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Association of age, breed, estrus and mating history in occurrence of pyometra

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Abstract
The study was aimed to analyze the influence of age, breed, estrus cycle and parity in the occurrence of canine pyometra and to assess the treatment of choice being followed for pyometra. For this study, case records of pyometra in dogs, presented between January 2013 to December 2017 were scrutinized and the influence of different factors on the incidence of pyometra was worked out. A total of 108 cases with the history of pyometra were presented in TVCC in period of 5 years. The pyometra observed in the middle to old age (>6 years) predominately (45.37%, mean age- 5.65 ± 0.3 years). The incidence was more in non-descript breeds (29.63%) followed by Labrador (24.07%) and Pug (15.74%). The disease was more prevalent in nulliparous dogs (81.82%) as compared to primiparous and pluriparous dogs which accounted to be 18.18%. There was history of estrus 16-60 days prior to the occurrence of disease in 74.63% dogs, of them, 17.05% (15/88) had mating history. Ovariohysterectomy (37.03%) was principle approach opted for treatment of pyometra. Other treatment opted for treatment of pyometra were antibiotics (24.07%), methergine (20.37%), $PGF_{2\alpha}$ analogue (16.67%) and mifepristone (0.93%).

Keywords: Canine, diestrus, nulliparous, ovariohysterectomy, pyometra

Introduction
Pyometra is defined as accumulation of purulent material within the lumen of the uterus in bitches [1]. The condition is classified as open and closed cervix pyometra, according to the presence or absence of vulvar discharge [2, 3]. Pyometra in bitches usually occurs in diestrus phase of the estrous cycle and is defined as hormonally medicated diestrual reproductive disorders [3]. Pyometra can occur at any age ranged from as young as 4 months to as old as 16 years of age [4]. Most frequently it occurs at 7-8 years of age with increased incidence in nulliparous bitches and moreover in bitches greater than 4 years of age [1]. A predisposition in certain breeds has occasionally been reported. Smith (2006) [3] reported that some breeds to be predisposed to pyometra included Rottweiler, Saint Bernard, Chow Chow, Golden Retriever, Miniature Schnauzer, Irish Terrier, Airedale Terrier, Cavalier King Charles Spaniel, Rough Collie and Bernese Mountain dog while Jitpean *et al.* (2012) [5] described that the top 10 breeds diagnosed with pyometra were Leon Berger (73%), Irish wolfhound (69%), Bernese mountain (69%), Great Dane (68%), Staffordshire Bull Terrier (66%), Rottweiler (65%), Bull Terrier (62%), Doberman (62%), Bouvier des Flanders (60%) and Airdale terrier (60%). Various protocols have been used to treat pyometra like use of antibiotics alone [6], prostaglandin therapy [7], aglepristone [8] and cloprostenol sodium [9] but they did not bring about the expected therapeutic outcome and therefore ovariohysterectomy had been the treatment of choice [10]. So, the present investigation was undertaken to analyze the influence of age, breed, estrus cycle and parity in the occurrence of canine pyometra and to check the treatment of choice being followed for pyometra.

Materials and Methods
Case records of pyometra in dogs, presented to the TVCC, Guru Angad Dev Veterinary and Animal Sciences University Ludhiana during January 2013 to December 2017 were scrutinized and the influence of following factors on the incidence of pyometra was worked out.

Age
The age of the bitch at the time of diagnosis of pyometra was obtained from each case record. Based on age, the animals were grouped as less than 2 years, more than 2 to 4 years, more than

4 to 6 years, more than 6 to 8 and more than 8 years. The frequency distributions of occurrence of pyometra in different age groups were compared to assess the possibility of predisposition of age of the dog and development of pyometra.

Breed
Information regarding canine breeds diagnosed with pyometra were analyzed to study the frequency distribution of pyometra amongst various breeds.

Occurrence of pyometra in relation to estrus
Data regarding the estrous cycle history of the animals affected with pyometra was obtained from each case record as well as from the clinical cases handled during present investigation. Based on history of estrus prior to occurrence of pyometra, the animals were grouped as estrus before 15 days, between 16-30 days, between 31-60 days and more than 60 days.

Mating history
The mating history of the animals affected with pyometra was classified as no data, no mating history, mating done and animal conceived and post coital pyometra.

Treatment
Data regarding the treatment history of the animals affected with pyometra was classified as ovariohysterectomy, methergine, $PFG_{2\alpha}$ analogue, antibiotic and mifepristone.

Results and Discussions
The data regarding age, breed, parity, stage of estrus and type of treatment was analyzed in 108 female dogs affected with pyometra during a period of five years from 2013-2017.

Association of age with pyometra
The different age groups showing incidence of pyometra have been presented in Table 1. The incidence of pyometra ranging from 16.67% to 27.78% was recorded in different age groups of the dogs. The highest per cent of dogs (27.78%) affected with pyometra were in the age group of 6 to 8 years. In the present investigation, 62.04% dogs suffering from pyometra were more than 4 years of age. The mean age of affected dogs was 5.65 ± 0.3 years and ranged from 10 months to 13 years.
Contri *et al.* (2014) [11] reported mean age of the dogs diagnosed with pyometra to be 6.2±2.4 years. Similar findings by Baithalu *et al.* (2010) [12] recorded that pyometra occurred at any age after the first estrus, typically a condition of the middle aged to older aged dogs with mean age of 7.25 years as young as 4 months to as old as 16 years of age. Martins *et al.* (2015) [13] observed the incidence of pyometra in 119 dogs at the age of 2 to 16 years. The mean age of these pyometra dogs was 8.5 years, majority of them were 6-9 years old. Pyometra was more often observed in aged and most frequently at 7-8 years of age and moreover in bitches greater than 4 years of age [1]. This increase in incidence of pyometra with age could be due to more exposure of endometrium to progesterone with the increase number of estrous cycles [14].

Table 1: Influence of the age of the dog on the incidence of pyometra (n = 108).

Age (in years)	No of dogs affected with Pyometra	% incidence
≤ 2 years	20	18.52
>2-4 years	21	19.44
>4-6 years	18	16.67
>6-8 years	30	27.78
>8 years	19	17.59
Total	**108**	**100**

Breed wise incidence
The details with respect to different breeds affected with pyometra have been shown in Table 2. Clinical records indicated that highest incidence of pyometra occurred in non-descript breeds (29.63%) followed by Labrador (24.07%) and Pug (15.74%) female dogs. The other breeds in order of decreasing frequency were German Shephard (5.56%), Rottweiler (3.7%), Saint Bernard (3.7%) and Pomeranian (3.7%). The incidence of pyometra was less than 3 per cent in Cocker Spaniel, Pitbull, Boxer, Golden retriever, German Spaniel, Dash hound, Great Dane and Spitz female dogs. This breed differences may be reflection of true genetic differences or merely constitute a reflection of the different life spans in different breeds [15].
The results agree with Martins *et al.* (2015) [13] who reported 41% prevalence of pyometra in mixed breed (mongrels) and 27% of poodles with pyometra. However, Antonov *et al.* (2015) [16] found higher incidence in breeds such as Golden Retriever, Irish Terrier, Saint Bernard and Rottweiler. Other study conducted by Younis *et al.* (2014) [17] reported high prevalence of pyometra in Griffon, German Shephard, Pitbull, Mixed breed, Boxer, Rottweiler and Yorkshire Terrier.

Table 2: Influence of breed of the female dog on the incidence of Pyometra (n=108)

Breed Name	No. of cases of pyometra encountered	% Incidence
Non-descript	32	29.63
Labrador	26	24.07
Pug	17	15.74
German Shephard	6	5.56
Rottweiler	4	3.7
Saint Bernard	4	3.7
Pomerian	4	3.7
Pitbull	3	2.78
Boxer	3	2.78
Cocker Spaniel	2	1.85
Dash hound	2	1.85
Great Dane	2	1.85
Golden retriever	1	0.93
German Spaniel	1	0.93
Spitz	1	0.93
Total	108	100

Occurrence of pyometra in relation to estrus

The details of the previous estrus before being affected by pyometra in 71 dogs were available and is depicted in the Table 3. Most of the dogs (38.01%) affected with pyometra had history of estrus 16-30 days back whereas 36.62% dogs were in estrus 31-60 days before and another 12.96% were in estrus more than 60 days before being affected with pyometra. The pyometra was also recorded in 5.63% dogs having estrus history of less than 15 days prior to occurrence of pyometra. High incidence of pyometra after 15-60 days of estrus shows that pyometra is primarily a disease of diestrus phase which accounted for 74.63%.

Smith (2006) [3] in his study found similar results that pyometra in dogs usually occurred in diestrus phase of estrous cycle and defined it as the hormonally medicated diestrual reproductive disorder. Verstegen *et al.* (2008) [18] reported that due to elevation of progesterone there was suppression of immune responses, stimulation of endometrial gland secretions which provide a suitable environment for bacterial growth, functional closure of the cervix which inhibits drainage of uterine exudates and mediation of pyometra. Krekeler *et al.* (2012) [19] opined that susceptibility of host and pathogenic bacteria along with progesterone appeared to be an important component leading to disease condition.

Table 3: Onset of pyometra in relation to estrus (n=71)

Onset of pyometra in relation to estrus	No. of cases	Percentage
Less than 15 days	4	5.63
16-30 days	27	38.01
31-60 days	26	36.62
More than 60 days	14	19.72
Total	71	100

Mating history

The details of mating history of 88 out of 108 pyometra affected female dogs were available and is shown in Table 4. The maximum cases of pyometra (53.41%) occurred in the dogs in which mating did not happen followed by the dogs (28.41%) in which mating was done but the female did not conceive. The rest of 16 dogs (18.18%) which encountered pyometra had earlier conceived following mating. Thus, the animals that did not conceive and developed pyometra were 81.82 per cent. Out of 41 dogs which had been mated earlier, 15 were mated in the recent heat and had developed pyometra. Out of 15 dogs, 13 dogs had previous estrus cycle within 2 months prior development of infection while 2 had previous estrus cycle of more than 2 months prior to development of infection. The occurrence of post-coital pyometra could be due to unhygienic condition leading to infection in the favourable environment during impending diestrus.

The higher incidence of pyometra in nulliparous compared to parous dogs in the present study is in confirmation with the case series by Niskanen and Thursfield (1998) [20] in which they found that nulliparous dogs had a moderately higher risk of developing pyometra than primiparous and multiparous animals. Chastain *et al.* (1999) [21] opined that incidence of pyometra was more in nulliparous female dogs than in multiparous and pluriparous female dogs. Roberts (1986) [22] reported that there is increase in incidence of pyometra with age following repeated non-productive matings, pseudocopulation and spontaneous ovulation.

Table 4: Mating history of dogs prior to development of pyometra (n=88).

Mating history	No. of cases	Percentage
No mating done	47	53.41
Mating followed by whelping	16	18.18
Mated but not conceived	25	28.41
Total	88	100

Treatment

Ovariohysterectomy was performed directly in 37.03% of the dogs affected with pyometra. Only antibiotics given to 24.07% dogs. In combination with antibiotics either of methergine, $PGF_{2\alpha}$ analogue or mifepristone was administered to 20.37%, 16.67% and 0.93% of pyometra affected dogs, respectively. There was death of one animal before the start of any treatment (Table 5).

Table 5: Retrospective analysis of treatment given in pyometra during 2013-17 (n=108).

Treatment	Animals	Percentage
Ovariohysterectomy	40	37.03
Only Antibiotic	26	24.07
Methergine + Antibiotic	22	20.37
$PGF_{2\alpha}$ analog + Antibiotic	18	16.67
Mifepristone + Antibiotic	1	0.93
Dog died before treatment	1	0.93
Total	108	100

Conclusion

The pyometra was most common in middle aged canines during diestrus stage. However, younger animals less than 2 years of age were also susceptible to pyometra. Nulliparous animals were at higher risk. Breeds with high risk of pyometra were non-descript (29.63%) followed by Labrador (24.07%) and Pug (15.74%). The other breeds viz. Rottweiler, German Shephard, Cocker Spaniel, Saint Bernard, Pomeranian, Pitbull, Boxer, Golden Retriever, German Spaniel, Great Dane and Spitz were at less risk. Principal treatment opted for pyometra in dogs was ovariohysterectomy suggestive of treatment of choice.

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