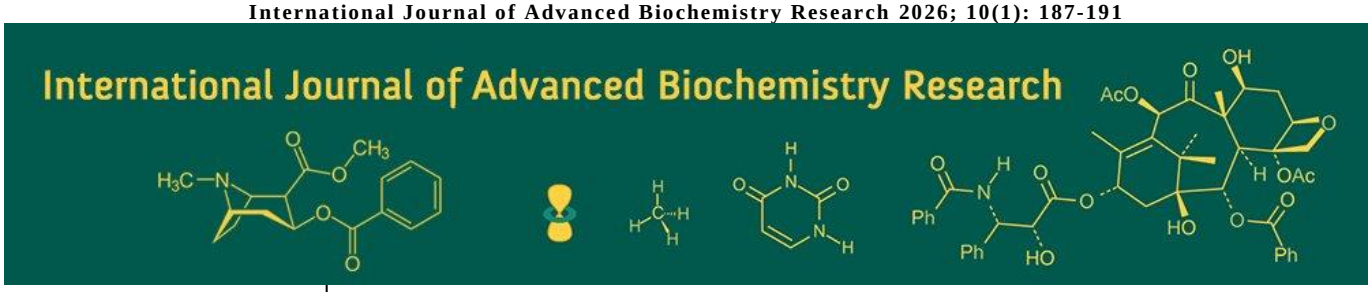

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Retrospective study of factors influencing occurrence of canine pyometra

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Abstract
The present study was done to analyze the incidence, distribution and factors influencing occurrence and management of pyometra. The study was done on the 3952 female dog outpatients presented to the Department of Veterinary Gynaecology and Obstetrics, Veterinary College, Hebbal, Bengaluru from January 2023 to December 2024. A total of 418 pyometra cases indicating an overall incidence of 10.58%, were presented and out of that 90.91% were open pyometra and 9.09% were closed type. The condition was most frequent in bitches aged 6-8 years (23.68%) and >10 years (21.29%), while only 4.31% occurred in bitches <2 years. Breed predisposition was more in Labrador Retrievers (20.57%), Pugs (12.68%), Golden Retrievers (11.72%) and Pomeranians (9.33%) were the most affected breeds collectively accounting for over half the cases. Nulliparous bitches were most affected (72.73%). Seasonal occurrence peaked during the monsoon (25.60%) followed by winter (22.25%) and with respect to estrus, most cases were recorded 16-30 days post-estrus (37.80%), highlighting progesterone's influence in disease pathogenesis. Regarding therapeutic management, ovariohysterectomy was the most commonly employed and preferred treatment modality, performed in 72.73% of cases, reaffirming its status as the definitive therapy for pyometra, while medical management was adopted in selected cases. The findings highlight key risk factors associated with canine pyometra and emphasize early diagnosis and timely surgical intervention to reduce mortality in affected bitches.

Keywords: Canine, pyometra, retrospective study, management and estrus

Introduction
Pyometra is a serious and potentially life-threatening uterine disorder observed in intact female dogs, characterized by the buildup of pus within the uterine lumen (Hagman, 2018) [8]. Pyometra is classified into open and closed-cervix forms, depending on whether the cervix permits the drainage of accumulated purulent material (Pretzer, 2008) [16]. Dog breeds with higher risk and more prone to developing pyometra are Rottweilers, Golden Retrievers, Chow Chows, Saint Bernards, Airedale Terriers, Irish Terriers, Miniature Schnauzers, Rough Collies, Cavalier King Charles Spaniels and German Shepherds (Smith, 2006) [14]. Dogs can develop pyometra at any age between 3 months and 20 years but it is most commonly seen in middle-aged to older dogs with mean age of 9 years. (Martins *et al*., 2015) [10]. The risk of pyometra increases in middle-aged and older dogs due to repeated estrus cycles, with nulliparous bitches being more commonly affected than primiparous or pluriparous animals (Sethi *et al*., 2020) [12]. In the diestrus phase, progesterone boosts the secretory functions of the endometrial glands, stimulates the growth of the endometrium, reduces the contractility of the myometrium, and facilitate the closure of cervix (Pretzer, 2008) [16], thereby creating a favorable environment for bacterial proliferation. Seasonal variation in incidence has also been reported by several authors, possibly reflecting breeding patterns and environmental stressors (Antonov *et al*., 2015; Devarajan *et al*., 2024) [2, 3]. Despite the clinical importance of pyometra, region-specific data on its occurrence and associated risk factors remain limited. Retrospective hospital-based studies are valuable for identifying epidemiological trends, assessing disease burden and guiding preventive and therapeutic strategies. Therefore, the present study was undertaken to retrospectively analyze the occurrence of pyometra in bitches.

Materials and Methods

Case records of pyometra in dogs, presented to the Department of Veterinary Gynaecology and Obstetrics, Veterinary College Hebbal, Bengaluru during January 2023 to December 2024 were scrutinized and the influence of following factors on the incidence of pyometra was studied.

Year wise Incidence

The number of cases were obtained year wise from case records. Based on the year, animals grouped as year 2023 and year 2024. The frequency of occurrence of pyometra in different years compared to assess the possibility of predisposition of pyometra cases.

Forecasting of pyometra incidence was performed using linear regression analysis applied to retrospective OPD data with projections generated to assess the future trend of disease occurrence.

Type of pyometra

Type of pyometra details were obtained from the case records. Based on the type of pyometra they were divided into two groups as open pyometra and close pyometra according to respected years. The frequency of the type of pyometra in different years were compared to assess the possibility of predisposition of type of pyometra.

Age

The age of the bitch was obtained from case records. Based on age, the bitches were grouped as less than 2 years, between 2 to 4 years, between 4 to 6 years, between 6 to 8, between 8 to 10 years and more than 10 years. The frequency distributions of occurrence of pyometra in different age groups were compared to assess the possibility of predisposition of age of the bitch and development of pyometra.

Breed

The breed of the bitch was obtained from the case records. Based on breed, the frequency of distribution analyzed in different breeds.

Parity

The parity of the bitch was obtained from the case records. Based on the parity, bitches were grouped as Nulliparous, Primiparous and Plueriparous. The frequency distribution of occurrence of pyometra in different parity groups were compared to assess the possibility of predisposition of parity of the bitches and development of pyometra.

Relation to onset of estrus

Data related to onset of estrus was recorded from the case records. Based on history of estrus period prior to onset of pyometra, bitches were grouped as estrus period less than 15 days, between 16 to 30 days, between 31 to 60 days and more than 60 days.

Occurrence of pyometra in relation of season

Data related to onset of pyometra in different seasons were obtained from the case records. Based on the different season bitches were grouped as autumn, Monsoon, spring, summer and winter.

Management of pyometra in bitches

Data related to the management of pyometra were obtained from the case records. Based on different type of management bitches were grouped as Antibiotic only, Mifepristone + Antibiotic, Mifepristone + Misoprostol + Antibiotic, Misoprostol + Antibiotic, OHE (Ovariohysterectomy) and owner refused treatment.

Result and Discussion

Year wise incidence of pyometra

The year wise incidence of pyometra and total female dog outpatients are depicted in Table 1. A total of 3952 female dogs were presented to the clinic over two years (2023-2024). A total of 418 cases were diagnosed with pyometra, representing an overall occurrence rate of 10.58% higher than Gibson *et al*., (2013) [6] who reported a 2.2% prevalence over six years. In the year 2023, out of 2047 FDOs, 203 cases were affected, accounting for a prevalence of 9.92%. In comparison, the year 2024 recorded 1905 FDOs and 215 pyometra cases, showing a relatively higher prevalence of 11.28%. The findings indicate a slight increase in the occurrence of pyometra in 2024 compared to 2023.

Table 1: Year wise distribution of no. of female dog outpatient (FDO) and pyometra cases in bitches

S. No.	Year	FDO	No. of pyometra cases	Percentage
1	2023	2047	203	9.92
2	2024	1905	215	11.28
Total		3952	418	10.58

Trend-based forecasting of pyometra incidence was carried out using retrospective OPD records to evaluate the future pattern of disease occurrence depicted in Table 2. An increasing trend was observed with the number of cases rising from 203 in 2023 to 215 in 2024. Linear regression analysis (Figure 1) projected a further increase in incidence to 227 cases in 2025 and 239 cases in 2026. The observed upward trend in pyometra incidence and its projected continuation suggest an increasing clinical burden of reproductive disorders in bitches. The forecasted values should be interpreted as indicative of the direction of change rather than exact estimates of future incidence.

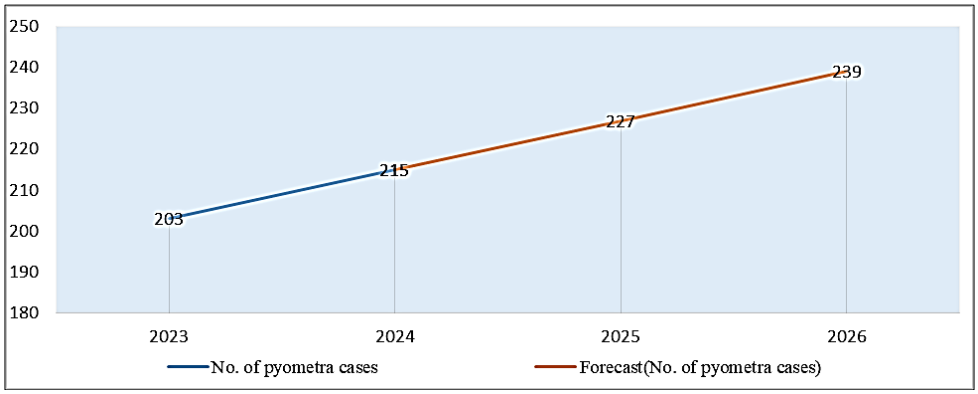

Fig 1: Trend-based forecast of pyometra incidence in bitches derived from retrospective OPD data (2023-2026)

Incidence of type of pyometra in bitches

Incidence of open and close pyometra with percentage of contribution are depicted in Table 2. Out of 418 pyometra cases, 380 cases (90.91%) were diagnosed as open-cervix pyometra, whereas 38 cases (9.09%) were diagnosed as closed-cervix pyometra similar to Pitroda *et al*., (2025) [11] and Devarajan *et al*., (2024) [3], who documented 89.0% open cases compared to 11.0% closed cases of pyometra and 71.0% open pyometra and 29.0% closed pyometra cases respectively. In 2023, among 203 pyometra cases, 184 (90.64%) were open and 19 (9.36%) were closed. Similarly, in 2024, out of 215 pyometra cases, 196 (91.16%) were open and 19 (8.84%) were closed.

Table 2: Type of pyometra in bitches

S. No.	Year	Open pyometra cases	Open pyometra (%)	Close pyometra cases	Close pyometra (%)
1	2023	184	90.64	19	9.36
2	2024	196	91.16	19	8.84
Total		380	90.91	38	9.09

Influence of age on occurrence of pyometra in bitches

The details of different age affected by pyometra are given in Table 3. The highest incidence was observed in the 6-8 years age group (23.68%) similarly to Martins *et al*., (2015) [10] and Antonov *et al*., (2015) [2], who reported peak incidence in bitches between 6 to 9 years of age with a mean age of around 8.5 years and 7.5 years respectively, followed closely by bitches aged above 10 years (21.29%) and those in the 8-10 years group (20.81%). Bitches between 4-6 years contributed 17.22%, while the 2-4 years age group had 12.68%. The lowest incidence was observed in bitches younger than 2 years with 4.31%.

Table 3: Influence of age on occurrence of pyometra in bitches

S. No.	Age	No. of pyometra cases	Percentage
1	<2 years	18	4.31
2	2-4 years	53	12.68
3	4-6 years	72	17.22
4	6-8 years	99	23.68
5	8-10 years	87	20.81
6	>10 years	89	21.29
Total		418	100.00

Influence of breed on occurrence of pyometra in bitches

The details with respect to different breeds affected with pyometra are shown in Table 4. The highest number of affected bitches belonged to the Labrador Retriever breed (20.57%) followed by Pugs (12.68%), Golden Retrievers (11.72%) and Pomeranians (9.33%). Other commonly affected breeds included Shih Tzus (8.85%), Non-Descript (ND) dogs (8.61%), Rottweilers (7.18%) followed by others (21.06%).

These findings are consistent with Singh *et al*., (2020) [13] and Devarajan *et al*., (2024) [3] both identified Labrador Retrievers as the most commonly affected breed with 28.89% and 19.52% of cases respectively. Similarly, Pitroda *et al*., (2025) [11] and Ahamed *et al*., (2015) [1] also highlighted Labradors as highly affected accounted for 18.5% and 35% of total cases.

Table 4: Influence of breed on occurrence of pyometra in bitches

S. No.	Breed	No. of pyometra cases	Percentage
1	Golden Retriever	49	11.72
2	Labrador	86	20.57
3	ND Dog	36	8.61
4	Pomeranian	39	9.33
5	Pug	53	12.68
6	Rottweiler	30	7.18
7	Shih Tzus	37	8.85
8	Others	88	21.06
Total		418	100.00

Influence of parity on occurrence of pyometra in bitches

The influence of parity on occurrence of pyometra is shown in Table 5. The highest incidence was recorded in nulliparous bitches (72.73%) followed by primiparous bitches (14.59%) and pluriparous bitches (12.68%). The findings indicate that nulliparous bitches were more commonly affected by pyometra compared to those that had whelped one or more litters.

These findings are in close agreement with Dow, (1958) [5] who reported that approximately 75% of pyometra cases occurred in nulliparous females. Dhaliwal *et al*., (1998) [4] and Hagman *et al*., (2011) [7] reported even higher figures with 94.11% and 86% of affected bitches being nulliparous respectively. Sethi *et al*., (2020) [12] and Verma *et al*., (2022) [15] also support this trend by reporting nulliparous prevalence rates of 81.82% and 78.69% respectively.

Table 5: Influence of parity on occurrence of pyometra in bitches

S. No.	Parity	No. of pyometra cases	Percentage
1	Nulliparous	304	72.73
2	Pluriparous	53	12.68
3	Primiparous	61	14.59
Total		418	100.00

Onset of pyometra in relation to estrus

The details of the previous estrus before being affected by pyometra is shown in Table 6. A total of 336 bitches were available and is presented. The highest occurrence was observed 16-30 days after estrus (37.80%). This was followed by cases reported >60 days post-estrus (24.70%) and those occurring 31-60 days post-estrus (23.51%). Additionally, 13.99% were recorded within 15 days of estrus.

This pattern aligns closely with the observations of Sethi *et al*., (2020) [12], who found that 74.63% of cases occurred between 15 to 60 days post-estrus and Liao *et al*., (2020) [9], where 87% of affected bitches had a history of estrus within the previous 90 days.

Table 6: Onsets of pyometra in relation to estrus

S. No.	Onset of Pyometra Related to Estrus	No. of pyometra cases	Percentage
1	< 15 days	47	13.99
2	16-30 days	127	37.80
3	31-60 days	79	23.51
4	> 60 days	83	24.70
Total		336	100.00

Occurrence of pyometra in relation to season

Influence of different seasons on occurrence of pyometra is described in Table 7. A total of 418 pyometra cases, the highest occurrence was observed during the monsoon season with 107 cases (25.60%), followed by winter with 93 cases (22.25%) and summer with 82 cases (19.62%). Autumn accounted for 76 cases (18.18%), whereas the lowest number of cases was recorded during the spring season with 60 cases (14.35%).

Table 7: Occurrence of pyometra in relation to season

S. No.	Season	No. of pyometra cases	Percentage
1	Autumn	76	18.18
2	Monsoon	107	25.60
3	Spring	60	14.35
4	Summer	82	19.62
5	Winter	93	22.25
Total		418	100.00

Management of pyometra in bitches

Management of pyometra details are given in the Table 8. Ovarian hysterectomy (OHE) was the most common management method for pyometra, performed in 72.73% of cases, indicating it as the preferred treatment. Among medical approaches, mifepristone + misoprostol + antibiotics were used in 13.15% of cases followed by antibiotics alone (6.22%), misoprostol + antibiotics (5.74%) and mifepristone + antibiotics (0.96%). In 1.20% of cases treatment was denied by owners.

Table 8: Management of pyometra in bitches

S. No.	Treatment	No. of pyometra cases	Percentage
1	Antibiotic only	26	6.22
2	Mifepristone + Antibiotic	4	0.96
3	Mifepristone + Misoprostol + Antibiotic	55	13.15
4	Misoprostol + Antibiotic	24	5.74
5	OHE (Ovariohysterectomy)	304	72.73
6	Owner refused treatment	5	1.20
Total		418	100.00

Conclusion

The present study was carried out to obtain the information of incidence and probability of development of pyometra based on age, breed, parity, estrus period, season and open and close cervix pyometra.

- The overall incidence of pyometra was 10.58% (N=3952) with overall 90.91% of open pyometra and 9.09% of closed pyometra.
- The highest age wise incidence was observed in the 6-8 years age group (23.68%) and Labrador Retriever and Pugs were most affected breeds 20.57% and 12.68% respectively.
- Parity wise incidence was highest in nulliparous bitches (72.73%) and occurrence of pyometra was observed 16-30 days post estrus (37.80%) followed by greater than 60 days post-estrus (24.70%).
- The highest occurrence was observed during the monsoon season with 25.60% followed by winter with 22.25% and in the management of pyometra ovarian hysterectomy (OHE) was performed in 72.73% of cases, indicating it as the preferred treatment.

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