine endometrium wall was shown in bitches by 3β- hydroxysteroid dehydrogenase, sometimes show increased cystic endometrial hyperplasia–pyometra complex expression recently reported by (Gultiken *et al*., 2016).

Local progesterone synthesis can be the measure cause in the pathogenesis and promotion the incidence of pyometra even in the condition of normal hormone levels circulating in the body. Although the normal range of the circulating ones are observed addition to pyometra by its local effect. The most effective side of treatment protocols by medicine the limiting the pyometra progression and can be possibly done by drugs by antagonising or decreasing the effects of hormones. This can be useful during the subtle phase and stages that exibhits subclinically. Advancement is valuable to explore in the stage of subclinical progression. Ongoing research on endometrial pathologies for the improved diagnostic methods for early discovery of disease, biopsy techniques along with endoscopy done transcervically have proven helpful and easy for any pyometra- predisposing changes' early discovery, for early therapeutic intervention that is really proved to be a prerequisite in the studies of (Christensen *et al*., 2012; Fontaine *et al*., 2009; Groppetti, Pecile, Arrighi, Di Giancamillo, & Cremonesi, 2001; Günzel-Apel, Wilke, Aupperle, & Schoon, 2001; Mir *et a*l., 2013). Diagnostic imaging confirmation and other techniques when they are researched and advanced properly for this purpose will also be valuable.

The bitch succeptibility and infecting bacterias' virulence are factor of importance in the individual cases. Progesterone that is locally acting seems to be a component that is most crucial in nature in the study of (Chen *et al.* 2003; Krekeler, Marenda *et al*., 2012; Krekeler, Lodge *et al*., 2012). In studies that were done earlier

experimentally difficult for induction of uterine infection, circulating levels of estrogen concentrations when in high and concentrations of circulating progesterone was found low.

However, in all bitches CEH does not progress inevitably to pyometra while commonly CEH usually precedes pyometra. This is an evident of that although all dogs develop CEH with age, pyometra will develop in some of them. Pyometra can develop which do not have prior clinical evidence along with pathological symptomps of CEH in young animals. In canine pyometra disease adult bitches which are intact showing variety of clinical signs genitally and systematically in the disease. The cystic endometrial hyperplasia (CEH) - Pyometra, concept was opined by the reports of D.Petzer (2008) concludes changes in hormones cause CEH predisposing factor to secondary infection of the uterus, leading to pyometra. The experiments were done before Dow's investigations the description of condition had been under a different degrees.

**2.6 Bacteriological**

Certain bacterial strains in the study of (Arora, Sandford, Browning, Sandy, & Wright, 2006; Chen, Wright, Lee, & Browning, 2003) are pathogenically virulent than others along with increased succeptibility of individually increase in their ability to cause pyometra are different factors. The immunizing of animal against pathogenetic factors vitally important in starting infection by *E. coli* attachment , the potentially limitaton of adhesion to the uterine endometrium, investigation is required further bacterial identification (Krekeler, Marenda *et al.*, 2012, 2013). Recently studies showed that necessary action of blocking adhesins of three types was required, showed by a pyometra causing *E. coli* strain and adhesion ability affection was studied by (Krekeler *et al.*, 2013). After medical therapy formation biofilms is exactly Whether growth of bacteria in for recurrence of the disease along with maintaining the uterine infection. The role of urinary tract infection will need to be further investigated.

They were more commonly associated is e.g. 02, 04, 06, and 075 found by Arora (2007) serotypes of *E. coli*, , Cytotoxin Necrotizing Factor (CNF) was than others with pyometra and the presence of severe endometrial changes were associated with more.

Cystic endometrial hyperplasia and lesions of uterine wall in bitches with infected in pyometra, bacterial flora of the uterus and lesions in bitches uterine affected with infection of endometrial wall was discovered by Dhaliwal, G. K., Wray, C. and Noakes, D. E., 1998.

**2.7 Clinical signs**

The clinical signs in dogs affected with pyometra depends upon the factor was discovered by Feldman and Nelson (2004). Along with that they found the factor was cervical patency, which is sufficient to make discharge of fluid that ranges from purulent to serosanguinous and variable in nature. Malodorous sanguinous to vaginal discharge having purulent in nature is the commonly found clinical finding with cases of open-cervix pyometra affected female dogs.

Verstegen *et al.* (2008) reported about the vaginal discharge. That is the obviously found clinically given indication of pyometra, ranging from the nature purulent to mucopurulent. In some bitches minimal and fastidious discharge is observed. Mostly having clinical signs of less vaginal discharge in the grooming bitches having less amount makes difficult to detect. Vaginal discharge signs may not be seen apparently externally in other cases, from smears of vaginal layers and examination with a vaginoscope the uterine exudate in the cranial vagina is present and that is revealed.

The partially dependence of vaginal discharge on the emphysematous pyometra degree. It was reported amount of cervical discharge in an 8 year old dog is reported by Hernandez *et al*. (2003) where in a mild purulent vulvar discharge and were noticed along with enlarged abdomen.

Polyuria, polydipsia and vomiting in pyometra were observed in Bigliardi *et al*. (2004), Kashinath *et al.* (2009), Singh *et al. (*2010) and Vural *et al.* (2010).

In addition, hyperthermia (Bigliardi *et al*.,2004andVural *et al*.,2010) and anorexia (Kashinath *et al*.,2009; Singh *et al*.,2010and Vural *et al*.,2010) were also noticed.

Other less common symptoms reported were diarrhea and prostration by Bigliardi *et al*. (2004), dullness and depression by Singh *et al*. (2010) and dehydration by Vural *et al.* (2010).

Kashinath *et al.* (2009) reported purulent, brownish red and whitish in colour vaginal discharges while Singh *et al*. (2010) vulvar discharge from chocolate brown to pinkish with foul smelling in pyometra. Biswas et al. (2012) reported sanguino-purulent vaginal discharge, distended abdomen and cachexia in a virgin German Shepherd with pyometra at 9year old.

Evaluation of physiological parameters in 28 bitches with pyometra by Jena *et al*. (2013) revealed increased temperature and respiration rate but variation of heart rate didi not show any change significantly reported by the opinions in the study ofMurthy *et al*. (2013) recorded oedematous vulva, purulent discharges and higher body temperature in 35 bitches with pyometra.

Whereas Ramsingh *et al*. (2013) recorded both higher and normal body temperature in pyometric bitches.

**2.8Haematology**

At admission to a veterinary clinic leucopenia is present and thus be important in bitches with the parameters to consider and that are evaluated in pyometra, laboratory variables in dogs, clinical signs, physical examination findings(Jitpean, Ström- Holst *et al.*, 2014)were recently investigated as predictively important indicators if they could be valuable. The rectal temperature increased or decreased were variables on the basis of association with increased the risk factor for peritonitis, leucopenia and abnormal (fold for leucopenia is 18 along with fold for abnormal temperature is 3), and depression of the general condition moderately to severely, mucous membranes are pale and were associated with leucopenia symptomps (sevenfold, threefold and over 3.5- fold, respectively) increased risk with the prediction to post- operative hospitalization prolongly (≥3 days). The most important predictive factor associated with fold of 18 associated with an increased risk for peritonitis and increased risk for prolonged postoperative hospitalization 3,5- fold was leucopaenia. Prognosis along with indicators associated with the findings from investigation on the

basis of clinical and laboratory examination and testing respectively may be useful, although in studies the results should be prospective need to be properly confirmed.

Singh *et al*. (2006) recorded leucocytosis,neutrophilia, lymphocytopenia and anaemiain bitches affected with CEH-Pyometra complex.Singh *et al*.(2010) observed leucocytosis that was moderate (17,000-30,000 cells/ mm3) in case of selected one, marked (30,000-50,000 cells/ mm3) in individually two cases and extreme (> 75,000 cells/ mm3) in cases of two individual out of 5 cases of canine pyometra examined. There was moderate neutrophil count (77-80 %) and markedly (> 80-99 %) in two cases each and (>90 %) in one bitch in extreme condition.

Sahoo *et al. (*2012) found anaemia, leucocytosis and absolute neutrophilia in canine pyometra while Yu (2012) observed mild normocytic normochromic anemia and less leucocytosis in bitches with open cervix pyometra

A decrease in TRBC, Hb, PCV and leucocytosis with neutrophilia was noticed by Jena *et al.(*2013), Murthy *et al.* (2013) and Patil *et al.* (2013) in pyometra whereas lymphopenia was also mentioned in the reports opined by the study of Jena *et al*.(2013)and Murthy *et al.* (2013).

Leucocytosis and neutrophilia predominantly left shift and 63% of PCV was reported in a dog with closed pyometra by Mahesh *et al. (*2014) whereas leucocytosis with neutrophilia was studied by Anoopkumar *et al*.(2016)in a Labrador dog of open pyometra.

Closed pyometra with bilateral follicular cysts reopted by Kumar *et al.* (2016) showed leucocytosis, neutrophilia, monocytosis and low haemoglobin.

**2.9Haematobiochemistry**

Clinical examination of blood chemistry investigation having findings are the most consistent elevated serum alkaline phosphatase, present in 50 –75% of cases approximately were reported by Verstegen *et al*. (2008) in their study opined that, mildly elevated level of serum alanine aminotransferase concentrations may also occasionally be seen. Diminished and decreased level of hepatic circulation due to dehydration these changes are reflection of hepato-cellular damage and toxaemic nature

of the disease. Hyperproteinemia along with hyperglobulinemia dehydration reflects the antigenic stimulation chronically. Development of the renal dysfunction is a majour condition in response to present with this disease and importantly found in canine pyometra. Not usually elevation of Serum creatinine concentrations are observed along with blood urea nitrogen, unless development of azotemia pre-renally as a dehydrational consequence. In azotemia is association of more severe clinical signs generally. Even glomerular filtration is usually decreased in non-azotemic rehydrated patients, indication of the fact that with the disease affection of renal perfusion some factors associated either in the presence or absence of azotemia.

Bigliardi *et al.* (2004) reported elevated AST and creatinine levels in bitches with CEH-pyometra complex while Nath *et al.* (2004) noticed higher levels of serum urea and creatinine in bitches with pyometra.

Ravishankar *et al.* (2004) observed values of serum urea nitrogen (59.95 ±8.19 mg/dl), creatinine (1.35 ± 0.13 mg/dl), AST (50.11 ± 4.07 IU/L) and ALT (48.03 ± 5.97 IU/L) in pyometric dogs compared to control dogs that showed elevated levels in bitches with pyometra.

Dabhi and Dhami (2006)found three times higher concentration of serum urea and creatinine in pyometra affected bitches than normal. Singh *et al.* (2006) noticed increased BUN and hyper proteinemia in bitches with CEH-Pyometra complex whereas the plasma creatinine values were not very much affected. Elevated total protein, cholesterol, creatinine, BUN, ALP, ASAT and LDH were reported in canine pyometra by Sahoo *et al*. (2012).

Yu (2012) observed a disproportionate increase in BUN in closed cervix pyometra.

Murthy *et al*. (2013) recorded elevated BUN and creatinine in 35 pyometra cases

whereas Patil *et al*. (2013) noticed significant elevation of serum ALT and AST that were reduced after medical treatment or surgery in all dogs with pyometra.

Mahesh *et al*. (2014) observed BUN and creatinine levels at 37mg/dl and 3.6 mg/dl respectively in a German Shepherd dog with closed cervix pyometra.

Anoopkumar *et al*. (2016) observed elevated urea nitrogen (40.90mg/dl) and creatinine (2.88mg/dl) in serum of a pyometric Labrador dog. Moderately elevated BUN (73.4mg/dl) and serum creatinine (2.0mg/dl) were reported in the study of Kumar *et al*. (2016) in a closed pyometra case.

Lakshmikanth *et al*. (2016) found that ALT did not show any change significantly while AST was increased in closed cases of pyometra in dogs significantly.

The creatinine has a higher concentration in both types compared to healthy dogs. Elevated BUN and serum creatinine levels in pyometric bitches was given by Ravikumar *et al*. (2016), Shah *et al*. (2016) and Shah *et al*. (2017) in their study.

The mean values of BUN (25.27 ± 19.14 mg/dl) and creatinine (1.10 ± 0.44 mg/dl) values in affected animals was above the normal physiological range whereas the mean ALT (37.3 ± 10.18 IU/L) in the affected animals appeared to be within the normal ranges (Samantha *et al*.,2018).

**2.10Ultrasonography examination**

Imaging techniques used in diagnosis preferred usually in pyometra suspected cases is ultrasonography, the reason is along detailed information about the size of uterus provision, it also gives proper information about uterine thickness, fibrosis or cysts absence or presence of endometrial surface in the uterus, appearance of the fluid in the lumen of uterus with its nature (Bigliardi *et al*., 2004).

Flow of blood detection in uterus with fluid- filled uterus along that helps in the differential diagnosis of occurrence of pyometra and mucometra has been shown in cases are reported by (Batista *et al*., 2016).

Treating the cases of pyometra along the available equipment effectiveness and the surgeon is having experience about the procedure, feasible in selected cases is ovariohysterectomy that is assisted laparoscopically has been shown effectiveness.

Surgical treatment advances have been made and medical treatment has also been advanced was reported by(Adamovich- Rippe *et al*., 2013; Becher- Deichsel, Aurich, Schrammel, & Dupré, 2016; Wallace, Case, Singh, Ellison, & Monnet, 2015).,

Recovery time potentially decreases induced this technique might be an option in milder cases was reported by (Devitt, Cox, & Hailey, 2005). This was also same for stress and response of pain.

Before considering this approach however, the peritonitis or other complications are present or not that should be ruled out. This is highly important. Some drugs like ketamine are the reasons for which the inflammatory responses may subdue induced by the disease caused by adapting procedure along protocols for drugs administered during analgesia and anaesthesia a adapting procedure for ovariohystetrectomy may be advantageous was reported by(Liao, Chang, Chen, & Wang, 2014).

Potentially harmfully affection and occurence of an incontrollable inflammation especially in cases of sepsis on the basis of risk in which endotoxemia and its effects could already have induction of systemic inflammation is important to be minimized and a severe illness such as disseminated intravascular coagulation, multiple organ dysfunctions, shock and death might be induced in "second hit" was reported by (Conti- Patara *et al.,* 2012; Marretta *et al.,* 1989).

Variables of inflammation and recovery following in them during the process. Determination of them helpful may be for a progressing systemic inflammation detection along with complications of the future. Additional systemic inflammation is resulted from the stimuli of surgical trauma. During this induction which is caused can be decreased the continued recovery in postoperative course (Dabrowski, Kostro, Lisiecka, Szczubiał, & Krakowski, 2009). Concentrations decreasing or increasing expected several days is absent in an after surgery condition. It is likely to systemic inflammation reflect persisting having a cause of pending sepsis and complications.

(Dabrowski *et al*., 2009; Dąbrowski *et al*., 2015; Fransson *et al*., 2004; Jitpean, Pettersson *et al*., 2014; Karlsson *et al*., 2016) reported circulating inflammatory

mediators investigated as the acute phase proteins measuring, tryptophan cytokines or metabolite can be preceded by systemic inflammation.

Available automated advantageous methods are by which the investigation of acute phase protein as C- reactive protein is measured rapidly, which is mostly increased in occurrence of pyometra markedly, and methods by routine laboratory having a lot of importance is reported by (Hillström, Hagman, Tvedten, & Kjelgaard-Hansen, 2014).

Organ dysfunctions complications of pyometra is important to that are not associated be awared of with inflammation systematically and detection methods are needed otherly for the disease were reported by (Jitpean, Ström Holst *et al*., 2014; Marretta *et al*., 1989; Wheaton *et al*., 1989).

Recently modified medical treatment protocol in a comparatively short period of antimicrobial which aglepristone was more often administered with therapy for (6 days) in combination was tried with results that were reported by (Contri, Gloria, Carluccio, Pantaleo, & Robbe, 2015).

With no recurring of infection reported 2 years after treatment the new protocol proved to be highly good on the basis successfulness that is reported by (Contri *et al*., 2015) in 47 treated pyometra cases. Improved efficiency does not have the reason or not yet known, but for a longer time algepristone perhaps be an explanation could be its concentration is higher in tissue. To determine the new protocol of treatment further improved by adding administer antimicrobials combining with other drugs and fewer days with the same results. Treatment routines protocols in pyometra while decreasing the unnecessary antimicrobial use for the improvent in outcome more research is needed to be developed.

In recent years technologies which has prompted possibilities those are new and sequencing that is rapid in nature are the methods have been developed, for new studies. In one study upregulated 29 genes that are reported during the disease is of activation in gene and this one was identified by (Voorwald *et al*., 2015).

If diagnostic tests are developed in cost- effective and rapidly importantly manner, in clinical practice products of the genes that are upregulated and are possibly identified by indicators of diagnostic for use was reported by(Bukowska *et al*., 2014; Chu Py, Salamonsen, Lee, & Wright, 2002; Hagman, Rönnberg, & Pejler, 2009; Silva *et al*., 2012).

Diagnostic that are valuable investigation and novel aids could be challenging on the basis of especially in cases where obscure signs clinically are there and in interpretion difficulty on the basis of appearance of the uterus. Varied depending on the patency of the cervix either closed it was or open. Exogenously administered progesterone had been the factor gene expression (Voorwald *et al.*, 2015). The development of pyometra may be influenced by these differences, whether it really happen or not and how is yet to be determined. Diagnostic tests for pyometra clinically useful, cost- effective and new methods is highly valuable to be developed for predicting outcome.

Accurate ultrasonography is qualitative and quantitatively an procedure for the examination and canine pyometra diagnosis (r: 0.985, $p < 0.001$) was found very close correlation in the postoperative macroscopic between ultrasound scan measurements of the uterus. Ultrasound diagnosis and questionable results are discussed along with accuracy of the study reasons for false diagnosis. (Zoldag *et al*.,1992) reported in the summary the diagnostic value of sonography in the clinical picture of pyometra in the dogs.

In (d0), at day 7 and at day 14 With open and closed pyometra lumen in ultrasound of treated bitch detected by the day of the start of the treatment uterine diameter. Modified medical treatment of administration protocol for the canine pyometra. Effectiveness of this was studied by (Alberto Contri *et al*.,2014).

Hemodynamic, inflammatory, and proliferation changes in changes are identified by Gisele Almeida *et al* ,2016 in the cystic endometrial hyperplasia–pyometra syndrome of bitches.

Distended and fluctuant uterine horn was thin-walled in 5 cm in diameter, caused by the basis of accumulation of the gaseous and liquid content in right uterine

horn. In fluid in left uterine horn diameter and contained mainly 1 cm. When cutting through Chiara Mattei (2018) found purulent exudate were present and uterine wall into the lumen gas .

(FayrerHosken *et al.*1991) reported that ultrasonographic studies are the best with made aid of ultrasonography diagnosis of pyometra. The findings are included typically in the study of (Voges and Neuwirth 1996). An enlarged convoluted, uterus with tubular horns filled is detected in the study with anechoic to hypoechoic fluid

(Nyland and Mattoon, 2002) reported that the although homogenous luminal contents are usually present, echodense with slow and contents may also be swirling patterns.

7 animals suspected and studied by Wheaton *et al*. (1989) studied that affected with the infection of pyometra. He opined in all cases of transabdominal ultrasonography revealed examined and reported an enlarged fluctuating uterus.

The diagnostic value of ultrasonography was found by (Zoldag *et al*.) (1992) found and reported of pyometra (r = 0.985) in a very close correlation in the bitch between where uterus the macroscopic postoperatively and scan measurement in ultrasound. An accurate procedure for the examination and diagnosis of canine pyometra qualitatively and quantitatively, was confirmed was ultrasonography.

Old Golden Retriever bitch was studied four year in Memon and Mickelsen (1993) ultrasonography transabdominally study, observance of the diameter 4.0 in left and 3.2 cm right horns were observed and description of a large fluid filled uterus have shown in the ultrasonic in a involving both uterine horns features of close pyometra.

In 33 bitches a 5 MHz B-mode scanner instrument for ultrasonography was used with histories clinically pyometra compatible with in study of Alvarenga *et al*. (1995). With pyometra ultrasonography the findings were presented in the affected uterus. In an ultrasonography study the presented dialated uterus tubule like structure with a diameter between 0.5 to 4.34 cms image of well-defined. Than the wall, with clear echoic spots the uterine lumen contents were less echogenic. The viscosity of the secretion was increased along with the echogenicity have a correlation in between in

31 dogs. At laprotomy they were confirmed ultrasonographic diagnosis was possible in them. An efficient method to disgnose pyometra in bitches were concluded to be the B-mode ultrasonography.

Pyometric bitches having clinical signs in 50 of were scanned by Tello *et al.* (1996) and its accuracy of diagnosis were compared to laterally and ventrodorsally done radiography and efficiency of ultrasonographic study was described and concluded as compared to the radiography diagnosis of the pyometric uterus in a efficiency of 100 percentage.

Measurement of the uterine horns by ultrasonography before application of PGF2α was studied by Renton *et al*. (1993) and added mean of the uterine diameter was 1.5cm after that as treatment after protocol medically.

Matton and Nyland having the opinion (1995) the uterus presentation in imaging ultrasonographically having technique specifically allows pyometra type to be recorded (showing localization, segmentality or uniformly distributed in tubular in nature) along with uterine wall integrity. Fayrer *et al*. (1991) study shows the usefull ness of ultrasonography for detecting the content type present inside the uterus.

For the pyometra diagnosis before any clinical signs seen in the bitches prior can be used ultrasonography diagnosis for the guiding of female dogs which were hormonal therapy subjected for bitches having the acyclicity in ovarian cycle or mismating or suppression of estrous cycle are monitored in a therapeutic way. The endometrium is examined and evaluated on the basis classification for its integrity, exudation present or not, nature of formation of sacculating and endometrial cystic hyperplasia of uterine glands. The uterus in Group A was having absence of cysts, endometrial surface is normal in nature and uterine content is anechoic in nature, in the study group B showed that having cysts are few in number, normal endometrial wall structure surface, anechoic endometrial uterine content, Group C in many no and large sized cystic and thickened endometrial wall surface, and having many in hypertrophic irregular and large cysts in all the uterus, irregularity in the surface and hypertrophic or atrophic nature of endometrium, was reported hyperechoic showing uterine content by (Samantha *et al*.,2018) of Group D.

## 2.11Radiography

Changes in positions were done by (Mattei, C., Fabbi, M. & Hansson, K.) (2018) report mentioned location alteration of the dog to know the gases in uterine lumen, cranial to the ovary of right side and in the caudal position of uterus, the second structure is confirmed to be the right uterine horn. Emphysematous pyometra was final diagnosis made.

The diameter was observed to be 6 cm and length was observed to be 16 cm in the abdominal cavity found to be gas-filled loops of multiple in number, tubular structures having the nature of filled with fluid and gas. In an approximate manner it was studied that the structures which are gas filled having the location in the left aspect, structures of mixture gas-filled and fluid-filled are located in the abdomen of the right aspect. Occupation was having a length of the entirely covering the abdomen. Generally, craniocaudal direction was observed except one craniocaudally gas-filled loop run in a that runs after that shifts to right direction laterally. In its normal position urinary bladder is present. Identified with a bright was and filled with the normal size descending colon could be faeces. At the ventral aspect lumbar vertebrae having spondylosis deformans is present in both the joints in luxated coxofemoral in craniodorsally, acetabulae remodelling should be associated with. (Thilagar, S., Vinita, W. P., Heng, H. G., Aisah, S., & Khairani-Bejo) reported this in (2006).

Gas-filled severly dialated tubular structures segmented (7 cm diameter approximately) located in the cranial to middle portion of abdomen. The result of plain abdominal radiographs is in distention and enlargement of abdomen showed. Chang, J., Jung, J., Jeong, Y., Hong, K., Kim, K., Yoon, J., & Choi, M. (2007) did the superimposition of this on the distended loops viscid normal small intestine with a appearance.

Suspicion for pyometra in abdominal radiography can raised if done incoorectly even in normal condition. Small bowel is having a displacement craniodorsally and a opacity in contorted tubular of homogeneous in nature the in abdomen caudoventrally in projections of x-ray laterally. The small bowel displacement is observed in cranial and medially in radiographic ventrodorsally projection. Sometimes this one becomes insensitive for detection of pyometra as uterine distention detection cannot be done until

the diameter is larger than that of the small bowels of the uterus present adjacently, both visualization of uterine horns can be seen tissue dense in nature. In addition, pyometra from mucometra or pregnancy in early stage cannot be differentiated cause of uterine distension as the differential diagnosis (prior to fetal skeletal mineralization) is reported by (Jeff Dennis, Brian Lucas Hamm (2012).

A golden retriever received the state of a suspected diagnosis with a size of 1.02 cm, in contrast to another flatcoated retriever with a size of 2.8 cm whose also received the same state. Both of these females were within the same range of age and weight. A third patient, involving a flatcoated retriever with similar weight and age, as the two females previously mentioned, retained a uterine size of 1.5 cm was still identified with a certain diagnosis of pyometra (and not as suspected). Giving the conclusion that the maximum and minimum limits will not be significantly implemented as a true genrealized range for all female canines, but will instead remain an individual estimate for each cases under the influence of a proper radiography, position and skilled veterinarian. Average size of the uterus represented in the pyometra group has been estimated to 3.39 cm. This study supports the theory that hyperplasia and prominent enlargement of the uterus will always become evident when canines are affected with a pyometra. Leading to the understanding of the importance for the radiographic images in the determination when stating a correct diagnosis. The size of the uterus, in all cases included, was concluded to retain a size above the normal range of 0.5- 1 cm. (Anna Mia Regina Lidén Radiographic imaging and blood profile analysis of canine pyometra in a Swedish small animal clinic 2012)

In a retrospective study of lateral abdominal radiograph of 131 bitches with proven pyometra, Marcus et al. (2010) found out that in 31 cases (24%) the uterinesilhouette could not be seen in survey radiograph. In 100 (76%) cases uterus was clearly visible. The diameter of uterine shadow was measured and compared to the length of second lumbar vertebrae and this ratio ranged from 0.4 to 3.5. Smallest uterine diameter measured in plain radiograph was 12 mm.

Lagerstedt (1993a) reported the results of hysterographic studies in 82 bitches with clinical signs related to genital system. Hysterography was performed under general anaesthesia with the assistance of fluoroscopy. Colpography was first performed using a cuffed endotracheal tube to visualize vagina and portio vaginalis. A

“guiding device” consisting of a metal tube with a metal wire loop at the anterior end to clasp and align the cervical and the catheter was used. A bulb ended metal catheter was inserted through the guiding device and was manipulated into the uterine lumen through the cervical canal. Contrast material (Urographin 60%) was infused approximately at the rate of Vi ml per kg body weight and radiographs were made. The radiographic appearance was correlated with macroscopic appearance of a few extirpated uterus ovariohysterectomy and suggestions were made for the hysterographic diagnosis of uterine pathologies. ‘Cork Screw’ appearance was found related to myometrial contractions subsequent to PGF2a administration in dilated uterus. ‘Tight spiral’ like appearance was explained as multiple cysts with regular arrangement on endometrium contractions of myometrium. Distinct ‘filling defects’ seen in hysterograms might be due to cystic endometrial hyperplasia. Small dilatations making ‘string of pearl’ appearance is considered to be an appearance in postpartum period. Persistence of ‘cotton-reel-like’ formations was seen during later stages of puerperium. Apparently normal uterus with ‘distal local dilatation’ was suggestive of myometrial cyst. The author concluded hysterography as a diagnostic tool to exclude uterine pathologies without affecting.

Lagerstedt (1993b) described the technique and results of hysterography invarious stages of oestrus cycle including postpartum period in four bitches. A bulb end edmetal catheter was inserted into uterine cavity with the help of a guide instrument with a wire loop at the end. All attempts were made under general anaesthesia except for those in postpartum period. The cannulation was performed with the aid of fluoroscopy with the bitch controlled in right lateral recumbency. Colpography was performed before hysterography to visualize vagina and portio vaginalis. Urographin 60% was used as contrast material and the volume required to fill the uterus adequately was approximately 0.5 ml per kg body weight. Out of the 93attempts, auther claimed success in 83 and the hysterographic appearance of uterus invarious stages of oestrus cycle was described. A complication reported was only slight dilatation of uterine lumen due to 12-13 times of repeated hysterography.

Feldman and Nelson (1996) stated that on a plain radiograph of abdomen in bitches affected with pyometra a tubular structure that was fluid dense and larger in diameter as comparing it to small bowel loops be in the ventrally and caudally in the

abdomen, displacing dorsally and cranially loops of intenstine. This has to be differentiated from early pregnancy.

**2.12Histopathology findings**

Uterine lesions were grouped as acute endometritis, subacute endometritis, acute metritis, subacute metritis. Complete blood-count, blood biochemical parameters and toxin levels were determined. Only alkaline phosphatase levels were significantly different between all groups. (emirel MA, Atalay Vural S, 2018)

Inoculation using progesterone and/or estradiol and the endometrium histopathology reports and cell ultrastructure in bitches with pyometra using progesterone and Escherichia coli. It was investigated along with uterine histopathological and microstructural changes in dogs with pyometra infection induced by Escherichia coli (E. coli) was reported by (Cunzhong Qian *et al*.,2020)

Commonly endometrial glandular hyperplasia (CEH) is the highest occurrence and is frequently found in association with pyometra with lesions of bitches is cystic nature and in uterus and queens. The serosa, myometrium, or endometrium of uterus are included. The serosal layer involving cysts, adenomyosis, endometrially involved polyps, mesonephric ducts cystic remnants and cysts (cystic glands and hyperplasia "pseudo-placentational" nature of the endometrial hyperplasial structure was reported by (DH Schlafer) (2008).

Massive neutrophilic and mononuclear cell infiltration, hyperplasia, sqamous metaplasia andfibrosis and cystic distension of uterine glandular element were common findings in canine pyometra. (Jena *et al*) (2015)

Complex of cystic endometrial hyperplasia pyometra in female dogs. 446 dogs were screened for pyometra out of which 18 bitches were confirmed to have pyometra. Results revealed that pyometra was higher in female dogs at ages 6-9 years old (55.55%). Smaller breeds than large breeds Pyometra was more prevalent in the earlier one. Nulliparous bitches were more affected than pleuriparous bitches. Frequently observed were anorexia, lethargy, polyuria, polydipsia, vomiting and vaginal discharge. Clinical signs mostly observed and Histopathological examination revealed

inflammatory cellular changes ranging from simple enlarged glandular hyperplasia to cystic endometrial hyperplasia. The lumen of endometrially involved glands were heavily infiltrated with neutrophils, lymphocytes, macrophages and plasma cells due to the effect of progesterone on endometrium and bacterial infection. (Kashi Nath; Tiwari, S. K.; Raju Sharda) (2009)

**2.13 Treatment**

The treatment surgically is effective on the basis of safety ovariohysterectomy. It is still considered as the best method due to the reason that removing the infection is directly from its source and prevention of recurrence although available medically purely alternative methods are also was reported by the study of (Fieni, Topie, & Gogny, 2014).

Binding of as progesterone-receptor antagonists to receptor and blocking the progesterone receptor, prevention of normal hormonal activity was done by mifepristone or aglepristone. Prevention of progesterone receptor is done by antagonists in progesterone recepto to its along with induction of transcription inhibition and all its level hormonal effects are inhibited cellularly. Stimulation consequently, absence of receptor is there. Along with inhibition of activation and mimicking of the observance of effects are there. Induction of luteolysis with causation of the cervix to be relaxed was reported by the study of (Hubler and Arnold, 2000; Hoffman et al.2001; Wherend *et al*. 2003 and Corrda *et al*.2006)

Controversial review regarding induction of contractions of uterus the treatment is able or not to be used in one method 43 PGF2α Verstegen *et al.* (2008). The myometrial contractions action is not likely of progesterone antagonists. The inductions are expected not to be present. Uterine associated with contractions and have obvious never enough been for allowing the use of drug in this type safely alone but not combined with prostaglandins. Combining these two medications resulted uterine contractions and luteolysis induction, observed effects on uterus along on the immune system affected by the progesterone.

Study was conducted by Gobello *et al* (2003) on 15 bitches affected with pyometra. Comparing the two protocols using a combination of aglepristone and cloprostenol on the basis of efficacy and safety serum profiles before the therapy given

of progesterone(P4) is described and in course of treatments, for animals at 10mg/kg, s.c. aglepristone was administered in group I (n = 8), with cloprostenol on days(if not cured) 1, 3, 8, and 15, combined at the dose of 1 microg/kg, s.c., group II (n = 7) on days 3 and 8, and received with aglepristone the same treatment as treatment I but on days 3, 5, 8 10, 12, and 15 (if not cured) cloprostenol. On days 8, 15, and 29 clinical signs of all bitches were evaluated along with side effect of treatment, concentrations of progesterone in serum, hemogram and diameters of uterus at the beginning before the treatment and after. Initial basal in both treatment P4, serum concentrations, success achieved without side effects treatment and differences in bitches are not observed significantly, either on 44 day 15 or on day 29. Both of the treatments in groups, signs observed clinically, haematologically examined parameters, and diameters of uterus metrics improvement of these in to values as in the normal bitches in the entire course of the experiments. Day and treatment was P4 were significantly interacted when all bitches were considered together found for percentage change in. 20 percent of the bitches showed the recurrence of pyometra next in the estrous. In one non redevelopment bitch mating and whelping was done with a normal litter. Combination and conclusion throughout treatments protocols are proved to be efficient simultaneously clinical signs of cases of open cervix pyometra are reversed independently safely and togetherly of P4 concentrations initially and to have an effect that the number of administrations cloprostenol seemed on changes in P4 serum concentrations.

Study was under taken by Fienie (2006) at the dose rate of 10 mg/kg with or without the addition either alone or low doses of cloprostenol for the treatment of metritis or pyometra on days 1, 2 and 8 in bitches of for 5 days a the efficacy of aglepristone was evaluated. Examinations with investigations performed on day 90, 14 and 28, in addition to days 8 that treatments determined been curative in the term longly. Aglepristone had effect on cervical opening occurrence in a time of 48 h of administration. Aglepristone alone was having a curative effect in bitches affected with metritis and closed type of pyometra. Compared to bitches not given cloprostenol along the from days 3 to 7 additional treatment with cloprostenol with open or closed pyometra, significantly at day 90 improvement of the overall success rate. Total leucocyte count and progesterone plasma concentrations decreased significant manner of treatment in over the course.

Ucmak and Cagataytek (2008) studied treatment protocols investigation showed the effectiveness of with aglepristone or aglepristone ovariohysterectomy operations with PGF2α combinedly. Three groups 45 are divided equally the surgically treated group (OP) in one group and secondly treated with aglepristone (AL) and with PGF2α (AP) in combination in the third group including thirty bitches with pyometra were grouped. A on days 1, 2, and 7 and dose of 10 mg/kg subcutaneously of if needed on day 14 aglepristone was administered. Once days 3 to 7 every 24 h between. Surgically Eighty percent in treated group of the bitches and in medically treated groups 50% were recovered the bitches of the AP 0.25 mg/kg group received additionally of dinoprost tro methamine. Treatments alternative to ovariohysterectomy using medicines like aglepristone or with PGF2α in bitches constituted safely treatment is done in the phase of diestrous in the opinion of the study carried out repeated investigations frequently, more than 2 ng/ml with Progesterone.

Treatment of Aglepristone with cloprostenol in the opinion of Gobello *et al*. (2003) and Fienie (2006) than aglepristone alone effective the combination in the pharmacological and medical treatment of open and closed pyometra.

Successful the intravaginally in presented dogs use of misoprostol results concerned for promotion of relaxation of cervix have been done, but scientific evidence is not prominent based on its efficacy (Verstegen *et al*2008.)

Although sensitivity studies in vitro and clinical the evident clinical signs proved that amoxicillin, amoxicillin plus clavulanic acid, cephalosporins, or potentiated sulfonamides are preferred initially, many antimicrobials have been used successfully. Culture identification is done finally and should always have a basis of sensitiveness of the involved bacteria (Verstegen *et al*.2008).

E. coli, having 86.1% resistance against cephalothin, for ampicillin 68.9% resistance, for cefoxitin46.4%, 34.4% for tobramicin, 32.5% for tetracycline, 29.8% for amicacin, 27.8% for cefalexin, 15.2% for gentamicin, 13.9% for cefotaxim, 13.2% for sulphazotrin, 12.6% to enrofloxacin, 10.6% to aztreonam, 7.9% to chloramphenicol, 6% to neomycin, 2% for norfloxacin and 0.7% for polimixin B is reported by Coggan *et al*. (2008) was study reported antimicrobial 151 strains. highly sensitive susceptibility of the isolates considering the) Norfloxacin (94%), polimixin B (82.8%), sulphazotrin (76.8%), enrofloxacin (75.5%) and chloramphenicol (75.5%)

## 2.14 Prognosis

With-in pyometra of potentially severe complications disease subsequently. Life- threatening sepsis, peritonitis, bacterial infection disseminately, shock septically and dysfunction multiorganly is shown list in the study of (Fransson *et al*., 2004; Jitpean, Ström- Holst *et al*., 2014; euthanasia cases. 10% was this including disease and middle- aged (Jitpean, Ström- Holst *et al*., 2014) of suffering diseases are affected. Complication pyometra of surgically treated is peritonitis (Fransson *et al*., 2004) common from rate of mortality thus concurrent surprisingly. Reported total were approximately in bitches that, as low as 1% was recorded by (Jitpean, Ström- Holst *et al*., 2014). With the disease result is a favourable prognosis of the to older individuals with increased probability considering the severity.

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# MATERIAL METHODS

The study that was carried presently in female dogs which are presented to Teaching veterinary clinical complex, Department of Animal Reproduction Gynaecology and Obstretics, College of Veterinary Science and Animal Husbandry, OUAT, Bhubaneswar, as the suspected case of pyometra.

### 3.1 Selection of animals

The selection of animals are on the basis of history medically, particular reference to examination physically for the presence of vaginal discharge purulent to mucopurulent in nature. Vaginal discharge were exibhiting abnormal nature in theanimals suspected for open pyometra. A diagnosis in female dogs of tentative nature of pyometra was done along with proper examination was done by ultrasonography for pyometra confirmation. Where in animals having the suggestive clinical signs for pyometra although exhibition of any discharge having abnormal and vaginal nature diagnosis were done as tentatively of closed pyometra.

On the basis of vaginal discharge was whether present or absent animals are divided in to three groups

- **Group I Control group (n= 12)**

Dogs exhibiting diminished vulvar discharge and reduced edema of vulva, vaginal mucosal folds becomes flattened and flaccid and the vaginal cytology revealing a decline in of superficial cells the number precipitously and intermediate and parabasal cells reappeared and frequently neutrophils were considered to be in diestrus and served as control.

- **Group 2 Open pyometra (n=12)**

Those female dogs with relative good health, discharging light chocolate brown coloured malodorous vulval discharge with enlarged vulva exhibiting discoloration or scalding of perivulval tissues and perineum with no fever, normal hydration status were considered to be the cases of mild open pyometra.

- **Group 3Close pyometra (n=12)**

Those female dogs a month after the completion of estrus presented with history of polyuria and polydipsia, dehydration andvisible moribund abdominal distention. Abdominal palpation revealed a soft, doughy mass suggestive of the distention in uterus which was greater and with visible associated enlargement in the caudal abdomen, complete lack of appetite, lethargy, depression, apathy, enlarged abdominal integuments and with fever.

In all group of dogs, the ultrasonography revealed fluid filled uterine horns with anechoic homogenous contents along showing the bands of hyperechoic in nature confirming the typical cases of pyometra.

### 3.2 Medical history

Information regarding breed, age, parity, duration of last proestrus bleeding, hormonal treatment if any were collected. The observation of clinical signs like anorexia, polyuria, polydipsia, vomition, presence and nature of vaginal discharge were also obtained from the owners.

### 3.3 Clinical examination

On presentation of the dogs with the signs suggestive of pyometra, a detailed clinical examination was carried out and the following observations were made.

1. Temperature, rate of heartbeat, respiratory rate were measured.

2. Abnormal vaginal discharge was present or absent that was noted, by visual examination evidently investigating lips of vulva or of the perineum soiled in nature and matted hairs in perineal region.

3. Dehydration present or absent that was examined on the basis of presence or absence of elastic nature of the skin according to the report of Dibartola and Bateman (2006).

### 3.4 Ultrasonographic studies

Female dogs which are tentatively diagnosed as pyometric cases for confirmation were subjected for transabdominal ultrasonography in a range of 5 to 7.5 MHz in the machine of **Aloka Prosound alfa 6 Ultrasound Machine.**

Ventral hairs of the abdomen present from xiphi sternum to the pubis region and along with extra region to severally to some centimeters in both the side of the middle region was properly shaved by applying savlon. Then in dorsal recumbency ultrasonography was done. The application of coupling gel for the reason of visibility along with better contact. Probe is moved from anterior manner and in front of the bladder laterally till the clearly visible uterus having distended horns can be shown.The diagnosis of pyometra was made when there uterus filled with contents of anechoic or hypo-echoic along with enlargement and convulation. The luminal homogenous contents were seen mostly although the echodense contents may also be with patterns of slowness and swirling. The measurements in ultrasonic procedure employement for of parametres on the basis of biomedically (diameter of horn externally of the uterine horn and of the uterine wall thickness) was measured. The frozen image was taken and the uterine horn diameter and the uterine wall thickness were measured. The sagittally and transversely mid-ventral abdomen was imaged in both plane for the uterus examination in the imaging. The examination and investigation to evaluation of endometrial integrity, exudateion presence, sacculating nature and hyperplasia of endometrial glands cystic nature. The cross-sectional uterine diameter horns were measured by callipers electronically.

### 3.5 Radiographic studies

Radiographhicaly imaged left laterally and ventro dorsally was done of the abdomen region. Most segment cranially which precceds abdominal/caudal of cranial right thoracic wall for the most dorsal part to be reached of the cranial abdomen of right side. Locational difference were seen inlaterally and ventrodorsally in intraluminal gas on radiograph was caused by positional changes of dog which leads to gravity. Thus, the gas and fluid that filled the tubular structure precedes almost length of the abdomen entirely, ranging from cranial part of the urinary bladder ends in stomach.

### 3.6 Collection of samples

Peripherally collected samples of blood were obtained from the three group of dogs radial vein into vacutainer tubes. The blood samples collected in EDTA were within 3–4 h processed. The hematological parameters ranging from Hemoglobin (Hb), Packed Cell Volume (PCV), Total Leukocyte Count (TLC), Differential Leukocyte Count (DLC) were performed on the day.

### 3.7 Haematological studies

The following haematological parameters were studied.

a. Haemoglobin (Hb) (g/dl)

The haemoglobin concentration was estimated by Sahil's acid haematin method by using N/10 HCL as diluent.

b. Total Leukocyte Count (TLC) (Cells/cmm)

The total leukocyte count was done estimated by standard dilution method using Thomas fluid as diluent. After proper dilution in white blood pipette one drop taken in Neubauer's slide. Cells were counted in corner four large chambers was multiplied by 50 to obtain the no of white blood cell.

c. Differential Leukocyte Count (DLC)

A thin blood smear was drawn on a thin grease free glass slide. blood smear was air dried and then stained by diluted leishman's stain. Hundred cells were counted and percentage of different white blood cells were estimated as per method described by Schalm (1965)

### 3.8 Surgical procedure of ovary-hysterectomy

The animal was treated for five days with Dextrose 5% 500 ml, then the conciplex injection was given 1 ml along with the Ampoxin@10mg/kg was injected i/v with DNS and diluted. The treatment of female dog was done for 3 days with 2ml metoclopramide and rantidine intramuscularly given for making the patient stable and

also for the renal failure acute condition. To combat the recurring pyometra after treatment completion, ovariohysterectomy was chosen by the owner. Preparation for ovariohysterectomy of abdomen was ventrally aseptically. Premedication was done of the bitch by giving Atropine (0.04mg/kg B.wt) then intramuscularly Dexamethasone @0.15mg was injected. After that the injection administration of Triflupromazine @0.75mg/kg, intravenously. Induction of anaesthesia and by injection of propofol at the rate of 2mg/kgbwt was used for maintainance in every intervals of 10 minutes. The animal was placed on dosal recumbency on the operation table. The incision in skin was given of the length from 3 to 6cm and laparotomy was performed. The dissection by using scalpel was given and done in sharp manner for the proper defining of white line. Then along side of the inside one cut down was given on the abdominal wall then the linea alba. Exteriorization of the horn of uterus, right ovary, three clamp technique was applied. Then ligation was done by the use of No. 1 chromic catgut. after that the ovary was removed. This was repeated in another side of ovary. The removing of the body of uterus was done with three clamp from the range of anteriorly to cervix after abdominal cavity packaging was done in proper manner for avoiding peritonitis. By using inversion suturing pattern the remainant or the cut end of body of uterus (stump) was sutured for prevention of the edge of cut adhesion to other organs of abdomen. Suturing technique simple-interrupted or by using the technique of continuous suture pattern the linea alba suturing was done. Subcutaneous tissue suturing of subcutaneous tissue was also done in similar manner similarly. The wound of laparotomy was sutured by using chromic catgut No. 0 in normally used procedure. In whole course of laparotomy intravenously administration of Ringer Lactate 500 ml was done. For 5 days 20mg/kg i/m Amoxin was administered to the animal along with 1.5 ml for 2 days meloxicam was adminstered. Then kidney failure treatment was started by givingRL 250 ml intravenously. With that intravenous admindstration of 70ml D25%. Administration of Injection of NS 500ml intravenously. Again 1ml victofol was given intramuscularly .1ml injection of Rantac along with the Imferon injection 1ml and also 1ml of Neophepateax was given intramuscularly. Administration of injections of Conciplex 1ml, Pantoprazole 20mg and Cefotaxim 500mg was done with Normal Saline togetherly ranging to 10 days post operatively.

### 3.9 Histopathology

Uterine samples were collected from the Department of surgery & radiology, college of veterinary science and animal husbandry after hysterectomy.

Representative individually collected tissue samples from the confirmed cases were collected and preserved in 10% neutrally buffered formaline during necropsy and subjected for routine histopathological examination in the Department of Veterinary pathology, college of Veterinary Science & Animal Husbandry. The tissues were processed, sectioned(5µm) and stained with routine Haematoxylin & Eosin stain and studied in detail for microscopic examination using fluorescent microscope for photography (Bancroft and Stevens, 1990).

### 3.10 Statistical analysis

The data collected from the clinical trial was obtained and then tabulated. The descriptive statistics were computed as per the methods. The variance was analysed by performing the tests of the variations comparing the groups and within the groups using the statistical software SPSS and one way anova.

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# RESULTS

## 4.1 Percentage of cases in pyometra

In the present study, out of 170 bitches, 24 were diagnosed with pyometra with an overall incidence of 14.3 %(Table 1). The age, breed and parity of the 24 pyometric bitches was presented in Table 2

**Table 1: Percentage of cases of pyometra**

| S. No. | No. of female dogs presented | No. of dogs diagnosed with pyometra | percentage (%) |
|---|---|---|---|
| **1.** | 170 | 24 | 14.3 |

**Table 2: Details of age, breed and parity of dogs with pyometra**

| Animal No. | Breed | Age (Years) | Parity |
|---|---|---|---|
| **1.** | Pomeranian | 7 | Nulliparous |
| **2.** | Spitz | 9 | Primiparous |
| **3.** | Pomeranian | 10 | Pleuriparous |
| **4.** | German Shephered | 9 | Nulliparous |
| **5.** | Pomeranian | 10 | Nulliparous |
| **6.** | Pug | 3 | Nulliparous |
| **7.** | Pomeranian | 8.5 | Nulliparous |
| **8.** | Boxer | 4 | Nulliparous |
| **9.** | Labrador | 8 | Nulliparous |
| **10.** | Spitz | 4 | Nulliparous |
| **11.** | Pomeranian | 13 | Pleuriparous |
| **12.** | Labrador | 12 | Primiparous |
| **13.** | Pomeranian | 7.5 | Nulliparous |
| **14.** | German Shepherd | 9 | Primiparous |
| **15.** | Labrador | 10 | Nulliparous |
| **16.** | Spitz | 8 | Nulliparous |
| **17.** | Labrador | 8 | Nulliparous |
| **18.** | Labrador | 8 | Nulliparous |
| **19.** | Pomerenian | 10 | Primiparous |
| **20.** | Labrador | 3 | Primiparous |
| **21** | Pomerian | 8 | Nulliparous |
| **22** | Labrador | 8 | Nulliparous |
| **23** | pomerian | 8 | Primiparous |
| **24** | pomerian | 8 | Nulliparous |
| | Mean | 8.05±0.61 | |

The age wise, breed wise and parity wise incidence of pyometra are presented below.

### 4.1.1. Age

In the present study, the mean age of occurrence of pyometra was 8.05 ± 0.61 years (Table 2). The bitches with pyometra were further grouped under 1-5years, 6-10years and >10 years of age to know the age wise incidence. Pyometra was found to be the highest (70%) in the age group of 6-10 years (17 cases) followed by 1-5 years (5 cases) and >10years (2 cases) with an incidence of 20% and 10% respectively (Table3 and Chart 1).

**CHART 1**

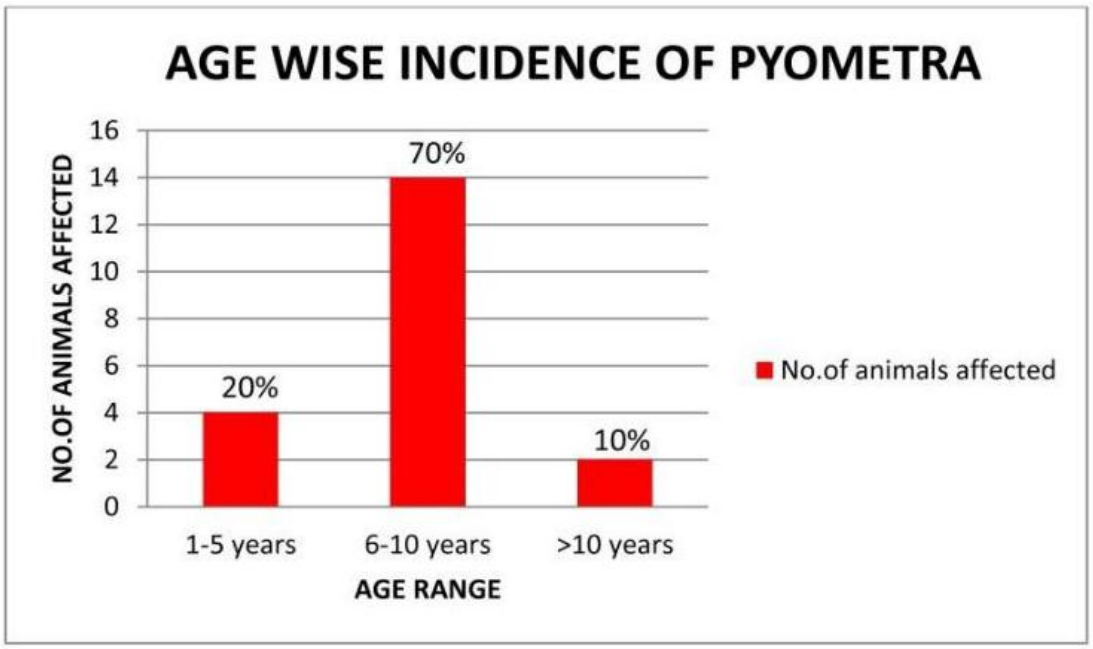



**Table 3: Age-wise incidence of pyometra**

| Age (years) | No.of animals affected | percentage (%) |
|---|---|---|
| 1-5 | 5 | 20 |
| 6-10 | 17 | 70 |
| >10 | 2 | 10 |
| **Total** | **24** | **100** |

### 4.1.2. Breed

In this study among the breeds, the highest percentage of incidence was found in Pomeranian (35%), Labrador (30%), Spitz (15%), German Shepherd (10%) and Boxer and Pug breeds (5% each) (Table 4 and Chart 2).

**CHART 2**

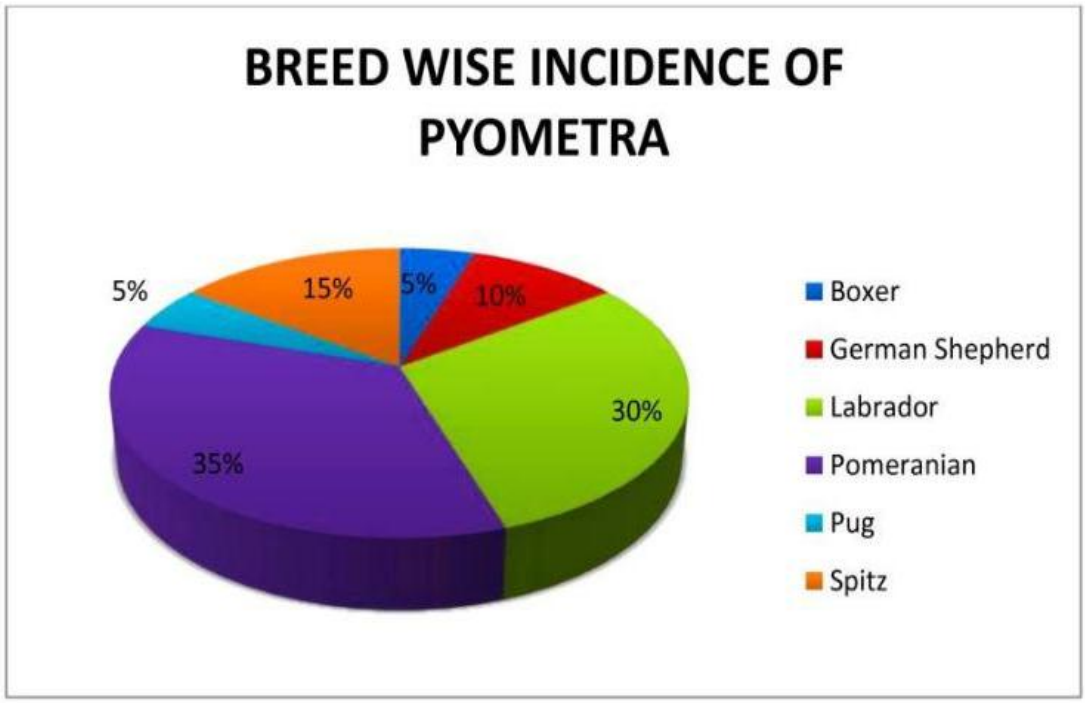



**Table 4: Breed-wise incidence of pyometra**

| S. No. | Breed | No. of animals affected | Percentage of cases(%) |
|---|---|---|---|
| **1.** | Boxer | 1 | 5 |
| **2.** | German Shepherd | 2 | 10 |
| **3.** | Labrador | 7 | 30 |
| **4.** | Pomeranian | 8 | .35 |
| **5.** | Pug | 1 | 5 |
| **6.** | Spitz | 5 | 15 |
| | **Total** | **24** | **100** |

### 4.1.3. Parity

In the present study, the incidence of pyometra was highest in nulliparous bitches followed by primiparous and pleuriparous animals with an incidence of 65%, 25% and 10% respectively (Table 5).

**Table 5: Parity-wise incidence of pyometra**

| Parity | No.of animals affected | Incidence (%) |
|---|---|---|
| Nulliparous | 16 | 65 |
| Primiparous | 6 | 25 |
| Pleuriparous | 2 | 10 |
| **Total** | **24** | **100** |

### 4.2. Clinical symptoms

On clinical examination, open (12 cases) and closed (12cases) types of pyometra were noticed with a percentage of 50% and 50% respectively (Table 6). All the pyometric bitches were in diestrus phase. Anorexia, lethargy in all cases and abdominal distension and vomition in some cases were noticed. Temperature was normal in all the cases except in one case where sub-normal temperature was recorded. Mucopurulent to hemorrhagic vaginal discharges with foetid odour were seen in all the open type of pyometra cases.

**Table 6: Type of pyometra based on cervical patency**

| S.No | Type | No.of animals affected | percentage(%) |
|---|---|---|---|
| **1** | Open pyometra | 12 | 50 |
| **2** | Closed pyometra | 12 | 50 |
| | **Total** | **24** | **100** |

### 4.3 Incidences in time of year

Times of year when the pyometra infection is prevelant, mostly incicidence is more in the month of September.

**Table 7 Incidences in time of year**

| Month of the year | Case presented | Incidence% |
|---|---|---|
| January | 0 | 0 |
| February | 0 | 0 |
| March | 0 | 0 |
| April | 1 | 4.16 |
| May | 1 | 4.16 |
| June | 1 | 4.16 |
| July | 0 | 0 |
| August | 0 | 0 |
| September | 10 | 41.6 |
| October | 2 | 8.33 |
| November | 5 | 20.83 |
| December | 6 | 25 |

### 4.4 Incidence of clinical signs

Clinical signs vary in different cases, mostly lethargy is common clinical signs (63%), different clinical signs are seen in a single case also, fever, systematic inflammatory responses, anorexia, polydipsia are common signs.

**Table 8 Percentage of clinical signs**

| Clinical signs | Incidence in number | Incidence in percentage% |
|---|---|---|
| Vaginal discharge | 11 | 57 |
| Lethargy | 12 | 63 |
| Anorexia | 8 | 42 |
| Polydipsia | 6 | 28 |
| Polyurea | 7 | 34 |
| Vomiting | 3 | 13 |
| Diarrhea | 2 | 10 |
| Abnormal mucous membrane | 3 | 16 |
| Dehydration | 3 | 15 |
| Palpable enlarged uterus | 6 | 19 |
| Pain on abdominal palpation | 7 | 23 |
| Lameness | 5 | 16 |
| Distended abdomen | 1 | 5 |
| Fever | 6 | 32 |
| Hypothermia | 1 | 5 |
| Tachycardia | 5 | 23 |
| Tachypnea | 5 | 32 |
| Systemic inflammatory responses | 11 | 57 |

4.5 **Blood picture findings**

| Blood parameters | Control group | Open pyometra | Closed pyometra | F value |
|---|---|---|---|---|
| PCV% | $39.25^{b}$±0.70 | $33.50^{a}$±2.67 | $29.58^{a}$±1.80 | 6.501** |
| Hb g% | $15.50^{b}$±0.82 | $10.55^{a}$±0.79 | $9.93^{a}$±0.68 | 15.753** |
| MCV | $73.67^{b}$±0.76 | $63.98^{b}$±2.81 | $59.03^{a}$±1.24 | 16.492** |
| MCH | 21.25±0.39 | 20.14±0.78 | 19.76±0.53 | 1.716 |
| MCHC | 32.33±0.44 | 31.70±0.96 | 33.52±0.80 | 1.425 |
| IMMATURE NEUTROPHIL(Band) | 13.17±0.32 | 21.08±5.01 | 14.42±2.34 | 1.770 |
| MATURE NEUTROPHIL | $40.17^{a}$±0.32 | $61.67^{b}$±5.26 | $69.50^{b}$±3.10 | 18.494** |
| TOTAL NEUTROPHIL | $51.67^{a}$±1.15 | $84.17^{b}$±1.90 | $83.92^{b}$±2.39 | 98.180** |
| LYMPHOCYTE | $45.70^{b}$±0.75 | $14.58^{a}$±1.82 | $14.00^{a}$±2.21 | 112.142** |
| MONOCYTE | 0.25±0.13 | 0.67±0.35 | 0.75±0.30 | 0.912 |
| BASOPHIL | $0.33^{b}$±0.14 | $0.00^{a}$±0.00 | $0.00^{a}$±0.00 | 5.500* |
| Eosinophil | 0.47±0.22 | 0.58±0.31 | 1.17±0.83 | 0.551 |
| TOTAL LEUKOCYTE COUNT | $6583.33^{a}$±158.98 | $32925.00^{b}$±6443.40 | $29316.66^{b}$±3349.32 | 11.597** |

*Significant at p<0.05

**Significant at p<0.01

Means with different superscripts vary significantly across the columns.

PCV, Hb were evaluated in the blood of pyometric dogs and the mean corpuscular values (MCV, MCH and MCHC) were calculated from the above data. TLC and DLC were evaluated.

### 4.5.1Packed Cell Volume (PCV)%

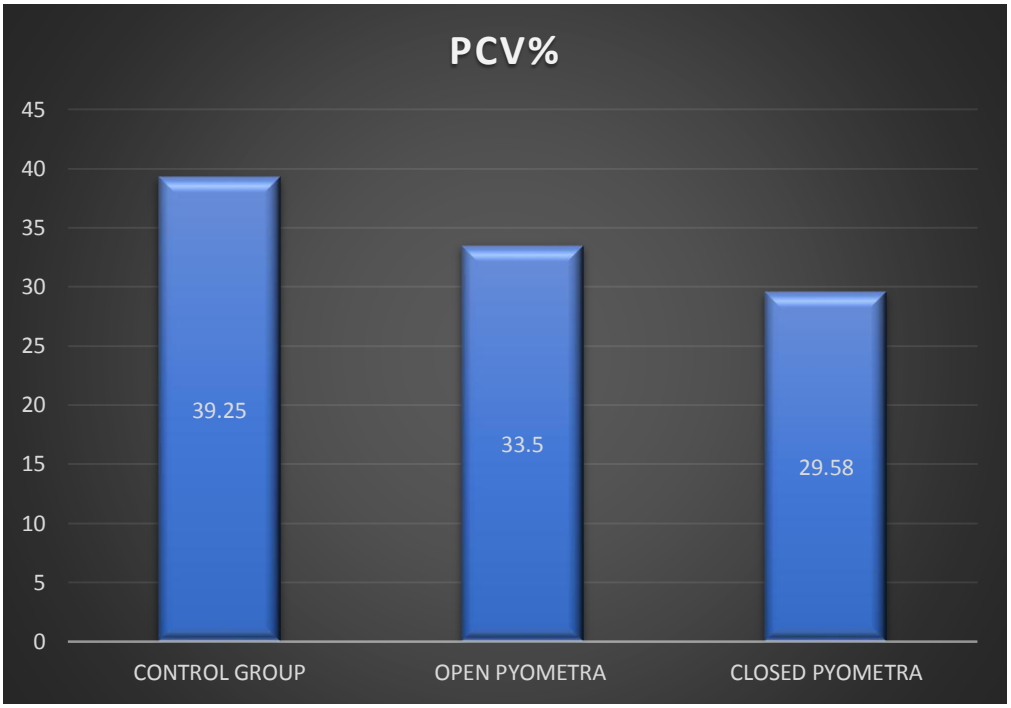
The mean PCV value of Group I, II, III was 39.25 ± 0.70, 33.50 ± 2.67, 29.58±1.80 respectively. A significant (P< 0.01) decrease was noticed in the PCV values of groupIIand groupIII compared to GroupI.

### 4.5.2Haemoglobin (Hb)g%

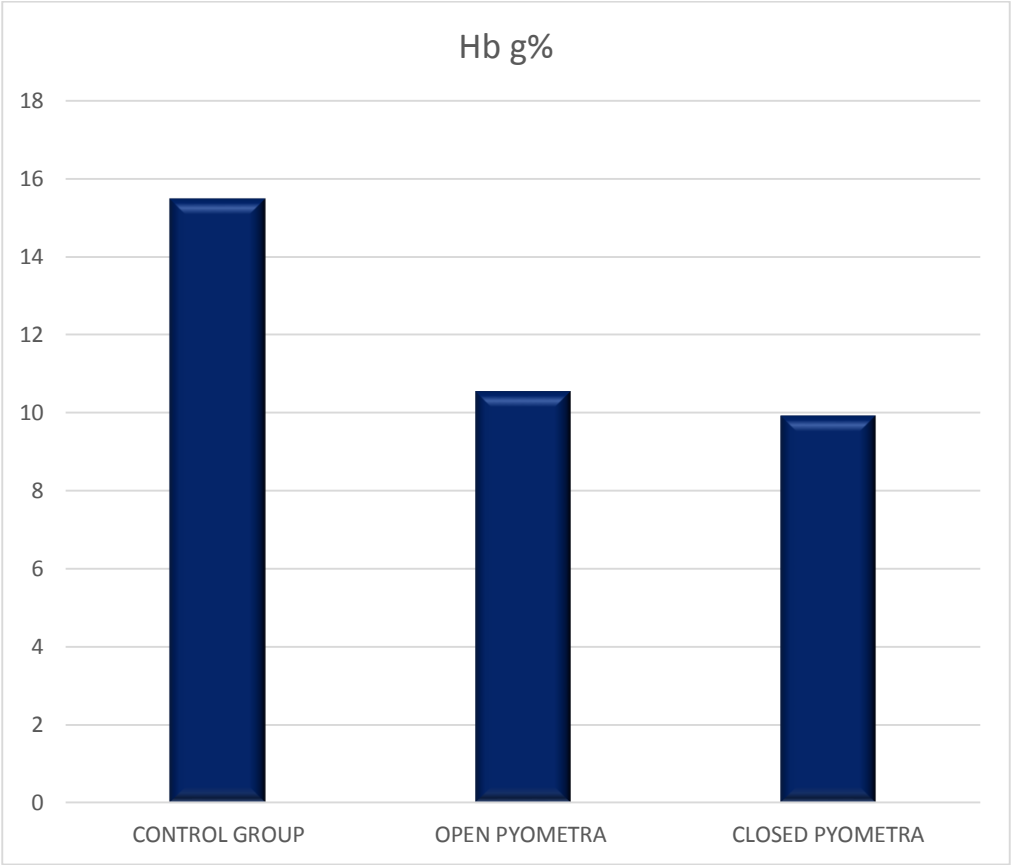
The mean values of Hb in Group 1,2,3 control bitches was 15.50±0.82,10.55 ± 0.79 ,9.93±0.68 respectively.There was a significant (P< 0.01) decrease in the Hb value of groupII and groupIII as compared to groupI. But no significance difference between groupII and groupIII.

### 4.5.3 Mean Corpuscular Values

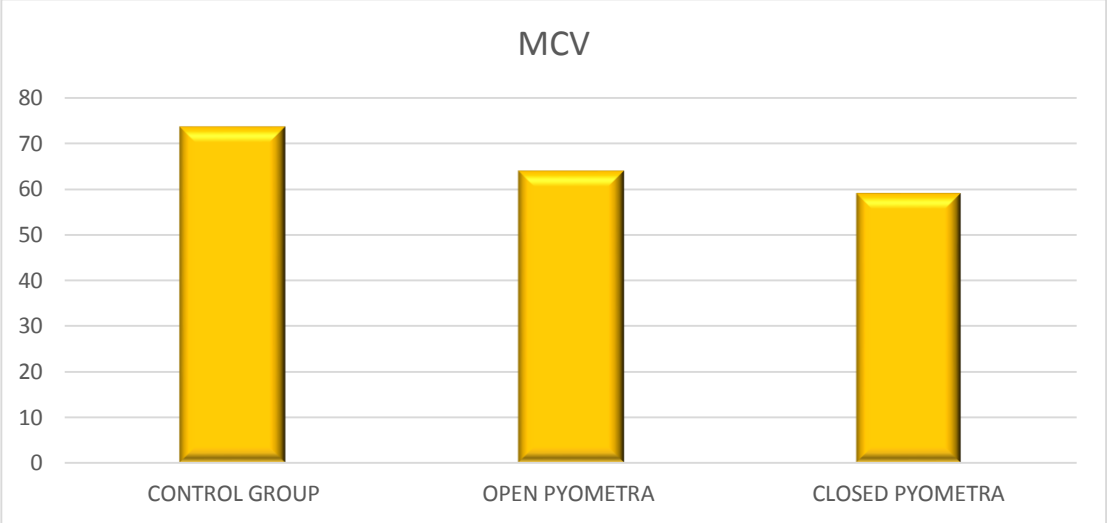
The mean values of MCV, MCH and MCHC were 73.67±0.76 pg ,21.25± 0.39 pg and 32.33±0.44 g/dl in group 1, In group2 ,63.98±2.81 pg ,20.14±0.78 pg,31.70±0.96 g/dl and in group 3 the mean value were 59.03±1.24pg,19.76±0.53 pg,33.52±0.80 g/dl respectively. The MCV value vary significantly(p<0.01) between group III as compared to groupI and groupII. But no significance variation between group I and group II.



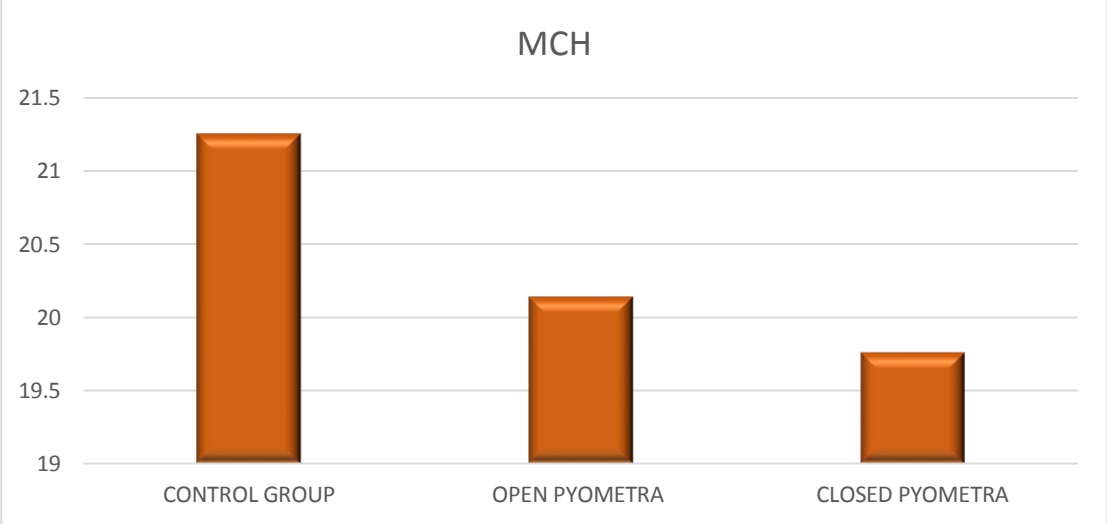

Graph 3: marked decrease in the PCV value of group II and group III as compared to group I



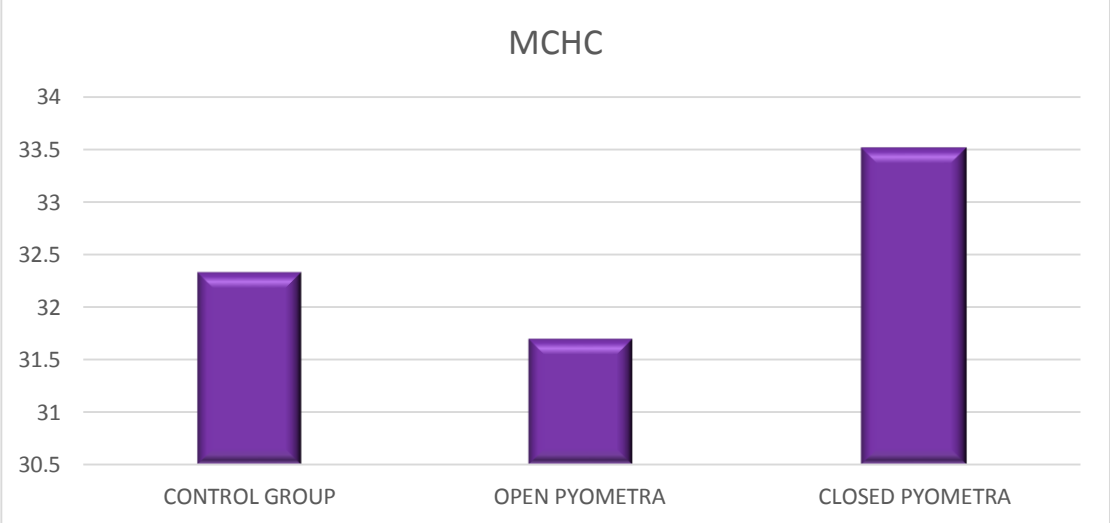

Graph 4: marked decrease Hb g % in group II and group III as compared to group I



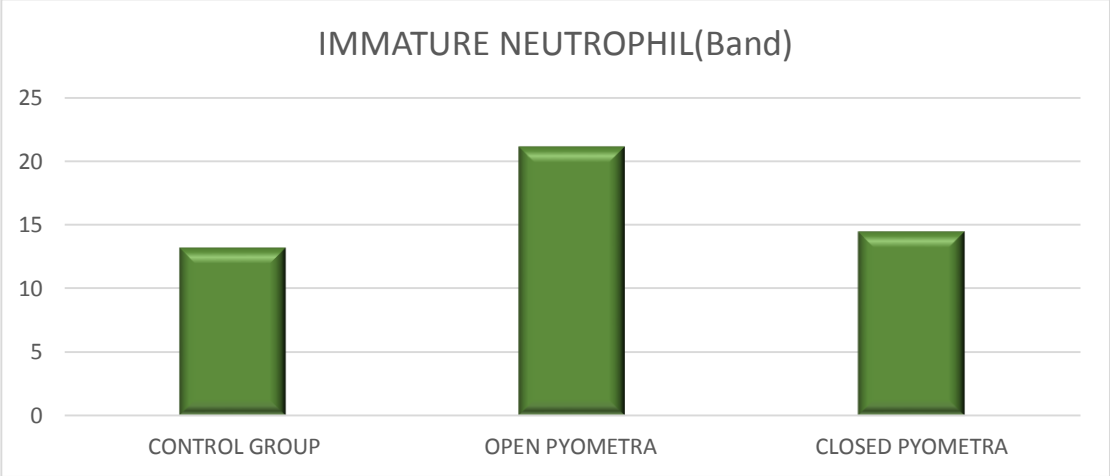

Graph 5: Marked MCV decrease in group II and group III as compared to group I



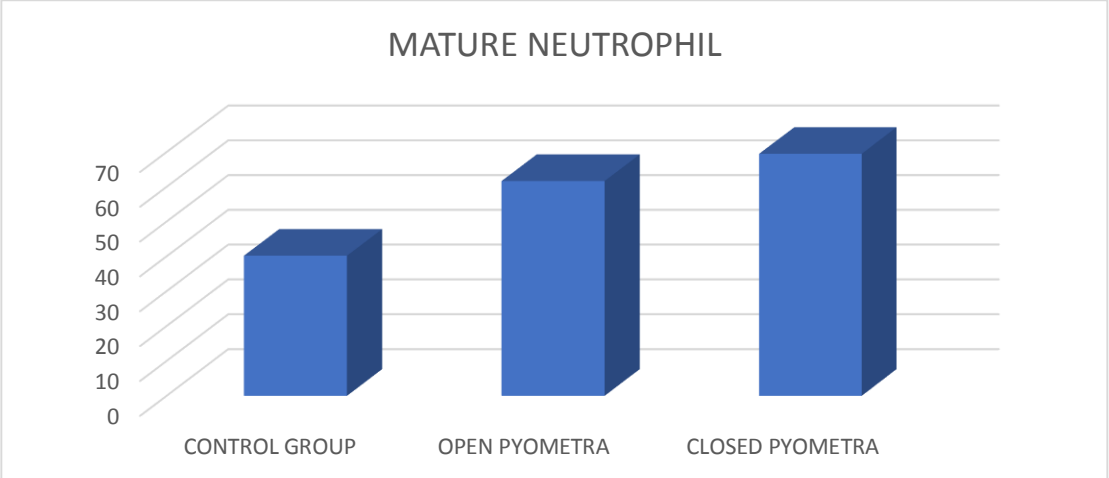

Graph 6: Marked decrease in the MCH value of group II and group III as compared to group I



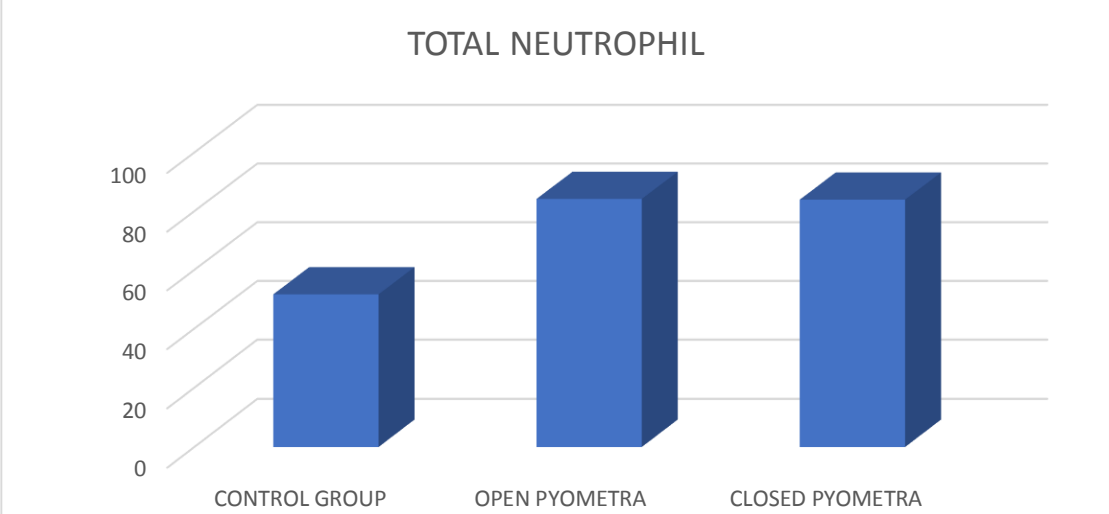

Graph 7: Marked increase in MCHC value of group II and group III as compared to group I




Graph 8: Marked increase in the immature neutrophil in group II and group III as compared to group I




Graph 9: marked increase in mature neutrophil value in group III and group II as compared to group I




Graph 10: marked increase in total neutrophil count in group II and group III as compared to group I

### 4.5.4 Differential leucocyte counts

4.5.4.1 Immature neutrophils

The mean value of immature neutrophil(band) count in group I, II and III were 13.17±0.32, 21.08±5.01,14.42±2.34 respectively.

4.5.4.2 Mature neutrophils

The mean value of mature neutrophil in group I, II, III were 40.17±0.32, 61.67±5.26, 69.50±3.10. A significant ($p<0.01$) increase in the neutrophil count of group II and group III compared to group I.

4.5.4. 3 Total neutrophil counts

The mean value of total neutrophil counts (cells/cmm) in group I, II, III were 51.67±1.15, 84.17±1.90, 83.92±2.39 respectively. and indicated significant ($P< 0.01$) increase in group II and group III compared to group I. The high TLC values and presence of immature neutrophils that are less than the mature cells indicated regenerative shift to left.

4.5.4.4 Lymphocyte counts

The mean value of lymphocyte counts (cells/cmm) in group I, II, III were 45.70±0.75,14.58±1.82,14.00±2.21 respectively with significant ($P< 0.01$) difference group II and group III compared to group I. No significant difference between group III and group II.

4.5.4.5 Monocyte counts

The mean value of absolute monocyte counts (cells/cmm) in group I, II, III were 0.25± 0.13,0.67±3.5and 0.75±0.30 respectively. There was no significant ($P<0.05$) difference between groups.

4.5.4.6 Eosinophil counts

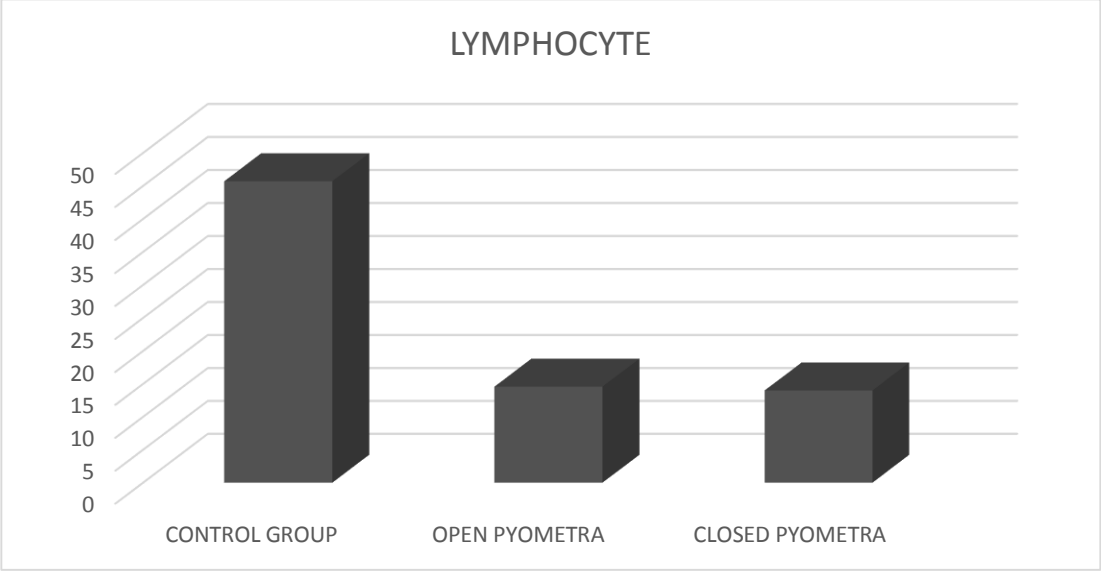
The mean value of eosinophil counts (cells/cmm) in bitches of group I, II, III, were 0.47± 0.22, 0.58 ± 0.31, 1.17 ± 0.83 respectively. There was no significant ($P<0.05$) difference in the absolute eosinophil counts between pyometric and control bitches.

4.5.4.7 Basophil counts

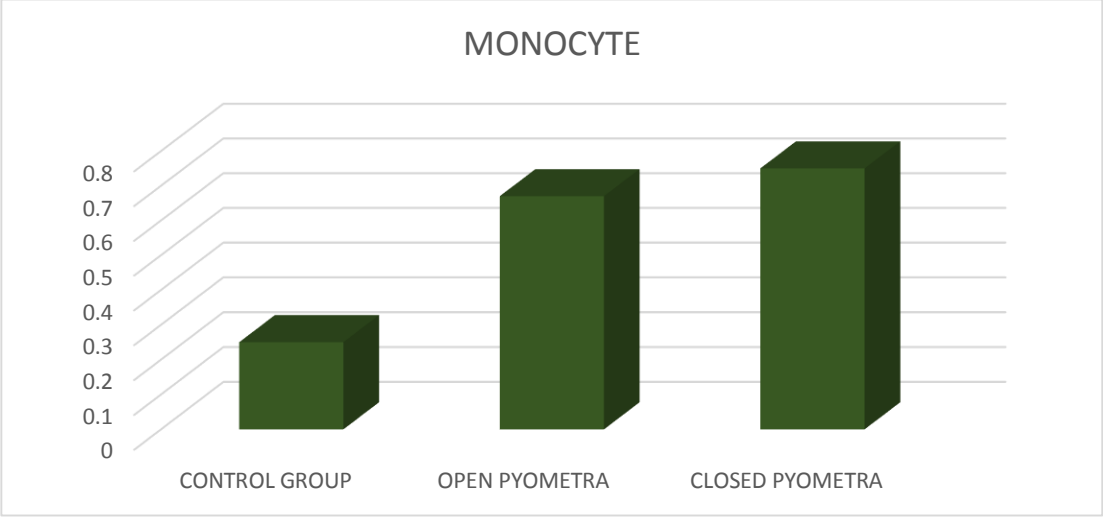
The mean value of basophil counts(cells/cmm) in group I, II, III, were 0.33 ± 0.14,0.00 ± 0.00,0.00 ± 0.00 respectively. There was significant ($P<0.05$) decrease in basophil count of group II, group III as compared to group I.

**4.5.5 Total leukocyte count**

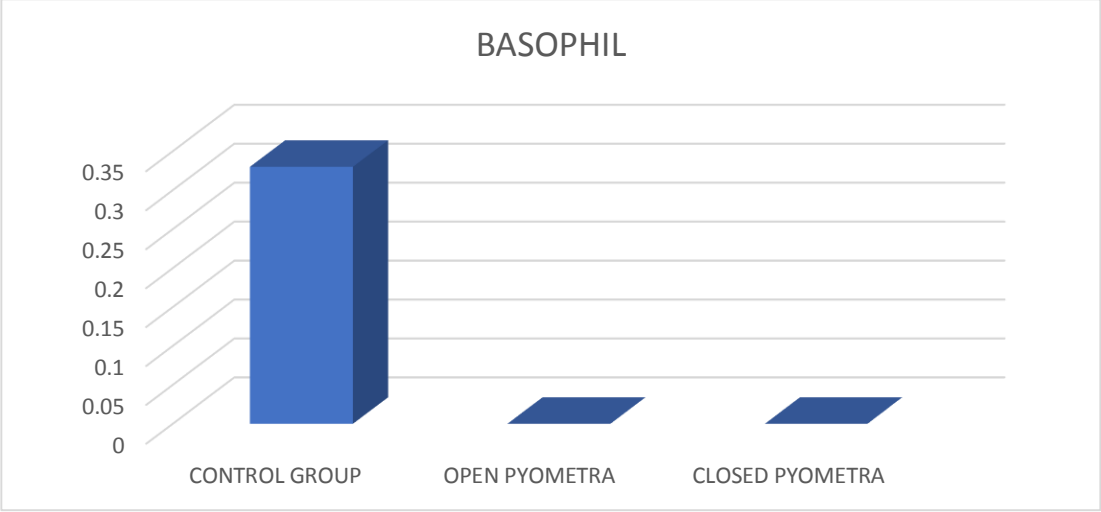
The mean value of total leukocyte count in group I, group II, group III were 6583.33±158.98, 32925.00±6443.40,29316.66±3349.32 respectively. There is significant ($P<0.01$) increase in the leukocytic count in group II and group III as compared to group I. That indicates leukocytosis in case of pyometra.



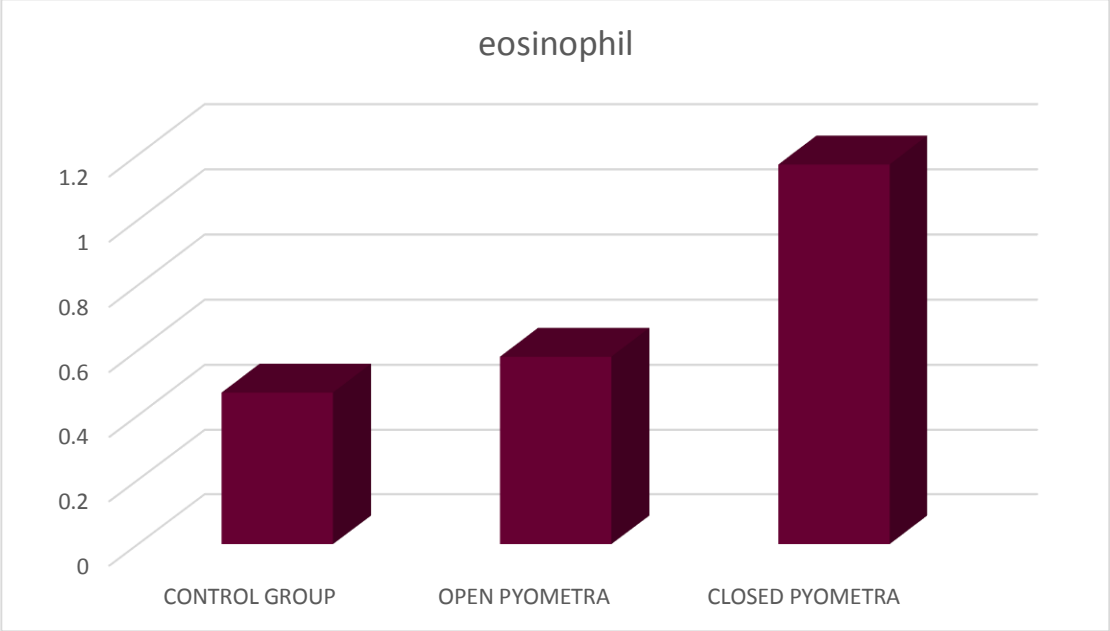

Graph 11: marked decrease in lymphocyte count in group II and group III as compared to group III



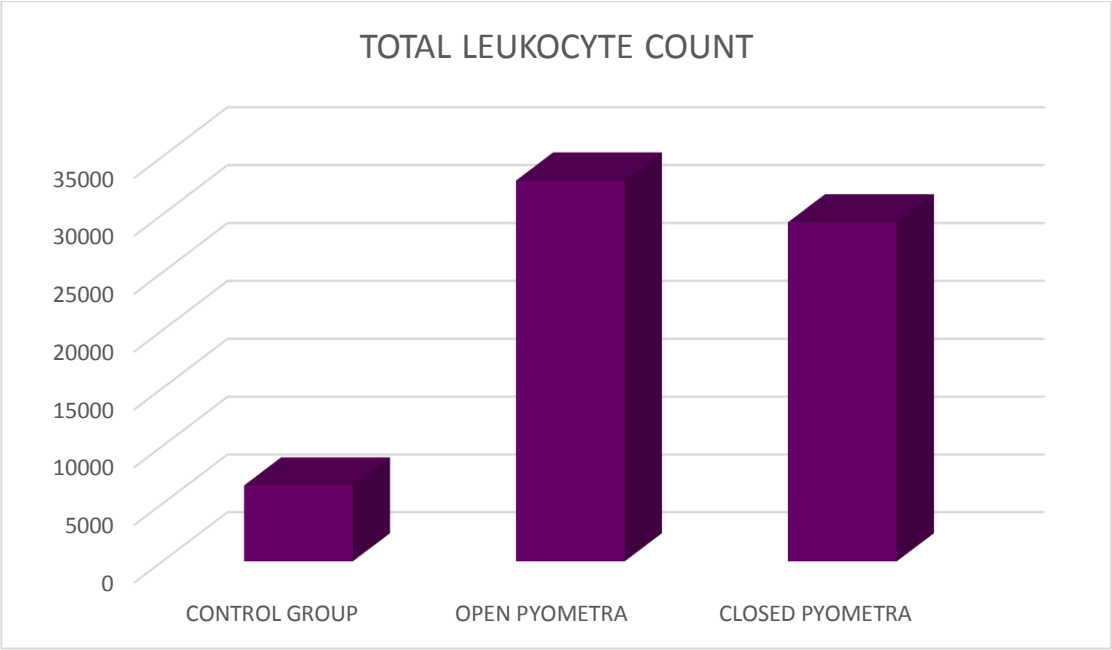

Graph 12: Marked increase in monocyte count in group II and III as compared group I




Graph 13: Decreased basophil count in group II and group I




Graph 14: Marked increase in eosinophil count in group II and group III as compared to group I




Graph 15: Marked increase in TLC in group II and III as compared to group I

## 4.10 Clinical signs

**Fig 1 Diestrous bitch with sanguino purulent vaginal discharge**

**Fig 2 Spitz breed dog showing red brown granular haemorrhagic discharge**

**Fig 3Thick hemorrhagic vaginal discharge from a diestrous Bitch with granules**

**Fig 4 Sanguino Purulent Vaginal Discharge from diestrous bitch**

**Fig 5 Miniature Pincher presented with anorexia, lethargy, Vaginal discharge**

**Fig 6 Distended abdomen along with pain on palpation**

**Fig 7 Spitz breed dog showing abdominal enlargement along with haemorrhagic discharges**

**4.11Radiography of suspected cases (Lateral radiography)**

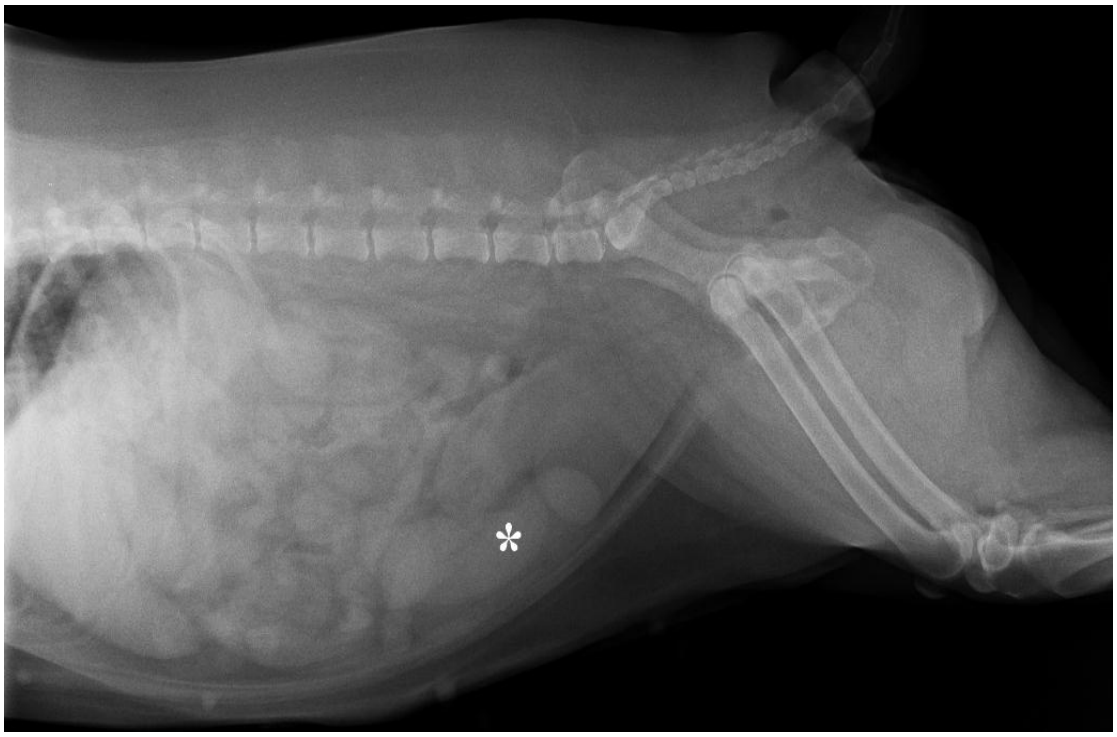


**Fig 8 largely distended uterus filling caudal and mid abdomen cranial and dorsal displacement of bowl along with ground glass appearance**

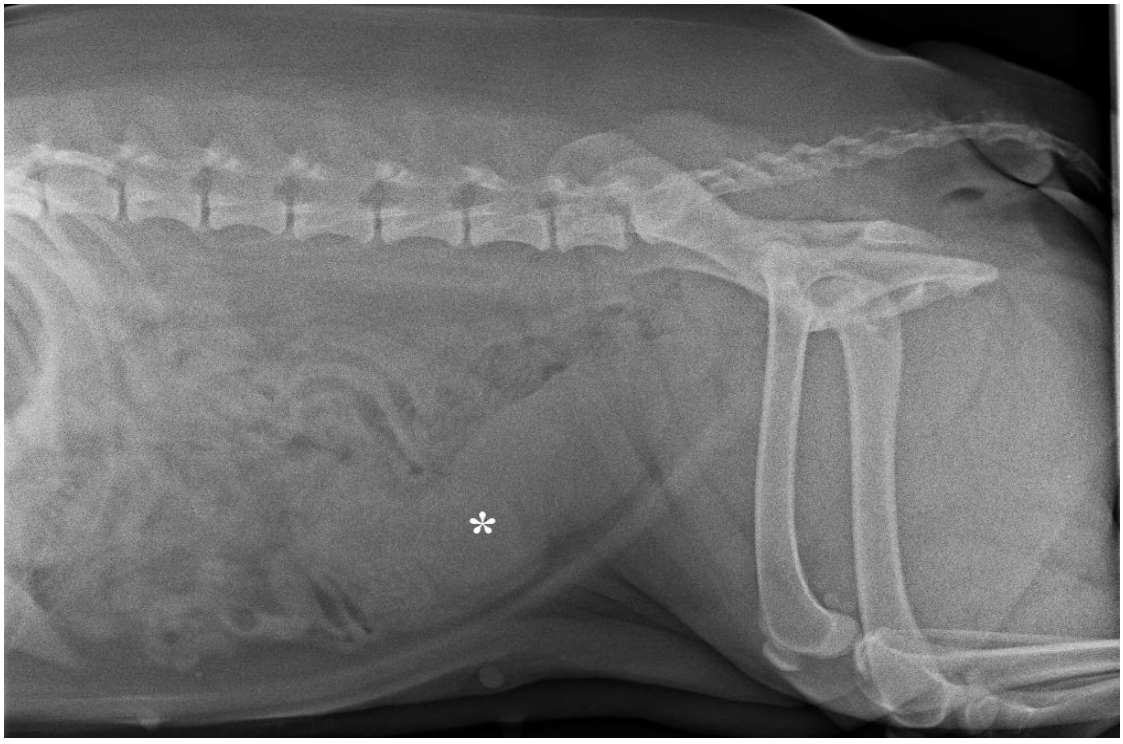


**Fig 9Homogenous tubular opacity in caudo ventral abdomen and cranial displacement of small bowl**

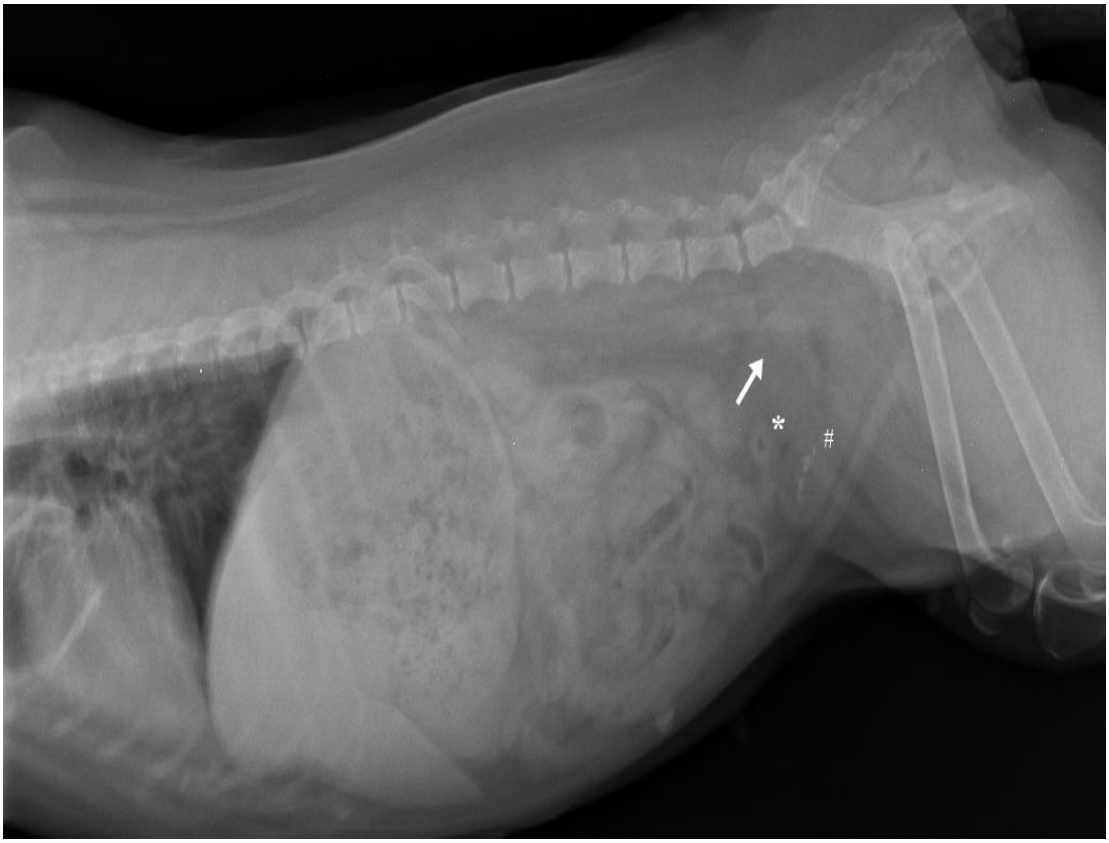
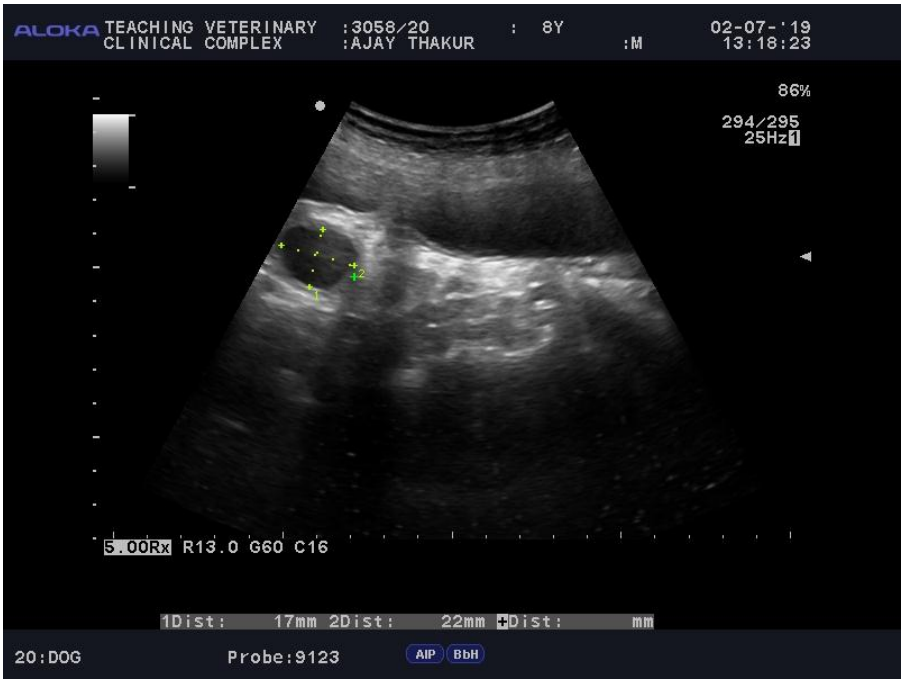


**Fig 10 Distended abdomen showing homogenous tubular opacity in caudoventral abdomen, largely distended uterus filling the mid and caudal abdomen**

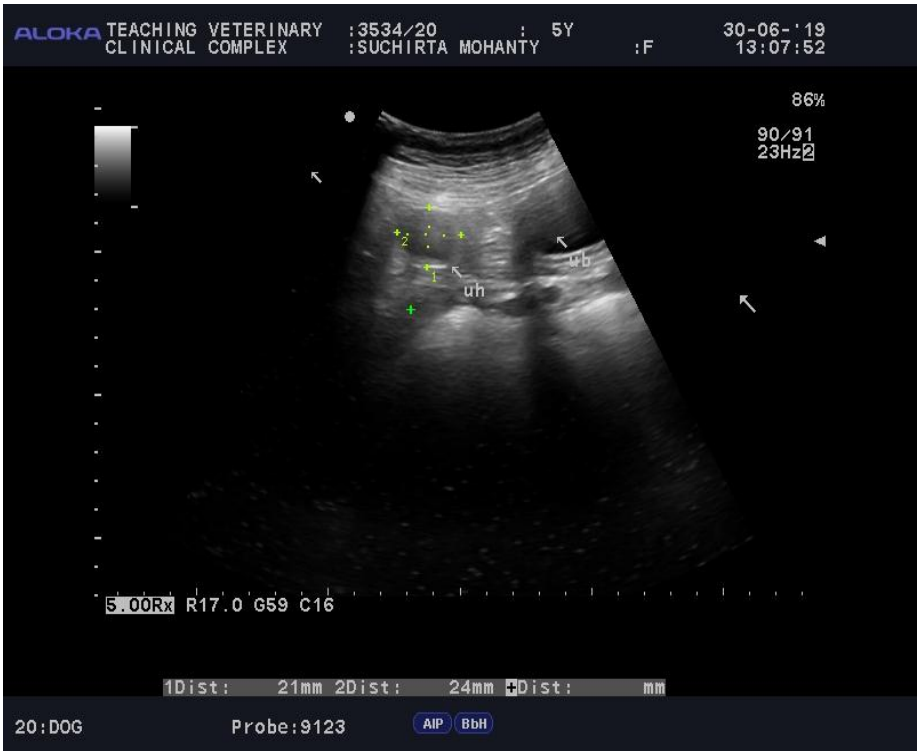
Diagnostic imaging confirms a presumptive diagnosis of pyometra generally. The classic radiographic finding between the descending colon and urinary bladder is a coiled, tubular structure of soft tissue or fluid opacity in the caudal abdomen. Often craniodorsally and medially displaced loops of bowel are found. Radiography can also be used as an tentative diagnostic aid in diagnosis of pyometra. In pyometra in the ventral and caudal abdomen a tubular structure is seen that is fluid filled. Loops of intenstines are displaced cranially and dorsally. In open cervix pyometra as there is drainage of contents of uterus through vagina in a significant manner,visualization of uterus may not be done radiographically.

### 4.12Ultrasonographic findings

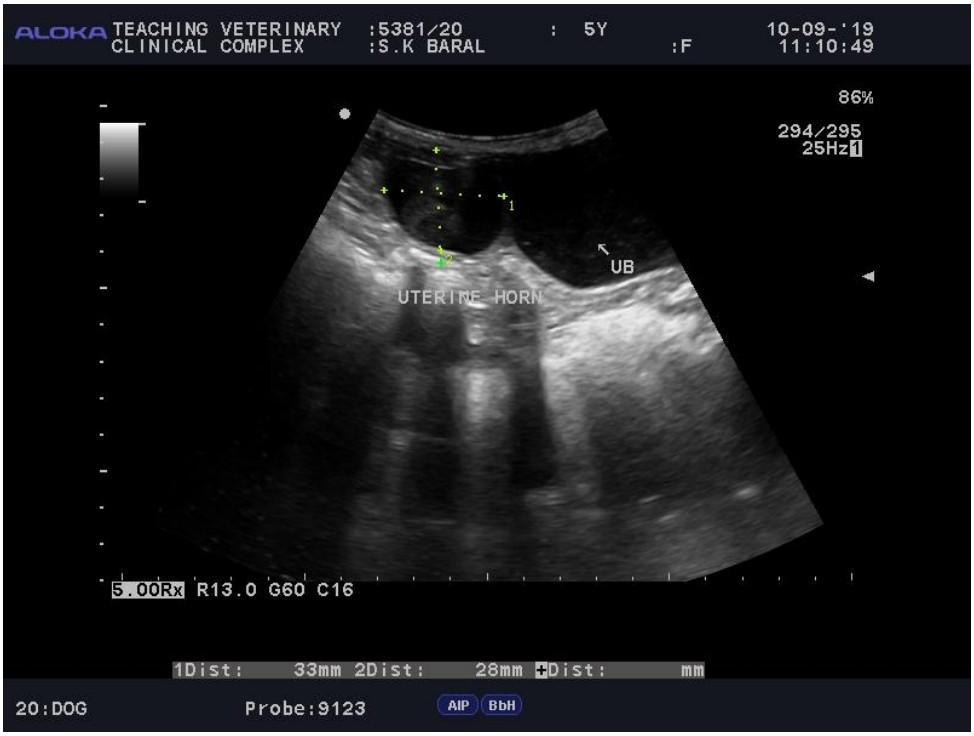
Ultrasonographyis both valuable and useful tool for diagnosis of pyometra. Demonstration of fluid of uterine lumen along with its nature. Cystic changes consistent with CEH may be seen occasionally an in the wall of uterus.



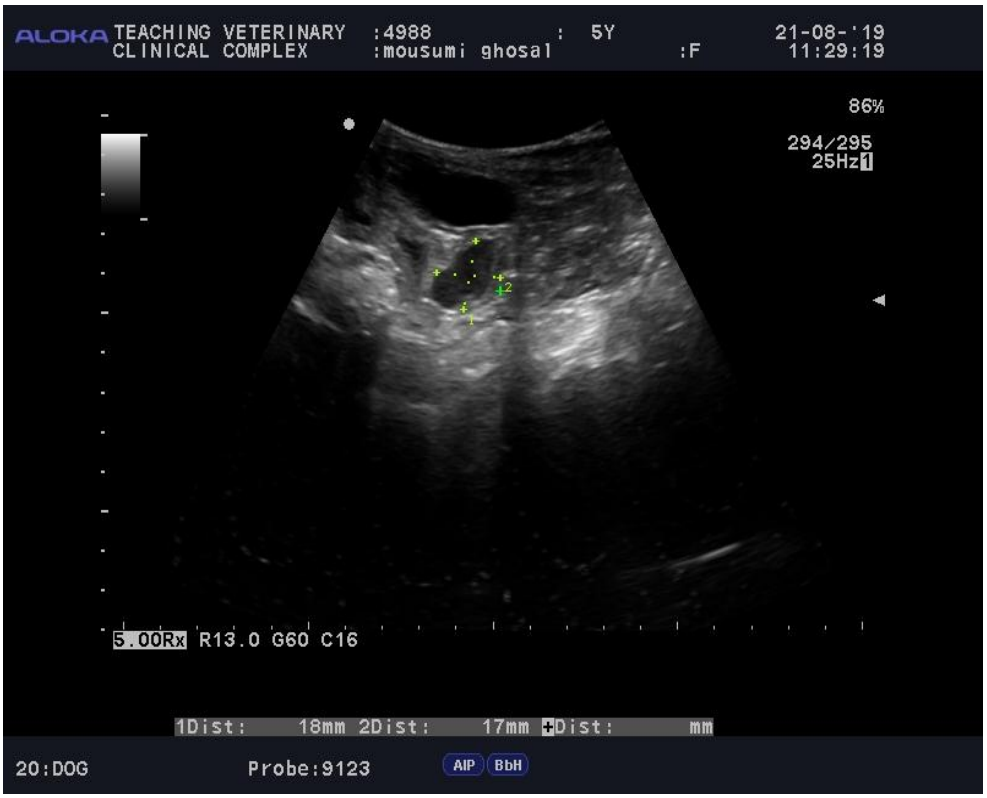

**Ultrasonographic appearances of open cervix pyometra were seen in Fig-11.** The uterine horns contained hyperechoic or anechoic material that showed movement in real time. The uterine horn is markedly enlarged. the luminal cavity includes anechoic fluid with strong distal enhancement



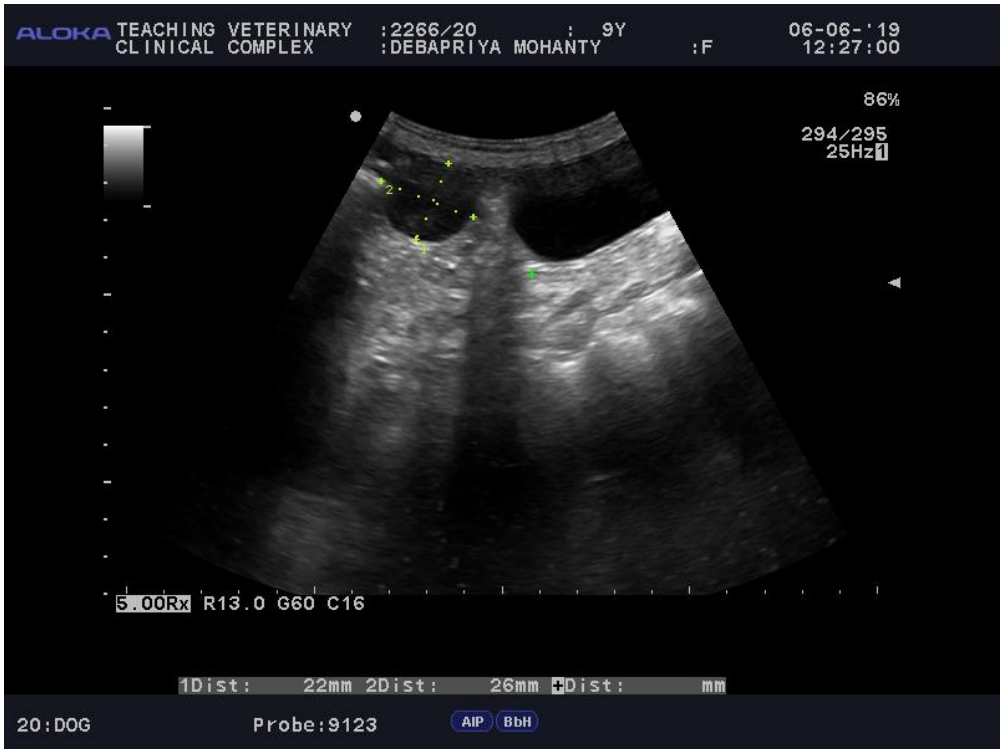

**Right uterine horn of a spitz dog of 4 year old showing anechoic uterine content (Fig-12).**



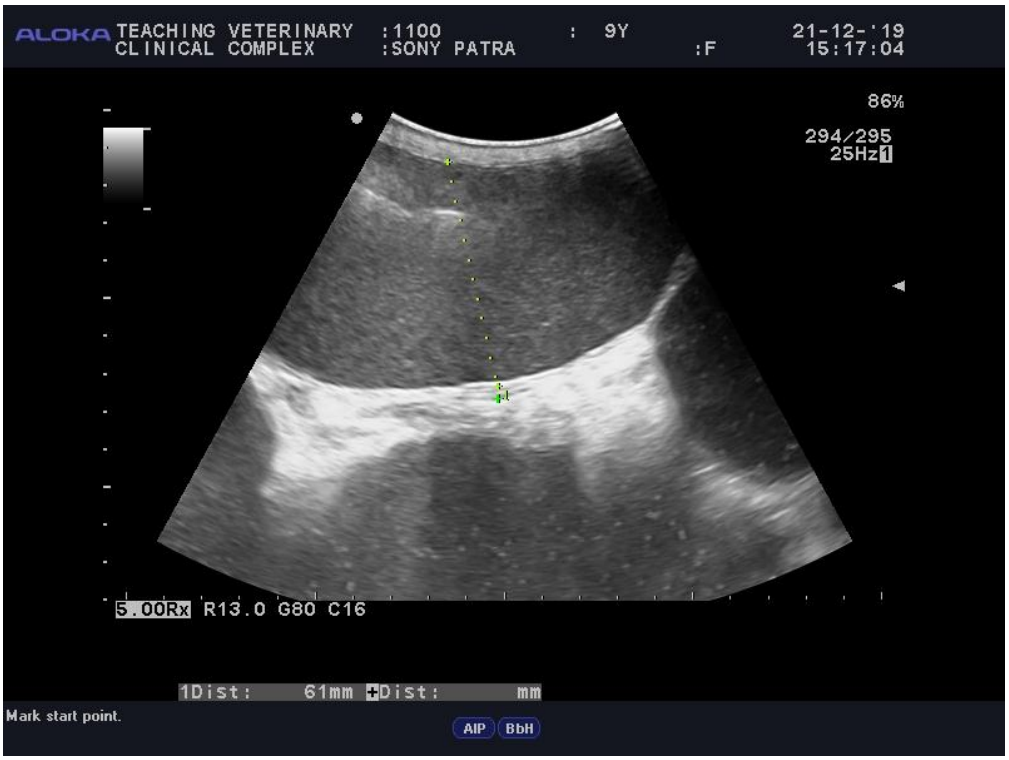

**Also, the uterine wall was thickened and irregular and thickened uterine wall has cystic and focal hyperechoic structure. (Fig-13).**




**In open pyometra The luminal cavity included smaller amounts of anechoic fluid than that of closed-cervix pyometra, endometrial lesions along with glands distension are present(fig14).**




**The uterine horn contains hyperechoic material and the uterine wall is thick. The uterine horn is markedly enlarged along with thin uterine wall shown in the real time (fig15)**




**An ultrasonographic finding of closed-cervix pyometra included variable patterns and was seen in (Fig-16)**

Ultrasonographic appearances of open cervix pyometra were seen in Fig-11. The uterine horns contained hyperechoic or anechoic material that showed movement in real time. The uterine wall was thicker than that of closed cervix pyometra (Fig-12). Also, the uterine wall was thickened and irregular and contained multiple tiny anechoic cysts (Fig-13). The luminal cavity included smaller amounts of anechoic fluid than that of closed-cervix pyometra. An ultrasonographic finding of closed-cervix pyometra included variable patterns and was seen in Fig-16. The uterine horns were markedly enlarged and contained hypoechoic nature of the material that showed original movement in real time. The uterine wall was variable on the basis of appearance, from thick and irregular to smooth and thin. Thickened endometrium of uterine wall had cystic and focal hyperechoic structures. The luminal cavity included anechoic fluid with strong distal enhancement.

In all cases, revelation of investigation and examination by transabdominally done ultrasound uterine exudation present inside such as blood, mucus, pus and cystic endometrial glandular hyperplasia were presented (Fig-11to Fig-16). Clearly evaluation of ultrasound examination was able to predict the integration of endometrial wall, uterine wall surface thickness variation, distension of uterus and endometrial glands cystic proliferation were seen. The glands in size and number had increased along with anechoic areas (1–2 mm) within the endometrium. The cystic endometrial surface hyperplasia in ultrasound diagnosis of the cases shown to be right diagnosis for all the cases due to high degree of correlation with Dow’s classification on the basis of accuracy.

**4.13 Gross lesions in the uterus those were obtained after hysterectomy is done**

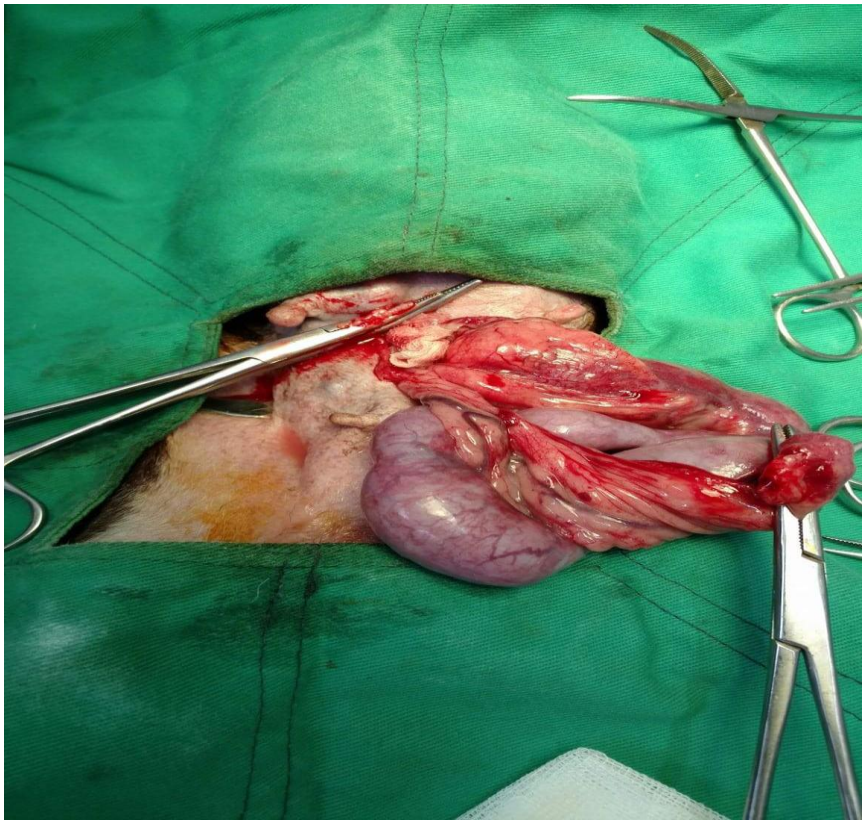


**Fig 17Exteriorized Enlarged and tortuous uterine horn with extensive accumulation of fluid**

**Fig 18 Close pyometra case showing Severely distended uterus with buildup fluid**

**Fig 19 Severely distended uterus along with buildup purulent fluid inside the lumen**

**Fig 20 Grossly enlarged horn along with sacculations showing hemorrhagic fluid buildup inside the lumen**

**Fig 21 Pus fluid with granular prolific endometrial surface showing through cut section**

**Fig 22Spitz breed after hysterectomy by following mentioned Procedure**

Gross uterus that are collected from the bitches at elective hysterectomy of pyometric bitches shows prominent enlargement. With fluid buildup which may be serous, mucous, mucopurulent, purulent, haemorrhagic,

The uterine horns were grossly enlarged with marked sacculations and in one openpyometra case, there was distension at the ovarian end of uterine horn. On cut section, the uterine fluid was hemorrhagic to dark chocolate in colour. The viscocity of the fluid varied considerably. The uterine wall was thickened in most cases and annular constrictions of the uterine wall were noticed on the endometrial surface.

The endometrium had a roughened appearance, focal haemorrhages and areas of ulceration. Grossly, the uterus was uniformly enlarged in most of the cases whereas sacculations were seen in few cases. Cut section revealed thickened uterine walls. The endometrial surface revealed hemorrhages, erosions and was covered with multiple or few irregular whitish cysts that on incision exuded creamy pus. The lumen contained small to moderate amounts of exudate varying from creamy fluidy contents to chocolate coloured thick viscous pus. In few cases, the contents were hemorrhagic and revealed blood clots in both closed and open pyometra cases.

## 4.14Histopathologic findings

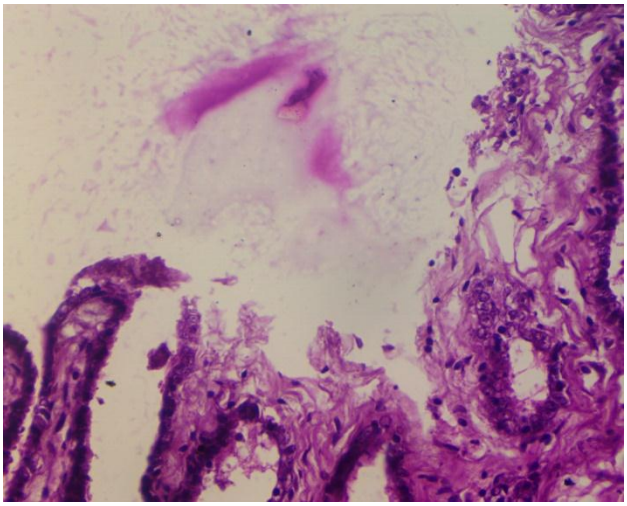


Fig. 23 Necrosis and desquamation of endometrial mucosa exposing submucosa with mild edemaand infiltration of few inflammatory cells(40X)

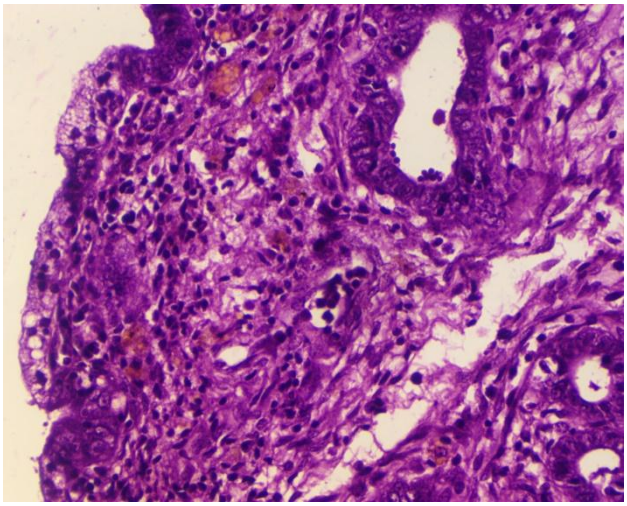


Fig. 24 Infiltration of inflammatory cells in the submucosa of uterus (40X)

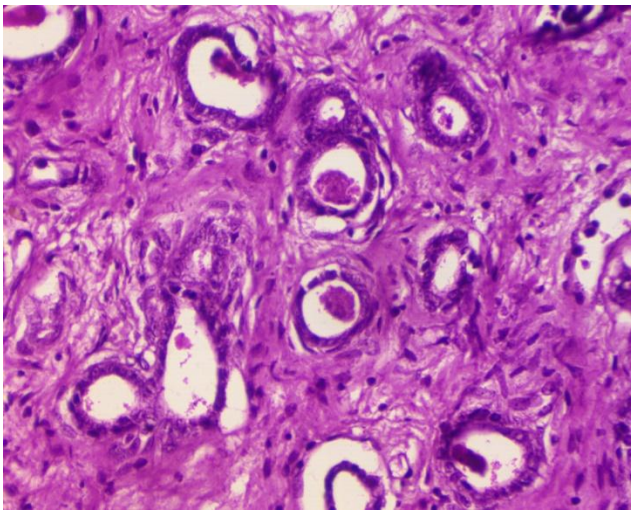


Fig. 25 Necrosis of glandular epithelium lining cells with presence of debris in the lumen(40X)

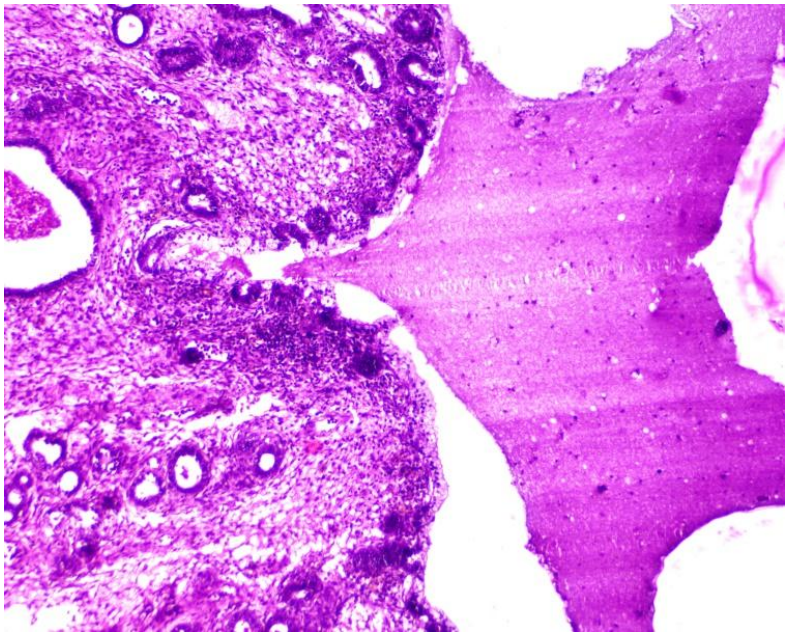


Fig. 26 Severe inflammation of mucosa with infiltration of inflammatory cells with presence of exudates in the lumen (10X)

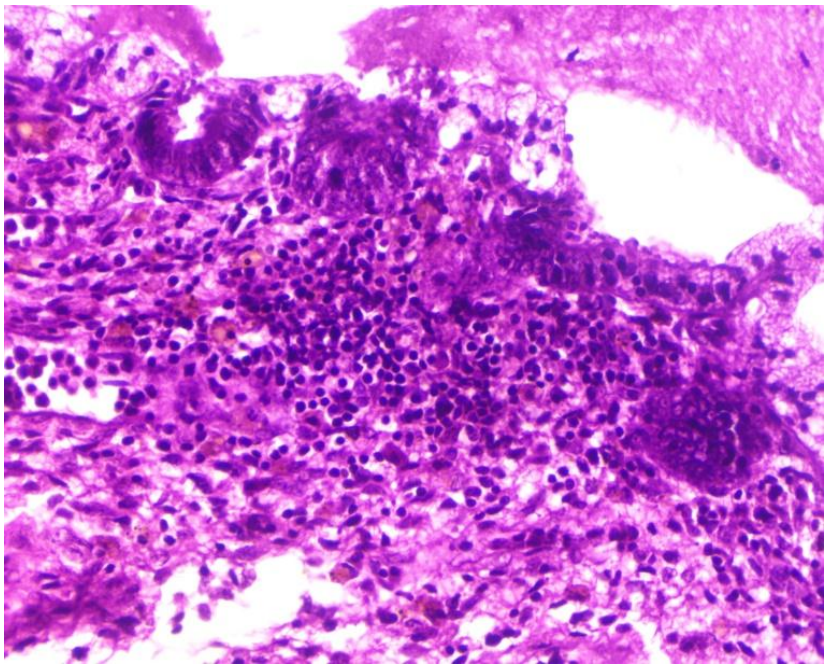


Fig. 27 Necrotic mucosa with inflammatory cells in sub mucosa and exudates in the lumen (40X)

Histopathological findings show marked infiltration of plasma cells in the endometrium along with cystic glandular hyperplasia. Sections of uterus revealed hyperplasia of endometrium extending into the uterine lumen at various points. The lining epithelium varied from cuboidal to tall columnar type. In two cases, erosion of surface epithelium was noticed. The lumen of the endometrial glands contained debris, polymorphonuclear cells, plasma cells and macrophages. Marked infiltration with plasma cells and a few macrophages was seen in the endometrial stroma and also surrounded the cystic endometrial glands.

It was characterized by infiltration of numerous polymorphs in the endometrium and within glandular lumen. Sections of uterus revealed hyperplasia of the endometrium. The glandular lumen was packed with polymorphonuclear cells and in few areas, the lumen contained eosinophilic secretions. In some glands, the lumen contained necrotic debris mixed with bacterial colonies. The glands were surrounded by polymorpoh-onuclear cells and plasma cells. Periglandular fibrosis was prominent with fibroblasts encircling the endometrial glands

▼▼▼

# DISSCUSSIONS

Various sample collection was done from these 24 pyometric bitches. They were utilized for forward studies done in the present study and the data obtained with regard to the incidence, clinical symptoms, clinico-pathological and bacteriological studies are discussed below. In addition, 12healthy bitches presented for elective spaying were used as control.

In this study, the percentage of pyometra was determined 14.3% (20/140). In abroad, a slightly higher incidence of 15.2 % was reported by Fukuda (2001) in Beagle dogs whereas a lower incidence of 5.17 % was reported in India by Gandotra *et al*. (1993). The age wise, breed wise and parity wise incidence was noted. The age wise incidence was found to be highest (70%) in group of age ranging from 6-10 years followed by 0-5years and >10years with an incidence of 20% and 10% respectively. The occurrence of pyometra was having 8.05 ± 0.61 mean age in years in the present study was in accordance with the study of Ahamed *et al*. (2015) and Shah *et al*. (2017). Similarly, Ravishankar *et al*. (2004) and Kashinath *et al*. (2009) also reported highest incidence of pyometra between 6-8 years and 6-9 years respectively. Younis *et al*. (2014) opined that percentage of pyometra occurence was observed higher in bitches over 6 years of age whereas Antonov *et al*. (2015) observed pyometra more often in 7 year old bitches. Stancic *et al*. (2008) report showd that the occurence risk of pyometra increased after 5 years of age significantly and along that showed the significant effect of breed on age of occurrence of pyometra. Egenvall *et al.* (2001) reviewed animal insurance records over a 2 year interval in Swedish dogs and their analysis showed that 23 -24 % of the bitches would experience pyometra by 10 years of age. Troxel *et al.* (2002) stated that consideration of pyometra typically not only a disease of middle aged bitches that are intact but also of young dogs. The disease spontaneously happens in bitches mostly over 6 years of age spontaneously a range of 8 weeks of estrus cycle happened previously. The age distribution could be due to repeated progesterone exposure in the course of the luteal phase long duration and a general feature of of canine cycle as stated by Niskanen and Thrusfield (1998). Feldman and Nelson (2004) stated that two distinct pyometra syndromes i.e. in the older bitch (7-8 years of age) and in the younger bitch (<6 years of age) can occur. In the older bitch repeated exposure

to progesterone during normal diestrus phase predisposes for CEH and exaggerates risk of developing pyometra. It is unlikely that similar pathophysiologic process account for uterine disease in young and old dogs. However, a strong co-relation exists between the incidence of pyometra in young dogs and estrogen administration.

The breed wise incidence in the present study indicated highest percentage in the Pomeranian (35%) followed by Labrador (30%), Spitz (15%), German Shepherd (10%) and Boxer and Pug breeds (5% each). However, in a study on incidence of pyometra in different breeds in Chennai, Simon *et al*. (2011) recorded 2.87%, 12.9%, 39.56%, 11.87% and 3.95% of pyometra in Pomeranian, Labrador, Spitz, Alsatian and Boxer breeds respectively and with lowest incidence in Pomeranian that was in contrast to the present study. Various authors reported differences in the susceptibility of different breeds. Feldman and Nelson (2004) stated that pyometra occurs in dogs of any breed. Egenvall *et al*. (2001) and Ahamed *et al.* (2015) noticed lower risk in German Shepherd while Ravishankar *et al*. (2004) found Doberman and Spitz to be the more predisposed breeds. Egenvall *et al*. (2001) stated that pyometra is a clinically important problem and differences related to breed and age occur. The occurrence in Pomeranian and Labrador increased and was noticed in the present study might be attributed to the the breed locally is locally poppular and attendance of these breeds during study period as opined by Ravishankar *et al.* (2004) and Ahamed *et al.* (2015) in their study.

In this study, the percentage of occurrence of pyometra was the highest in nulliparous bitches (65%) then primiparous (25%) and pleuriparous (10%) animals that was in accordance with the reports of Niskanen and Thrushfield (1998) and Kashinath *et al*. (2009). In a review on canine pyometra, Baithalu *et al.* (2010) stated that there a relationshipin between nulliparity and pyometra happens modestly. The disease does not develop during pregnancy than primiparous and multiparous dogs moderately higher risk in nulliparous bitches (Greene, 2011). The reason that protective effect of pregnancy apparently is unclear. The endometrium originally after pregnancy is lost and the protective new endometrial lining might differ on the basis of succeptibility of its receptors to estrogen or progesterone as the repoert of Niskanen and Thrusfield (1998). Dow (1959) opined that CEH-Pyometra in a complex mostly has a subsequent and spontaneous occurrence the nulliparous and old bitches becomes clinically manifestation of the disease during the luteal phase of cycle.

In the present study, clinically open (50%) and closed (50%) types of pyometra were noticed of which open type was the most common. All the bitches were in phase of diestrus. Anorexia, abdominal distension, lethargy, vomition and normal temperature along with mucopurulent to hemorrhagic vaginal discharges were the salient symptoms noticed. Open pyometra is more common than closed pyometra (Greene, 2011). The reason that the dogs were in diestrus stage in the present study might be because progesterone initiates the sequence of events leading to pyometra, and it occurs during the leuteal phase of cycle in dogs (diestrus) or after administration of progestins (Greene, 2011). Similar to the present study, anorexia and vomition were reported earlier by Nomura*et al.* (1984); Bigliardi *et al*. (2004); Kashinath *et al*. (2009); Singh *et al*. (2010); Ahamed *et al*. (2015) and Ravikumar *et al*. (2016). Abdominal distension was reported by ChoJong *et al.* (2000) and Younis *et al*. (2014). Normal temperature was noticed by Sadasivarao *et al.* (2002) and Mahesh *et al*. (2014) whereas higher temperatures were noticed by Bigliardi *et al*. (2004); Vural *et al.* (2010); Jena *et al*. (2013); Murthy *et al*. (2013); Anoopkumar *et al*. (2016) and Kumar *et al*. (2016). Few authors (Ramsingh *et al*., 2013 and Younis *et al*., 2014) observed both normal and high temperatures in pyometra. Vaginal discharges with pus were described by Nomura *et al.* (1984); Murthy *et al*. (2013); Fukuda (2001); Ahamed *et al*. (2015) and Anoopkumar *et al*. (2016), whereas chocolate brown fetid discharges were described by Murugavel *et al*. (2001); Sadasivarao *et al*. (2002); Singh *et al*. (2010) and Ramsingh *et al*. (2013). Greene (2011) stated that the clinical signs in the most severely affected animals are related to a systemic inflammatory response syndrome (sepsis, septic shock). Hagman *et al.* (2006) reported that the basis of systemic inflammatory response (SIRS) clinical signs in pyometra are caused by release of cell wall components. Release of endotoxins into circulation during growth of bacteria or via the disintegration of cell wall of gram negative bacteria. Roberts (1971) reported in acute cases there may be elevation is seen in body temperature, in chronic cases normal or in severe toxic cases may be subnormal. It has been suggested that an *E. coli* infected releases endotoxin from uterus is the cause of the clinical signs (De Schepper *et al*., 1987). The chronic status of the disease normal temperature noticed in the present study might be due to as opined by Jena *et al*. (2013). The mucopurulent to hemorrhagic vaginal discharges noticed in the study might have varied depending on weather damage occurred to endometrial blood vessels or not (Ortega-Pacheco *et al.,* 2012).

In the present study, PCV, Hb, TLC and DLC counts were estimated in the blood. The mean corpuscular values (MCV, MCH and MCHC) and the absolute counts of different leucocytes were evaluated from the above data. The results pertaining to erythrocyte parameters and leucocyte parameters are discussed below.

The mean value of haemoglobin in group I (control dog) 15.50±0.82 g%. Hb in blood of canine varies from10 to 16%. (Chauhan1995) (Benjamin 1957).in the present investigation the bitches belonging to pyemic infection possese low Hb. low Hb has been reported by Borrensen (1980) 5.02 to 12.9(Gandotra *et al*) (1994) (Singh *et al*). this due to loss of red blood cell with the diapedesis in to uterine lumen apart from depressed feed intake and impaired erythropoiesis under severe toxaemic condition in severly affected cases (Dhami *et al*) (2009). In the present study lower Hb value may be attributed to toxaemic effect as a result of pyaemic infection (Morrow) (1985).in the study decreased value of Hb indicate anaemia. Hagman *et al.* (2006) opined that an iron affinity of the reticulo-endothelial system increased and a total iron binding capacity decreased, is with acute and associated with chronic inflammation in the diseases and also induction of iron deficient and anemia subsequently. Due to movement of RBC's into lumen of uterus and lifespan of erythrocytes in blood shortened reported anaemia by De Schepper *et al.* (1987) erythrocytes diapedesis or loss into lumen of uterus with that bone marrow is depressed toxically as stated by Schalm *et al.* (1991). (Sevelius 1990)

In PCV the analysis of variance is significantly difference in group II and group III as compared to group I. The normal PCV value % 37 to 54 (Chauhan 1995) (Benjamin 1957). in present study in bitches affected with pyometra decreased PCV value resulted and showed a mild normocytic normochromic regenerative type of anaemia. (Dabhi *et al*) (2009) (Nelson and Feldman) (1986) reported due to the disease chronicity and suppressed bone marrow toxically (Verstgreen *et al* 2008). while the PCV value was in agreement with the mean value reported by Troxel *et al*. (2002)

In MCV analysis of variance is significantly different in group III compared to group II and group I. No significance variation between group I and group II. the mean corpuscular values did not vary significantly from the control that indicated a normocytic, normochromic anemia. All the mean values noticed in the erythrocyte parameters MCV. MCH, MCHC values of the study in this report agreed along with

reports of Ravishankar *et al*. (2004). The present report in this study showed that the mean value of MCV, MCH, MCHC were in normal range in group I and group II (Billigardi *et al*) (2004). The normocytic normochromic anemia might be the result of blood loss through vaginal discharge in open cervix cases (Yu, 2012). It reflects chronic nature of disease and toxic suppression of bone marrow (Baithalu *et al.,* 2010).

In neutrophils there is significance difference in group II and group III as compared to group I. Neutrophilia is observed typically in pyometra in haematological parameters of bitches. (Nath *et al* 2009), (Singh *et al* 2006). which might be due to different toxins in pyometra Nelson and Feldman (1986), Pande (2006), Stephens and Robert (1994). In the present study shift to left is observed. Neutrophilia with regenerative shift to left might be due to retention of purulent exudates in the uterus which exerts a chemotactic effect on neutrophils resulting accelerated granulopoiesis and lymphopaenia might be due to severe stress and elevated monocyte count due to the chronicity of suppurative process (Singh *et al* 2006), Hagman *et al* (2011). Significantly higher immature neutrophils noticed in the present study was in accordance with the reports of Mahesh *et al*. (2014). Regenerative shift to left be observed due to purulent exudates retained in the uterine lumen. Having a chemotactic effect of this exudation on neutrophils converts the scenario into granulopoiesis accelerated manner as reported by (Schalm *et al.,* 1991).

In the present study the differential leukocyte count including neutrophil, basophil, monocyte, lymphocyte, monocyte value were increased along with significance of variance is seen in basophil and lymphocyte counts of group II and group III compared to group I. Absolute neutrophilia, monocytosis, lymphopaenia, eosinophilia, monocytosis were common feature in pyometra (Wheaton *et al*1989), (Leib *et al* 1997) (England *et al* 2007).

In this the monocyte count did not vary significantly for group II and group III compared to group I. Neutrophilia shift to left, lymphopaenia with normal mean monocytic count basic feature of pyometra suggesting toxaemia (Dabhi *et al* 2009).

In the present study total leukocyte count was significantly different in group II and group III as compared to group I. Leucocytosis is found in group II and group III. leucocytosis is the most consistent finding of pyometra. (Jena *et al* 2013) (Nath *et al*

2009) (Dabhi *et al* 2009). This is the result of increased in body stress mechanism which produces leucocyte increasingly for combating of infection. (Nath *et al* 2009). Different degree of leucocytosis were observed in the study. The degree of leucocytosis depends upon due to varying severity of disease in different animal. (Dabhi *et al* 2009). The present study showed the mean leucocytes, which lies between the range suggested by Cox and Joshua (1979). The mean value of group II was 32925.00±6443.40 in the study, that agrees with (Sokolowski 1999) reported more than 300000 white blood cells in cubic mm in the pyometra affected bitches. The marked leucocytosis is observed due to suppurative diffused inflammation to combat infection of uterus and due to inflammatory response of bone marrow (Sevelius 1990). Leucocytosis observed in this study was in agreement with the findings of Ravishankar *et al*. (2004) and Sahoo *et al*. (2012). This one also agrees with the leucocytosis along with neutrophilia was indication of infection severly along with stress (Anoopkumar *et al*., 2016) and may be to the defence mechanism attribution is done responsed to the invading microorganisms (Samantha *et al.,* 2018). The mean TLC value of present study were similar in present study as reported by Hagman *et al,* 2001) (Meliah *et al.*,2012) and (Samantha *et al*., 2018)

Radiographic examination of uterus at other times are abnormal. Abdominal radiograph should be assessed in a bitch with suspected pyometra for a confirmatory diagnosis of the bitches with pyometra having a tubular structure that is in the ventral and caudal abdomen also fluid dense in nature seen, displacing loops of intenstine dorsal and cranial direction as reported by (Morrow1985).

It has been concluded that a performed radiologic examination serves as an initial method for the determinion and identification of the prevalence in canines affected by pyometra. This supports the study of Baithalu *et al* 2010. This study supports the theory that hyperplasia and prominent enlargement of the uterus will always become evident when canines are affected with a pyometra. Leading to the understanding of the importance for the radiographic images in the determination when stating a correct diagnosis. This is supported by the study of (Samnatha *et al* 2018).

The differential diagnosis cannot be ruled out in radiography in the suspected cases of pyometra in this study. This agrees with the study that radiuography could be frequently inconclusive mean of diagnosis in pyometra (Nyland TG *et al*2002) .

In the abdomen, organ fluid filled ranging wall thickness and changes are proliferative and visualization can be done as a sausage-like tubular organ fluid filled and having location at the descending colon beneathly and the urinary bladder could be identified. This agrees with the study of Smith F.O 2006), (Billigardi *et al* 2004).

A tubular structure in the ventral fluid filled in nature and caudally abdomen can be noticed on a plain lateral radiograph of the abdomen in the presented cases is in accordance with (Agrawal *et al* 2015)

But more or less, the radiographic estimations will provide a general view of the enlargement, and revealing the uterine size with quite less sensitive measurement. This supports the study that uterus in open cervix pyometra may not be visualized radiographigcally. (Baithalu *et al* 2010)

Ultrasonogtraphy has greatly enhanced clinician ability to document pyometra especially when abdominal radiographs are in conclusive, ultrasound allows the of uterine size determination, uterine wall thickness, fluid accumulation presentation in the uterus as reported by(Morrow1985)

Ultrasonography is the most confirmatory diagnosis in this study of suspected cases of pyometra. It accepts the fact that ultasonography has the advantage of detecting intrauterine fluid. (Hagman *et al* 2006). (Billigardi *et al* 2004) In this study all the (groups II, III) bitches were showing clinical signs of pyometra.

Ultrasonographic examination useful confirmatory diagnosis in uterine exudates detection. It is believed severe it is necessary for performation of ultrasonographic examination when clinical signs are severe for diagnosis of the degree of the lesions (Bigliardi *et a*l,2004).

In this study suspected case of pyometra were examined. Both open and closed cervix pyometra were seen. In open pyometra The uterine horns contained hyperechoic or anechoic material having real time movement. The uterine wall was thicker than that of closed cervix pyometra. It agrees with the uterine horn contained anechoic or hypoechoic build up fluid. (Samantha *et al* 2018). The uterine wall was thickened and irregular and contained multiple tiny anechoic cysts in the present study. Ultrasonography will allow the differentiation of uterine cyst and pyometra (Frayer-Hosken *et al* 1990) (Troxel *et al* 2002)

The luminal cavity included smaller amounts of anechoic fluid than that of closed-cervix pyometra. An ultrasonographic finding of closed-cervix pyometra included variable patterns and was seen. The horns of uterus were having enlargement with hypoechoic material markedly movement showed in real time (Samantha *et al*2018) (Baithalu *et al* 2010)

Varied appearance was shown by the wall of uterus, from thick and irregular to smooth and thin. Thickened uterine wall had cystic and focal hyperechoic structures. The luminal cavity included anechoic fluid with strong distal enhancement. (Samantha *et al* 2018).

In the present study differential diagnosis are also done by sonographic examination which includes mucometra, hydrometra, dead foetus etc. The imaging technique should be advanced for mucometra, hydrometra, haematometra. (Frayer Hosken *et al* 1990) (Hagman *et al* 2004)

Gross samples that are collected from the bitches at elective hysterectomy of pyometric bitches shows prominent enlargement, fluid build-up which may be serous, mucous, mucopurulent, purulent, haemorrhagic. That agrees with the study of uterine enlargement and fluid accumulation in pyometric female dogs, cystic deformation results in hyperplasia in the endometrium along with endometrial glands cystic deformation and stroma of the fibroblasts have proliferation with reaction due to inflammation as reports of (De Bosschere *et al*. 2001)

In this study the uterine horns were enlarged with marked sacculations and in one openpyometra case, there was distension at the ovarian end of uterine horn. (Dow, 1957)

On cut section, the uterine fluid was hemorrhagic to dark chocolate in colour. The viscocity of the fluid varied considerably. The uterine wall was thickened in most cases and annular constrictions of the uterine wall were noticed on the endometrial surface. this supports the study of diapedesis of RBC in to the uterine lumen. may also be due to RBC's movement diapedesis ion to lumen of uterus and lifespan of circulating erythrocytes shortened as opined by De Schepper *et al.* (1987) or might be due to loss of erythrocytes into uterine lumen coupled with depression of bone marrow toxically as stated by Schalm *et al.* (1991). (Sevelius 1990).

This present study also revealed the presence of pus (purulent exudates) in the uterine lumen. This also revealed the inflammatory nature of disease. This is supported

by the study purulent exudates are retained in the uterus having chemotactic effect exertion on neutrophils that leads to granulopoiesis acceleratedly as the reports of (Schalm *et al.,* 1991).

The endometrium had a roughened appearance, focal haemorrhages and areas of ulceration. This agrees with the study that nature of pyiometra as both localised and systemic chronic inflammatory response. (Hagman *et al* 2006)

Grossly, the uterus was uniformly enlarged in most of the cases whereas sacculations were seen in few cases. Cut section revealed thickened uterine walls. The endometrial surface revealed hemorrhages, erosions and was covered with multiple or few irregular whitish cysts that on incision exuded creamy pus. This agreed to the study of pus filled uterine horn is observed in ovariohysterectomy in pyometra (Agrawal *et al* 2015)

The lumen contained small to moderate amounts of exudate varying from creamy fluidy contents to chocolate coloured thick viscous pus. In few cases, the contents were hemorrhagic and revealed blood clots in both closed and open pyometra cases. This agrees to the study of (De Bosschere *et al* 2001) of hyperplastic and atrophic pyometra.

Histopathologically, hyperplasia (Jena *et al*., 2015 and Ravikumar *et al*., 2016), necrotic changes (Murugavel *et al*., 2001) and vacuolation of cytoplasm (Sahoo *et al*., 2005 and Jena *et al*., 2015) of lining epithelium described earlier were noticed in the present study. Infiltration of neutrophils and mononuclear cells seen in the uterus in pyometric bitches was also observed earlier by Murugavel *et al*. (2001); Sadasivarao *et al*. (2002); Vural *et al*. (2010) and Biswas *et al*. (2012) and cystic glandular hyperplasia with cellular exudates in the lumen was also noticed by Murugavel *et al*. (2001); Sadasivarao *et al*. (2002); Ravishankar *et al*. (2004); Sahoo *et al*. (2005); Kashinath *et al*. (2009); Younis *et al*. (2014) and Jena *et al*. (2015) in the uterus The important changes in histopathological structures in the uterus of bitches affected with pyometra included deposition of fibropurulent exudates in glandular lumen; squamous metaplasia of endometrium; vacuolation of cytoplasm of lining cells; inflammatory infiltrate consisting of neutrophils, lymphocytes, plasma cells and macrophages; distended uterine glands; and hyperplastic glandular epithelium as the frequent histopathological findings in pyometra-affected uterus44. Bigliardi E, Parmigiani E, Cavirani S, et al (2004).

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# SUMMARY AND CONCLUSION

A life-threatning and challenging of bitches that are intact. In pyometra 20% before 10 years of age approximately are affected. Between breeds percentage of affection having a description with ranging differences. On the basis of clinicalsigns, history medically, physical nature examination and analysis in laborotory. Along with it combination of radiography and/or ultrasonographic examination. Severity of disease depends upon clinical signs variation depending on the extent of infection. Leucocytosis, with left shift neutrophilia, anaemia, monocytosis are found in blood picture. In conclusion, the present study revealed an overall incidence of 14.3% of canine pyometra. 8.05 ± 0.61 years is the mean age of occurrence and Pomeranian was the most affected breed in the area under study. Anemia and leucocytosis with shift to left.

Although modern treatment routines are available deadly outcomes are there if treatment is not given properly. Ovariohysterectomy (OHE) is the safest and most effective treatment. Though OHE is routinely performed procedure, the multiple organ failure and systemic inflammatory response are the drawbacks. Increased postoperative hospitalization along with multiple systemic inflammatory responses are seen after surgery. Prediction of outcome is important indicators for survival, complications and morbidity are important, but clinically difficulties are there. By different examination on the basis of parameters evaluated through physical and laboratory examination. for prognosis or mortality prediction is currently a majour demand in veterinary. Current research focuses on identifying clinically valuable incidences as most clinical variables are unspecific and obscure. Pyometra having 3 to 4% mortality is seen in this diseases along increased postoperative hospitalization should be a measure of morbidity reduction.

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