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Hemato-biochemical evaluation of medically managed bitches affected with pyometra

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Abstract

The present study was undertaken to evaluate the hemato-biochemical changes associated with medical management in bitches affected with pyometra. Twelve bitches diagnosed with pyometra based on clinical signs, hemato-biochemical findings and ultrasonographic examination were included in this study. The affected bitches under different medical protocols exhibited decreased hemoglobin concentration, reduced total erythrocyte count, lowered packed cell volume, leucocytosis, neutrophilia, lymphocytopenia, hypoalbuminemia and hyperglobulinemia on the day of presentation. Progressive improvement in the altered hemato-biochemical parameters was observed following medical management in both treatment groups. The findings of the study suggested that periodic hemato-biochemical evaluation could serve as a reliable indicator for assessing therapeutic response and clinical recovery in pyometra affected bitches.

Keywords: Pyometra, bitch, hemato-biochemical alterations, leucocytosis, neutrophilia

Introduction

Pyometra is a life-threatening uterine disorder in intact female dogs that commonly affects older nulliparous bitches during the luteal phase of the estrous cycle, when circulating progesterone levels are elevated (Pretzer 2008^[20] and Santana *et al.*, 2021^[23]). The disease is characterised by bacterial infection and inflammation of the uterus, resulting in the accumulation of purulent exudate within the uterine lumen along with systemic illness (Fransson 2003^[5] and Hagman 2012^[9]). In pyometra affected bitches, bacteremia, endotoxemia and systemic inflammatory responses may lead to dysfunction of vital organs such as the heart, liver, kidneys and bone marrow, thereby increasing the risk of severe systemic complications and sudden death (Chitra, 2025)^[2]. Although ovariohysterectomy remains the treatment of choice, medical management is considered an alternative approach in breeding bitches where preservation of fertility is desired (Hagman, 2018)^[11]. Evaluation of hemato-biochemical parameters during medical management plays an important role in assessing disease severity, extent of systemic involvement and therapeutic response in affected bitches. Therefore, the present study was undertaken to evaluate the hemato-biochemical changes associated with medical management of pyometra in bitches.

Materials and Methods

The bitches presented with a history of loss of appetite, polyuria, polydipsia, vomiting, abdominal enlargement and vaginal discharge were subjected to detailed hemato-biochemical and ultrasonographic examinations for confirmation of pyometra. The selected animals were randomly assigned into two treatment groups (I and II) comprising six bitches each. Animals in Group I were treated with aglepristone @ 10 mg/kg body weight SC on days 1, 2 and 8. Animals in Group II were treated with mifepristone @ 2.5 mg/kg body weight PO for up to 5 days along with misoprostol @ 5 mcg/kg body weight PO. Depending on the clinical condition of each case, supportive therapy consisting of intravenous fluids and antibiotics was provided. The progress of treatment was evaluated through periodic clinical examination along with

hematological, biochemical and ultrasonographic assessments on days 1, 5 and 8.

Hematological parameters such as hemoglobin (g/dl), total erythrocyte count ($\times 10^6/\mu\text{L}$), total leucocyte count ($\times 10^3/\mu\text{L}$), packed cell volume (%), differential leucocyte count were estimated. Biochemical analysis included estimation of total protein (g/dl), albumin (g/dl), globulin (g/dl), alanine aminotransferase (IU/L), aspartate aminotransferase (IU/L), alkaline phosphatase (IU/L), blood urea nitrogen (mg/dl) and creatinine (mg/dl). The data obtained was statistically analyzed according to Snedecor and Cochran (1994)^[26] using repeated measures ANOVA in SPSS version 23.

Results and Discussion

Hematological and biochemical parameters were evaluated on the day of presentation (Day 1), and on Day 5 and 8 of treatment (Table 1 and 2). The mean Hb concentration (g/dl) remained below the normal range throughout the observation period, while PCV (%) and TEC ($\times 10^6/\mu\text{L}$) values were reduced on the day of presentation in both treatment groups (Table 1). Similar findings in pyometra-affected bitches were reported by Unnikrishnan *et al.* (2020)^[28], Demeli *et al.* (2023)^[3], Paudel *et al.* (2023)^[17] and Chitra (2025)^[2]. The reduced Hb, PCV and TEC values observed in the present study might be attributed to chronic inflammatory anemia, toxic suppression of bone marrow activity, decreased erythropoiesis, shortened erythrocyte lifespan, inflammatory sequestration of iron within bone marrow myeloid cells and loss of erythrocytes into the uterine lumen, leading to impaired hemoglobin synthesis in pyometra-affected bitches

(Hagman *et al.* (2014)^[10]; Samantha *et al.*, 2018^[22]; Grimes and Fry, 2014^[7]; Unnikrishnan *et al.*, 2020^[28] and Chitra, 2025^[2]).

The mean TLC ($\times 10^3/\mu\text{L}$) was elevated on the day of presentation in both treatment groups, indicating leucocytosis (Table 1). Similar findings in pyometra-affected bitches were reported by Demeli *et al.* (2023)^[3], Chitra (2025)^[2], Pitroda *et al.* (2025)^[18] and Suresh *et al.* (2025)^[27]. The leucocytosis observed in the present study might be attributed to inflammatory leukogram changes associated with intensified bone marrow response, immunological stress, and diffuse suppurative uterine inflammation in response to infection (Sevelius *et al.*, 1990^[24]; Kustritz, 2005^[15]; Verstegen *et al.*, 2008^[29]; Unnikrishnan *et al.*, 2020^[28] and Chitra, 2025^[2]).

The mean neutrophil count was elevated, while lymphocyte count was reduced on the day of presentation in both treatment groups (Table 1). Similar findings in pyometra-affected bitches were reported by Anusha *et al.* (2023)^[1], Chitra (2025)^[2], Pitroda *et al.* (2025)^[18], and Suresh *et al.* (2025)^[27]. The neutrophilia observed might be attributed to increased granulopoiesis stimulated by the chemotactic effect of purulent uterine exudates, whereas lymphocytopenia could be associated with endotoxemia-induced immunosuppression and disease severity (Singh *et al.*, 2006^[25]; Prasad *et al.*, 2017^[19] and Unnikrishnan *et al.*, 2020^[28]). The mean monocyte values remained within the normal physiological range throughout the study period, which was in accordance with the findings of Unnikrishnan *et al.* (2020)^[28] and Konjeti (2021)^[13].

Table 1: Hematological parameters (Mean $\pm$ SE) on different days of observation in bitches affected with pyometra (n=6)

Parameter	Group	Day 1	Day 5	Day 8
Hb*	Group I	7.69 $\pm$ 1.21 ^{Bb}	8.42 $\pm$ 0.43 ^{Ba}	9.37 $\pm$ 0.67 ^{Ba}
	Group II	9.94 $\pm$ 1.43 ^{Ab}	10.67 $\pm$ 1.18 ^{Aa}	10.67 $\pm$ 1.05 ^{Aa}
PCV**	Group I	23.04 $\pm$ 3.53 ^B	25.29 $\pm$ 1.32 ^B	27.33 $\pm$ 2.30 ^B
	Group II	31.16 $\pm$ 3.29 ^A	33.41 $\pm$ 2.99 ^A	35.45 $\pm$ 3.14 ^A
TEC*	Group I	3.55 $\pm$ 0.64 ^b	3.89 $\pm$ 0.17 ^b	4.37 $\pm$ 0.29 ^a
	Group II	3.93 $\pm$ 0.67 ^b	4.27 $\pm$ 0.62 ^b	4.75 $\pm$ 0.48 ^a
TLC**	Group I	46.02 $\pm$ 8.11 ^a	29.34 $\pm$ 8.22 ^b	21.62 $\pm$ 4.34 ^b
	Group II	39.74 $\pm$ 8.09 ^a	23.06 $\pm$ 3.95 ^b	15.34 $\pm$ 2.32 ^b
Neutrophils**	Group I	89.75 $\pm$ 1.50 ^a	87.5 $\pm$ 1.36 ^b	81.25 $\pm$ 0.99 ^c
	Group II	87.92 $\pm$ 0.60 ^a	85.67 $\pm$ 0.49 ^b	79.42 $\pm$ 0.60 ^c
Lymphocytes**	Group I	9.44 $\pm$ 1.50 ^b	11.28 $\pm$ 1.13 ^b	16.11 $\pm$ 0.84 ^a
	Group II	10.39 $\pm$ 0.47 ^b	12.22 $\pm$ 0.66 ^b	17.06 $\pm$ 0.67 ^a
Monocytes	Group I	0.94 $\pm$ 0.25	0.86 $\pm$ 0.25	1.53 $\pm$ 0.21
	Group II	1.22 $\pm$ 0.40	1.14 $\pm$ 0.36	1.81 $\pm$ 0.36

Values with different lowercase superscripts (a,b) within rows denote significant differences across the days.

Values with different uppercase superscripts (A,B) within columns denote significant differences between the groups.

Significant association (* p <0.05; ** p <0.01)

The total protein values (g/dl) remained within the normal physiological range throughout the study period (Table 2), which was in accordance with the findings of Nayana *et al.* (2021)^[16], Janković *et al.* (2022)^[12] and Kumar, (2023)^[14]. The mean albumin concentration (g/dl) gradually increased during the treatment period, whereas globulin concentration was elevated on the day of presentation. Similar findings in pyometra-affected bitches were reported by Renukaradhya 2011^[21], Demeli *et al.*, 2023^[3], Kumar 2023^[14] and Paudel *et al.*, 2023^[17]. Hypoalbuminemia in pyometra affected bitches might be attributed to loss of albumin through damaged kidneys while hyperglobulinemia could be associated with

acute phase inflammatory response and enhanced antibody production as a defensive response against infection, as opined by Hagman (2014)^[10] and Kumar (2023)^[14].

The ALT, AST and ALP values (IU/L) recorded during the study period remained within the normal physiological range. Similar findings in pyometra-affected bitches were reported by dos Anjos *et al.* (2021)^[4], Renukaradhya (2011)^[21], Kumar (2023)^[14] and Gangavati (2023)^[6]. The mean BUN (mg/dl) and creatinine concentrations (mg/dl) remained within the normal physiological range throughout the study period. Similar findings in pyometra-affected bitches were reported by Hagman *et al.* (2009)^[8], Nayana *et al.* (2021)^[16], and Kumar (2023)^[14]. Verstegen *et al.* (2008)^[29] opined that BUN levels are usually not elevated unless pre-renal azotemia develops secondary to dehydration, while normal creatinine values indicate preserved renal function in affected bitches.

Table 2: Biochemical parameters (Mean±SE) on different days of observation in bitches affected with pyometra (n=6)

Parameter	Group	Day 1	Day 5	Day 8
Total protein	Group I	6.45±0.34	6.24±0.22	6.40±0.20
	Group II	6.58±0.13	6.38±0.12	6.54±0.06
Albumin	Group I	2.07±0.24	2.30±0.27	2.48±0.25
	Group II	2.12±0.31	2.35±0.19	2.53±0.16
Globulin*	Group I	4.38±0.35 ^a	3.94±0.26 ^b	3.92±0.18 ^b
	Group II	4.46±0.29 ^a	4.02±0.15 ^b	4.01±0.18 ^b
ALT	Group I	32.05±5.48	31.73±6.64	35.48±11.65
	Group II	27.93±6.26	27.61±2.74	31.36±2.70
AST	Group I	41.41±5.41	40.17±3.51	40.09±5.81
	Group II	39.41±6.80	38.16±4.02	38.08±4.47
ALP	Group I	92.88±8.15	106.02±7.26	97.10±5.64
	Group II	89.01±11.25	102.15±34.47	93.23±24.06
BUN*	Group I	9.74±0.95 ^B	9.39±0.49 ^B	10.57±0.52 ^B
	Group II	15.83±3.71 ^A	15.49±4.78 ^A	16.66±6.76 ^A
Creatinine*	Group I	1.03±0.14 ^B	0.83±0.08 ^B	0.88±0.08 ^B
	Group II	1.46±0.27 ^A	1.25±0.36 ^A	1.31±0.43 ^A

Values with different lowercase superscripts (a,b) within rows denote significant differences across the days.

Values with different uppercase superscripts (A,B) within columns denote significant differences between the groups.

Significant association (* $p < 0.05$; ** $p < 0.01$)

Conclusion

The present study demonstrated that pyometra in bitches was associated with significant hematological and biochemical alterations indicative of systemic inflammation and infection. Medical management resulted in progressive improvement in hematological parameters, evidenced by increased hemoglobin, total erythrocyte count, packed cell volume, and lymphocyte count, along with decreased total leukocyte count and neutrophil percentage during the treatment period. Biochemical alterations such as hypoalbuminemia and hyperglobulinemia also showed gradual improvement following therapy, whereas liver and renal function parameters remained within normal physiological limits throughout the study period. The findings suggest that periodic hematobiochemical evaluation is a valuable tool for assessing disease severity, systemic involvement, and therapeutic response in pyometra-affected bitches undergoing medical management.

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Conflict of Interest

Not available

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