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Original article

# Risk factors for pyometra in cats in several clinics in Kediri, East Java, Indonesia

**Pegy Rosyta[1], Rimayanti Rimayanti[2*], Budi Utomo[2], Jola Rahmahani[3], Yulianna Puspitasari[3], Wiwik Misaco Yuniarti[4]**

[1] Internship Veterinarian at Kaki Empat Pet Care, Kediri, Indonesia
[2] Division of Veterinary Reproduction, [3] Division of Veterinary Microbiology,
[4] Division of Veterinary Clinic, Faculty of Veterinary Medicine,
Universitas Airlangga, Surabaya, Indonesia

[*] Corresponding author, e-mail: rimayanti@fkh.unair.ac.id
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## ABSTRACT

Pyometra is a reproductive disease that most often affects cats which is caused by bacterial infection of the uterus. This study aims to determine the risk factors that could influence the occurrence of pyometra in cats. The study was conducted at the Four Leg Pet Care, Asa Animal Clinic, and K-5 Animal Care in Kediri regency in December 2021 to February 2022. This retrospective cohort study took secondary data for the period 2020 to 2021 as research material and found 35 cats diagnosed with pyometra. The odds ratio was calculated to analyze the associations to some factors including age, body weight, use of hormonal contraception, frequency of administration of hormonal contraception, hormonal contraceptive drugs used, dose of hormonal contraception given. Analysis of the relationship between risk factors for pyometra showed that the factors age, use of hormonal contraception, and frequency of giving hormonal contraceptives each have p values of 2.17, 2.13, and 2.13, respectively. It could be concluded that age, use of hormonal contraception, and frequency of administration of hormonal contraception influenced or had an association with the risk of pyometra in cats.

**Keywords**: age, contraception, progesterone, queen, uterine discharge

## INTRODUCTION

Pyometra is an acute or chronic infection of the uterus and is characterized by an accumulation of discharge in the uterus. There are two types of pyometra, namely open pyometra and closed pyometra. In open pyometra, there is discharge in the vagina, while in closed pyometra, there is no discharge in the vagina. Treatment must be carried out immediately in cats with closed pyometra because there was an accumulation of discharge in the uterus that could not come out, which could cause sepsis and even death (Hagman, 2022). On pyometra examination, the bacteria commonly found were normally found in the uterus of healthy queens (Xavier *et al*, 2023).

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Pyometra was often found in queens aged 10 months to 13 years with an incidence rate of around 2.2%, and in bitches aged 10 months to 18 years with an incidence rate of around 25%. If not treated properly, pyometra had the potential to be fatal with a possible death rate of 3-4% (Patrick, 2016). The incidence of pyometra in queen was rare because progesterone dominance was less common due to dependence on season and induction of ovulation. In queen, 2.2% of pyometra were diagnosed before the age of 13 years with an incidence rate of 17/10,000 at-risk cats annually (Hagman *et al*., 2014).

The use of hormonal contraception in queens was still often done because it was considered an alternative to prevent pregnancy. One of the hormones used for contraception in queens was progesterone (Romagnoli, 2015). The use of exogenous progesterone in queens for contraceptive purposes could also cause pyometra, especially in young queens (Hollinshead and Krekeler, 2016).

Many cat owners do not know about the dangers of contraception in the form of pills and injections for cats, but many also believed that giving pills and injections was cheaper than sterilization. In addition, they thought that sterilization would be detrimental to their cats. Cats do not menstruate like humans, so giving contraceptives, whether in the form of pills or injections, could cause tumors or pyometra (Vasetska and Mass, 2017). Therefore, this study aims to determine the risk factors for pyometra in cats based on age, hormonal contraceptive use and its frequency at the Four Leg Pet Care, Asa Animal Clinic, and K-5 Animal Care in Kediri city in the 2020 to 2021 period.

## MATERIALS AND METHODS

This study used a retrospective cohort design by collecting secondary data from cat medical records at the Four Leg Pet Care, Asa Animal Clinic, and K-5 Animal Care, Kediri city, East Java. Medical record data of all queens with pyometra at these 3 clinics during 2020 to 2021 was used. Out of 7193 queens, 35 queens were diagnosed with pyometra and their data were collected including age, body weight, anamnesis, clinical examination, final diagnosis, history of hormonal contraception use, hormonal contraception drug used, dose of hormonal contraception given, treatment given, and ovariohysterectomy procedure.

Data were analyzed using the odds ratio formula. The odds ratio is a measure of how strongly an event was associated with exposure. The odds ratio is a ratio of two sets of odds: the odds of an event occurring in the exposed group versus the odds of the event occurring in the unexposed group. Odds ratios are commonly used to report case-control studies. Odds ratio helped identify how likely an exposure is to lead to a particular event. The greater the odds ratio, the higher the chance of the event occurring with exposure. An odds ratio of less than one implied the event had a fewer chance of occurring with exposure. If the data was arranged in a 2 x 2 table, then the odds ratio was (a/b) / (c/d) = ad/bc (Tenny and Hoffman, 2023). In this study, the data were formatted in a 2 x 2 table consisting of pyometra or no pyometra versus the risk factors of age (< 1.5 or > 1.5 years), and use of hormonal contraception (yes or no). The odds ratio was calculated using the following formula: (a x d)/(b x c) (Table 1).

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**Table 1** Two-by-two risk factor classification table

| | | pyometra | |
|---|---|---|---|
| | | yes | no |
| Risk factor | yes | a | b |
| | no | c | d |

## RESULTS

The number of queens from the three clinics during 2020 and 2021 was 7193, of which 0.72% (52/7193) were suspected of having pyometra based on clinical symptoms. Clinical, ultrasound and hematological examination confirmed that 0.49% (35/7193) of queens had a final diagnosis of pyometra. The distribution of pyometra cases in queen at three veterinary clinics in 2020 and 2021 is presented in Table 2.

### Age

Among the cats with pyometra, 14 cats were less than 1.5 years old and 21 cats were more than 1.5 years old. The odds ratio for age risk factor of 2.17 (greater than 1), meant that the age factor had an influence or was a risk factor for pyometra in queens (Table 3).

### Use of hormonal contraception

Pyometra cases in terms of hormonal contraceptive use were classified into 2 groups, queens with and without a history of hormonal contraceptive use. Among cats with pyometra, 11 had a history of hormonal contraceptive use and 24 had no history of hormonal contraceptive use. The odds ratio value of 2.13 (greater than 1) indicated that the use of hormonal contraception had an influence or was a risk factor for pyometra in queens (Table 4).

**Table 2** Distribution of pyometra cases in queens in 2020 to 2021 in Kediri, East Java, Indonesia

| | Four Legs | ASA | K-5 | total |
|---|---|---|---|---|
| 2020 | | | | |
| cases | 8 | | 6 | 14 |
| recovered | 8 | | 6 | 14 |
| recurring | - | - | - | - |
| 2021 | | | | |
| cases | 8 | 6 | 7 | 21 |
| recovered | 6 | 5 | 7 | 18 |
| recurring | 2 | 1 | - | 3 |
| total | | | | |
| cases | 16 | 6 | 13 | 35 |
| recovered | 14 | 5 | 13 | 32 |
| recurring | 2 | 1 | - | 3 |

**Table 3** Distribution of pyometra cases in cats based on age

| age (years) | pyometra (%) | no pyometra (%) | total |
|---|---|---|---|
| < 1,5 | 14/52 (26.92) | 4/52 (7.69) | 18/52 (34.62) |
| > 1,5 | 21/52 (40.38) | 13/52 (25.00) | 34/52 (65.38) |
| total | 35/52 (67.31) | 17/52 (32.69) | |

Odds ratio >1 (age influenced or was a risk factor) for the occurrence of pyometra in queens ($p<0.05$).

**Table 4** Distribution of pyometra cases in cats based on hormonal contraceptive use

| hormonal contraception | pyometra (%) | no pyometra (%) | total |
|---|---|---|---|
| contraception | 11/52 (21.15) | 3/52 (5.77) | 14/52 (26.92) |
| without contraception | 24/52 (46.15) | 14/52 (26.92) | 38/52 (73.08) |
| total | 35/52 (67.31) | 17/52 (32.69) | |

Odds ratio >1 (the use of hormonal contraceptives influences or is a risk factor) for the occurrence of pyometra in queen ($p <0.05$).

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## DISCUSSION

### Age factor

In this study, pyometra most often occurred in queens older than 1.5 years. This was in accordance with reports that most queens experienced uterine lesions at the age of 5-7 years or an average of 7.6 years (Hollinshead and Krekeler, 2016). Hagman (2022) reported that pyometra in queens was diagnosed at an average age of 4 years and that pyometra was diagnosed more frequently with age, with a marked increase in queens over 7 years of age.

Middle-aged to old queens were susceptible to pyometra because they had experienced estrus and mated repeatedly. In the estrus phase, the queen's cervix would open and allow bacteria to enter the uterus, and if accompanied by a hormonal imbalance it could cause infection (endometritis). This condition could develop and result in an accumulation of discharge in the queen's uterus. Apart from that, a decrease in the queen's immune system could also be one of the factors causing the queen to be more susceptible to pyometra (Hollinshead and Krekeler, 2016).

A queen's immune system decreased with age, one of which could also influence the dominance of the hormone progesterone. This was confirmed by Hagman's statement (2022), that the increase in pyometra in middle-aged to old queens was related to degenerative changes in the uterus or other conditions such as the presence of ovarian pathology or uterine neoplasia which more often affected older animals and can predispose to the development of pyometra. The average death rate in all cats was 5.7%, which is slightly higher than the 3% to 4% reported on dogs in Sweden (Hagman *et al*., 2014).

Older queen had less/decreased estrogen stimulation and this was followed by progesterone intervals that increasingly dominate (Satilmis, 2023). Progesterone dominance would cause increased endometrial proliferation, increase uterine mucus secretion, and decrease myometrial contractions. Increased mucus secretion and decreased myometrial contractions caused the uterus to have difficulty expelling mucus. Furthermore, this condition caused bacteria in the vagina to easily enter the uterus and be difficult to expel (Hollinshead and Krekeler, 2016).

### Factors in the use of hormonal contraceptives

Cases of pyometra in queen were reviewed from the history of using hormonal contraceptives indicating that there was an influence of the hormonal contraceptive use on the risk of pyometra in queen. A queen with a history of using steroid hormone contraceptives, such as progesterone, could increase the uterine response to these hormones and caused changes in the condition of the queen's uterus (Hollinshead and Krekeler, 2016). The increase in progesterone concentration could stimulate endometrial growth and proliferation, increase uterine mucus secretion, and cervical closure, suppress myometrial contractions, decrease local leukocyte response and uterine resistance to pathogenic bacterial infections which led to the development of reproductive disorders, such as pyometra (Esen *et al*., 2020; Hasan *et al*., 2021). This was confirmed by the statement by Vasetska and Mass (2017), that the use of oral hormonal contraceptives with the active ingredient megestrol acetate in queen caused an increase in the occurrence of pathologies in the reproductive system of queen such as endometrial hyperplasia, endometritis, metritis, pyometra, hydrometra, polycystic ovaries, and mixed pathology (polycystic ovaries and pyometra). The increasing dominance of progesterone caused changes in the uterine environment that support the bacterial growth process (Hollinshead and Krekeler, 2016).

## CONCLUSION

Age factors and the use of hormonal contraceptives, had an influence on the occurrence of pyometra in queens. Pyometra treatment with drug therapy or non-surgical therapy could be given and is aimed at reducing the clinical symptoms that appear. The ovariohysterectomy technique was the safest and most effective procedure for open and

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closed pyometra because it prevented recurrent pyometra.

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**AUTHOR'S CONTRIBUTIONS**

Pegy Rosyta (PR), Rimayanti Rimayanti (RR), Jola Rahmahani (JR), Wiwik Misaco Yuniarti (WMY), Budi Utomo (BU), Yulianna Puspitasari (YP)

PR, RR, JR: conceived the idea, and designed the mainframe of this manuscript, PR: acquisition, analysis, and interpretation of data, WMY, BU, YP: critically read and revised the manuscript for intellectual content. All authors read and approved the final manuscript.

**CONFLICTS OF INTEREST**

The authors declare that they have no competing interests.

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