International Journal of Veterinary Sciences and Animal Husbandry 2025; 10(10): 231-238

ISSN: 2456-2912
NAAS Rating (2025): 4.61
VET 2025; 10(10): 231-238

www.veterinarypaper.com
Received: 02-06-2025
Accepted: 04-07-2025

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Comparative efficacy of veterinary Ayurveda over conventional allopathic practices on various physiological & hematological parameters in relation to IBD as complex digestive disorder in canine pets of India

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DOI: https://www.doi.org/10.22271/veterinary.2025.v10.i10d.2634

Abstract
In recent years, pet dogs in India have become integral family members, with increased attention to canine health issues, particularly digestive disorders such as Inflammatory Bowel Disease (IBD). IBD in dogs is characterized by chronic intestinal inflammation, manifesting as vomiting, diarrhoea, abdominal discomfort, and nutrient mal-absorption, with similarities to human IBD and IBS. This study aimed to assess the prevalence, clinical patterns, and therapeutic effects of conventional and Ayurveda treatments on IBD in pet dogs. Conducted over three years (June 2021-May 2024) at the Veterinary Clinical Complex, Kolkata, and selected private clinics in West Bengal, the study included 24 Labrador Retrievers aged 6-12 years. Dogs were assigned to healthy control (Group I), conventional veterinary practice (CVP, Group II), Ayurveda drug-minimum dose (ADMD, Group III), and Ayurveda drug-standard dose (ADSD, Group IV). Physiological parameters (temperature, pulse, respiration), haematological indices (Hb, RBC, WBC, PCV, MCV, platelets, ESR), and faecal and biochemical analyses were monitored. Results showed significant improvement in physiological and haematological parameters in CVP and ADSD groups by day 28, approaching levels of healthy controls. ADMD group exhibited slower recovery. Both allopathic and Ayurveda interventions effectively reduced inflammation, modulated immune responses, and stabilized physiological functions, with herbal therapy showing potential as an adjunct or alternative treatment. This study highlights the clinical relevance of veterinary Ayurveda in managing canine IBD, supporting improved gastrointestinal health, haematological recovery, and overall well-being, and provides evidence for integrating traditional and conventional therapies in veterinary practice.

Keywords: Ayurveda, Allopathic, practices, Physiological, hematological, parameters Comparative, Conventional, efficacy, IBD digestive, disorder, Canine pet etc.

Introduction
In India, dogs have evolved from traditional working animals to beloved family companions, reflecting the growing human-dog bond across all sections of society. With this shift, attention to canine health and well-being has increased, especially concerning digestive disorders such as Inflammatory Bowel Disease (IBD), a chronic and complex condition characterized by intestinal inflammation, altered gut micro biota, and impaired digestion. Conventional allopathic treatments for IBD often provide symptomatic relief but may be associated with side effects or incomplete recovery. In contrast, Ayurveda veterinary practices emphasize holistic healing through natural formulations that aim to restore physiological balance and immune stability. The present study, conducted on canine patients at the Veterinary Clinical Complex, Belgachia, Kolkata, focuses on comparing the efficacy of veterinary Ayurveda therapy with conventional allopathic treatments by evaluating various physiological and haematological parameters, thereby exploring integrative approaches for managing IBD and improving canine health outcomes in the Indian context.

Materials and Methods

The study was conducted over three years (June 2021-May 2024) at the Veterinary Clinical Complex (VCC), Departments of Veterinary Medicine, Surgery and Radiology, and Biochemistry, Faculty of Veterinary Science, WBUAFS, Kolkata, and selected private clinics. A total of 24 Labrador Retrievers aged 6-12 years were categorized into four groups: Group I (Healthy Control), Group II (Conventional Veterinary Practice), Group III (Ayurvedic Drug-Minimum Dose), and Group IV (Ayurvedic Drug-Standard Dose). Clinical, physiological (rectal temperature, pulse, respiration), and haematological parameters (Hb, PCV, MCV, RBC, WBC, neutrophil, lymphocyte, eosinophil, monocyte, platelet, ESR) were recorded using standard methods *(Jain, 1986).* Blood samples were collected aseptically via vein puncture and analysed with an automatic cell counter. Dogs were handled gently to minimize stress-induced variations. Statistical analysis was performed using IBM SPSS® version 20, applying ANOVA and Turkey's HSD tests with significance levels set at $p<0.05$ and $p<0.01$.

Results and Discussion

Physiological parameters-Temperature

On day 0, the values of temperature of CVP group (104.73±.90 ºF), ADMD group (104.37±.98 º F) and ADSD group (104.38±.63 º F) were observed to be significantly ($p<0.01$) higher than healthy Control group value (100.68±.98 ºF). In the control group, no significant variation was observed in the rectal temperature on the days 0, 14 and 28. Values of CVP group (day 0: 104.73±.90 ºF, day 14:103.38±.82 ºF, day 28:101.85±.83 ºF) and ADSD group (day 0:104.38±.63 ºF, day 14: 102.47±.39 ºF, day 28: 100.82±.69 ºF) showed a trend of decrease significantly at ($p<0.01$) from day 0 today14 and from day14 today 28 which was not evidenced from the values of ADMD group (day 0: 104.37±.98 ºF, day 14: 104.00±.86 ºF, day 28: 103.32±1.29 ºF). On day 28, values of ADSD group (100.82±.69 ºF) and CVP group (101.85±.83 ºF) were in the same range of the healthy Control group (100.83±.68 ºF). Treatment with the allopathic medications usually helps maintain a stable range and continuous monitoring of body temperature is recommended to assess the treatment's effectiveness and detect any adverse reactions as reported by *Sullivan, et al. (2018)* [40], *Holt, et al. (2019)* [18] *and Cohen, et al. (2020)* [11]. These botanicals collectively show promising potential in controlling inflammation, oxidative stress, and temperature regulation during IBD episodes in dogs as reported by Bhatia, *(2016)* [7], *Ranjan, et al. (2020)* [33], *Shukla, et al. (2020*) [37].

Table 1: Effect of the different treatments on Range of Temperature (oF) (Mean ± SD) of different four groups of experimental dog

Range of Temperature			
Treatment	**0 days**	**14 days**	**28 days**
Control	100.68±.98^{b}	100.50±.73^{c}	100.83±.68^{b}
CVP	104.73±.90^{a}	103.38±.82^{ab}	101.85±.83^{ab}
ADMD	104.37±.98^{a}	104.00±.86^{a}	103.32±1.29^{a}
ADSD	104.38±.63^{a}	102.47±.39^{b}	100.82±.69^{b}
P-Value	< 0.001**	< 0.001**	< 0.001**

**Significant at 1% ($p<0.01$) level; N.B: Different superscripts (column wise) differ significantly according to Turkey's HSD test for multiple comparisons.

Physiological parameters-Pulse Rate

The mean ± SD values of pulse rate of dogs in the healthy Control group and the three treatment groups are presented here. In the healthy Control group, no significant variation was observed in the pulse rate on the days 0, 14 and 28 (day 0: 80.50±4.50 Pulse rate/min, day 14:81.00±3.94 pulse rate/min, day 28:80.16±3.71 pulse rate/min).On day 0,values of CVP group (105.83±5.11pulserate/min), ADMD group (101.67±6.19 pulse rate /min) and ADSD group (101.00±7.24 pulse rate/min) were seem to be significantly ($p<0.01$) higher than that of the healthy Control group (80.50±4.5 pulse rate/min). In treatment group CVP (day 0:105.83±5.11 pulse rate/min, day 14:93.3333±3.83 pulse rate/min, day 28:84.50±2.42 pulse rate/min), ADMD group (day 0:101.67±6.19 pulse rate/min, day14:97.83±8.18pulse rate/min, day 28: 96.83±5.60 pulse rate/min) and ADSD group (day 0:101.00±7.24 pulse rate/min, day 14:88.50±5.72 pulse rate/min, day 28:80.50±3.45 pulse rate/min), the pulse rate was seen to significantly ($p<0.01$) decrease from day 0 to day 14 and day 14 to day 28 and also the values of CVP group and ADSD group remained within the normal range of pulse rate. On day 28, the values of CVP group (84.50±2.42 pulse rate/min) and ADSD group (80.50±3.45 pulse rate/min) remained in the same range to that of the healthy Control group (80.16±3.7 pulse rate/min). Monitoring pulse rate during treatment with allopathic medications is essential as reported by *Holt, et al., (2019)* [18], *Cohen, et al., (2020)* [11]. *Similar studies were made by Holt, et al. (2019)* [18], *Cohen, et al. (2020)* [11], *Ranjan, et al. (2020)* [33], *Shukla, et al. (2020)* [37], *Suchodolski, et al. (2021*) [39] with the explanation that the use of herbal medications in managing IBD symptoms might indirectly influence pulse rate by improving overall gastrointestinal health and it is important to monitor these physiological parameters regularly to ensure optimal health outcome.

Table 2: Effect of the different treatments on Range of Pulse Rate (pulse rate/min), (Mean ± SD) of different four groups of experimental dog

Range of Pulse Rate			
Treatment	**0 days**	**14 days**	**28 days**
Control	80.50±4.50^{b}	81.00±3.94^{c}	80.16±3.71^{b}
CVP	105.83±5.11^{a}	93.33±3.83^{ab}	84.50±2.42^{b}
ADMD	101.67±6.19^{a}	97.83±8.18^{a}	96.83±5.60^{a}
ADSD	101.00±7.24^{a}	88.50±5.72^{bc}	80.50±3.45^{b}
P-Value	< 0.001**	< 0.001**	< 0.001**

**Significant at 1% ($p<0.01$) level; N.B: Different superscripts (column wise) differ significantly according to Tukey's HSD test for multiple comparisons.

Physiological parameters-Respiration

The respiration rate for healthy Control dogs as well as the dogs considered for the 3 treatment groups are presented here. On day 0, values of CVP group (26.33±1.96 respiration rate/min), ADMD group (27.17±2.31 respiration rate/min) and ADSD group (25.33±1.75 respiration rate/min) showed to be significantly (p<0.01) higher than that of healthy Control group (21.17±2.32 respiration rate/min). The respiration rate for the Control group did not vary from each other significantly on day 0 (21.17±2.32 respiration rate/min), day 14 (20.50±2.42 respiration rate/min) and day 28 (20.83±1.72 respiration rate/min). Treatment group CVP (day 0 26.33±1.96 respiration rate/min, day 14:21.50±1.87 and day 28: 18.00±1.41 respiration rate/min), ADMD group (day 0 27.17±2.31 respiration rate/min, day 14:24.33±2.58 and day 28: 24.17±1.41 respiration rate/min)and ADSD group (day 0 25.33±1.75 respiration rate/min, day 14:21.33±1.63 respiration rate/min and day 28: 19.00±1.09 respiration rate/min) showed a gradual decrease from day 0 to day14 (not significant), from day 14 to day28, significant at (p<0.01). In all the cases, the values remained within the normal range for respiration rate in dogs. On day 28, CVP group value (18.00±1.41respirationrate/min) and ADSD group value (19.00±1.09 respiration rate/min) showed significantly (p<.01) lower value than that of the healthy Control group (20.83±1.72 respiration rate/min) whereas on the same day, ADMD group value (24.17±1.47 respirationrate/min) showed significantly (p<.01) higher value from that of the healthy Control group. In the context of IBD, monitoring respiratory rate is crucial as metronidazole, tylosin, and prednisolone have various systemic effects, including potential impacts on respiratory function as reported by *Sullivan, et al. (2018)* [40], *Holt, et al. (2019)* [18], *Cohen, et al. (2020)* [11]. *Similar findings were made by Bhatia, et al. (2016)* [7], *Ranjan, et al. (2020)* [33] *and Shukla, et al. (2020)* [37] that the respiratory rate in dogs with IBD is positively influenced by the incorporation of these herbal remedies and each plant offers unique benefits that contributed to overall well-being and possibly stabilized physiological functions such as respiration.

Table 3: The effect of the different treatments on Range of Respiration rate/min), (Mean ± SD) of different four groups of experimental dog

Range of Respiration			
Treatment	**0 days**	**14 days**	**28 days**
Control	21.17±2.32^{b}	20.50±2.42^{b}	20.83±1.72^{b}
CVP	26.33±1.96^{a}	21.50±1.87^{ab}	18.00±1.41^{c}
ADMD	27.17±2.31^{a}	24.33±2.58^{a}	24.17±1.47^{a}
ADSD	25.33±1.75^{a}	21.33±1.63^{ab}	19.00±1.09^{bc}
P-Value	< 0.001**	0.032	< 0.001**

**Significant at 1% (p<0.01) level; N. B: Different superscripts (column wise) differ significantly according to Tukey's HSD test for multiple comparisons.

Haematological Parameters-Haemoglobin (HB)

The value of haemoglobin in the affected animals (CVP group: 9.93±0.87 g/dL, ADMD group: 9.47±0.67 g/dL, ADSD group: 10.10±1.30 g/dL) was found to be significantly (p<0.01) lower than that of the healthy Control group (13.58±1.15 g/dL) on day 0. After treatment it was observed that, the mean ±SD values of haemoglobin in CVP group increased signific antly (p<0.01) from day 0 onwards (day 0:9.93±0.87 g/dL, day14:11.48±0.75 g/dL, day 28:13.60±0.68 g/dL). Similar pattern of increase in the value of haemoglobin was seen in treatment group ADSD (day 0: 10.10±1.30 g/dL, day 14: 11.85±1.09 g/dL, day 28: 13.75±0.87 g/dL) and there is slight increase in the value of haemoglobin was seen in treatment group ADMD (day 0:9.47±0.67g/dL, day 14 :10.33±0.63 g/dL, day 28:10.82±0.55 g/dL).Onday14 of treatment, all 3 treatment groups (CVP group:11.48±0.75 g/dL, ADMD group: 10.33±0.63 g/dL, ADSD group: 11.85±1.09 g/dL) showed haemoglobin values to be lower than that of the healthy Control group (13.88±1.21 g/dL), significantly at (p<0.01). However, on day 28 of treatment, ADSD group (13.75±0.87 g/dL) and CVP group values (13.60±0.68 g/dL) were seen to be higher as that of the healthy Control group (13.58±1.15 g/dL) whereas on the day 28 of treatment, ADMD group values (10.82±0.55 g/dL) was seen to be lower than that of the respective Control group (13.58±1.15 g/dL). Effective management of IBD through these medications can help stabilize haemoglobin levels by addressing the underlying causes of anemia, such as chronic inflammation and malnutrition which is supported by the study findings of *Allenspach, et al. (2016)* [1], *McCarthy & Lascelles (2018)* [25] *and Craven, et al. (2019)* [12]. *The studies of Bhan & Singh, (2015)* [6], *Dey, et al. (2016)* [14], *Nambiar, et al. (2018)* [26] *and Raghavendra & Kumar (2021)* [32] suggested that the combination of these herbs may provide a supportive role in managing haemoglobin levels in dogs suffering from IBD by improving overall gut health and nutrient absorption.

Table 4: Effect of the different treatments on HB (g/dL), (Mean ± SD) of different four groups of dog

Haemoglobin			
Treatment	**0 days**	**14 days**	**28 days**
Control	13.61±1.41^{a}	13.88±1.21^{a}	13.58±1.15^{a}
CVP	9.93±.87^{b}	11.48±.75^{b}	13.60±.68^{a}
ADMD	9.47±.67^{b}	10.33±.63^{b}	10.82±.55^{b}
ADSD	10.10±1.30^{b}	11.85±1.09^{b}	13.75±.87^{a}
P-Value	< 0.001**	< 0.001**	< 0.001**

**Significant at 1% (p<0.01) level; N.B: Different superscripts (column wise) differ significantly according to Tukey's HSD test for multiple comparisons.

Hematological Parameters-Packed Cell Volume (PCV)

The effect of different treatments on PCV (%), (Mean ± SD). On day 0, CVP group (34.38±1.59%), ADMD group (34.68±1.57%) and ADSD group (34.09±1.01%) showed significantly lower values (p<0.01) compared to healthy Control group (41.00±5.14%). After treatment from day 0 to day 14, CVP Group (day 0: 34.38±1.59%, day 14:36.68±1.79%), ADMD group (day 0:34.68±1.57%, day 14:35.36±1.58%) and ADSD group (day 0: 34.09±1.01%, day 14: 35.78±.97%) showed significant (p<0.05) increase indicating improvement of condition upon therapy. After treatment from day0 to day 28, CVP group (day 0: 34.38±1.59%, day 28:38.46±1.26%), ADMD group (day 0:34.68±1.57%, day 28:35.80±1.51%) and ADSD group (day 0: 34.09±1.01%, day 28: 38.27±.98%) showed progression of PCV values of all three groups but the values of respective group is not significant in comparison to healthy Control group. A study by Allenspach *et al.* (2016) [1], McCarthy & Lascelles (2018) [25] and Craven *et al.* (2019) [12] noted improvements in clinical signs of IBD with allopathic management, suggesting potential benefits in hematologic parameters. The herbs have properties that may help improve overall health, gut function, and haematological parameters, including PCV which is simulated with the findings of *Puri & Sharma (2015)* [31], *Dey, et al. (2016)* [14], *Nambiar, et al. (2018)* [26] *and Raghavendra & Kumar (2021)* [32].

Table 5: Effect of the different treatments on PCV (%) (Mean ± SD) of different four groups of dog

Packed Cell Volume			
Treatment	**0 days**	**14 days**	**28 days**
Control	41.00±5.14^{a}	39.53±4.05^{a}	39.87±4.61
CVP	34.38±1.59^{b}	36.68±1.79^{ab}	38.46±1.26
ADMD	34.68±1.57^{b}	35.36±1.58^{b}	35.80±1.51
ADSD	34.09±1.01^{b}	35.78±.97^{ab}	38.27±.98
P-Value	0.001**	0.030*	0.079

*Significant at 5% (p<0.05) level **Significant at 1% (p<0.01) level N.B: Different superscripts (column wise) differ significantly according to Tukey's HSD test for multiple comparisons.

Hematological Parameters-Mean Corpuscular Volume (MCV)

The data represented the effect of different treatments on MCV (fl). On day 0, the values of CVP group (62.06±2.65fl), ADMD group (65.73±1.81fl) and ADSD group (63.95±1.45fl) were lower than that of the healthy Control group (65.95±5.84 fl). After treatment fromday0 to day14, all three groups are showing progression in MCV values respectively CVP group (day 0: 62.06±2.65 fl, day 14: 67.47±2.37fl), ADMD group (day 0:65.73±1.81fl, day 14:67.24±2.21fl) and ADSD group (day 0:63.95±1.45 fl, day14:68.38±2.54fl). But all the values of respective group are not significant. On day 28, CVP group (68.40±3.47 fl), ADMD group (68.10±2.10 fl) and ADSD group (73.25±2.51fl) showed values significantly (p<0.01) higher than healthy Control group (65.81±6.95 fl) indicating improvement of condition upon therapy. A study by *Allenspach, et al. (2016)* [1] supports the effectiveness of metronidazole in managing IBD symptoms, leading to improved hematological parameters. *Craven, et al. (2019)* [12] noted that managing dysbiosis can result in better clinical outcomes and hematological parameters in dogs with gastrointestinal diseases. According to *McCarthy & Lascelles (2018)* [25], corticosteroids can improve red blood cell production. The use of herbal medicines help improves hematological parameters, including MCV, similar observations were made by *Puri & Sharma (2015)* [31], *Dey, et al. (2016)* [14], *Nambiar, et al. (2018)* [26] *and Raghavendra & Kumar (2021)* [32].

Table 6: Effect of different treatments on MCV (fl) (Mean ± SD) of different four groups of dog

Mean Corpuscular Volume			
Treatment	**0 days**	**14 days**	**28 days**
Control	65.95±5.84	65.78±4.86	65.81±6.95^{b}
CVP	62.06±2.65	67.47±2.37	68.40±3.47^{ab}
ADMD	65.73±1.81	67.24±2.21	68.10±2.10^{ab}
ADSD	63.95±1.45	68.38±2.54	73.25±2.51^{a}
P-Value	0.572	0.507	< 0.001**

**Significant at 1% (p<0.01) level; N.B: Different superscripts (column wise) differ significantly according to Tukey's HSD test for multiple comparisons.

Hematological Parameters-Red Blood Cell (RBC)

In CVP group (3.86±0.46 ml/mm^{3}), upon diagnosis the mean ± SD values of RBC (million/microliter) was found to be significantly lower (p<0.01) than control group (6.66±0.57 million/microliter) on day 0. Same was the case for ADMD group (3.91±0.83 million/microliter) and ADSD group (3.49±0.76 million/microliter). CVP Group values showed significant (p<0.01) increase upon treatment (day14: 4.98±0.57 million/microliter, day 28: 7.07±0.74 million/ microliter). Similar trend was seen in both the remaining treatment groups ADMD (day 14: 4.49±0.60 million/ microliter, day28: 4.80±0.50 million/microliter) and group ADSD (day14: 4.81±0.70 million/microliter, day 28: 6.55±0.62 million/microliter). On day 14 of treatment, mean ± SD values of RBC were lowest in ADMD group (4.49±0.60 million/microliter), followed by ADSD group (4.81±0.70 million/microliter) and CVP group (4.98±0.57 million/ microliter). On day28, the mean ± SD values of CVP group (7.07±0.74 million/microliter) was the highest followed by ADSD group (6.55±0.62 million/microliter). They both varied significantly (p<0.01) compared to healthy Control group (6.80±.52). On day 28, ADMD group (4.80±0.50 million/ microliter) showed value higher than that of the value of 14 day (4.49±0.60 million/microliter) of the same group which indicating slow recovery. The findings are supported by the study of *Jergens, et al. (2014)* [19], *Allenspach, et al. (2016)* [1] *and Craven, et al. (2019)* [12]. Studies with herbs significantly impacting RBC levels, their ability to reduce gut inflammation and improve overall gastrointestinal health can indirectly promote better RBC production by addressing the underlying issues in dogs with IBD was simulated with findings of *Kumar, et al (2016)* [23].

Table 7: Effect of the different treatments on RBC (million/microliter), (Mean ± SD) of different four groups of dog

Red Blood Corpuscles (RBC)			
Treatment	**0 days**	**14 days**	**28 days**
Control	6.66±.57^{a}	6.91±.38^{a}	6.80±.52^{a}
CVP	3.86±.46^{b}	4.98±.57^{b}	7.07±.74^{a}
ADMD	3.91±.83^{b}	4.49±.60^{b}	4.80±.50^{b}
ADSD	3.49±.76^{b}	4.81±.70^{b}	6.55±.62^{a}
P-Value	< 0.001**	< 0.001**	< 0.001**

**Significant at 1% (p<0.01) level; N.B: Different superscripts (column wise) differ significantly according to Tukey's HSD test for multiple comparisons.

Hematological Parameters-White Blood Cells (WBC)

On day 0, the mean ± SD values of WBC (cells per microliter) of CVP group (17.05±0.85 cells per microliter), ADMD group (17.45±1.15 cells per microliter) and ADSD group (17.60±1.39 cells per microliter) were higher significantly (p<.01) than that of the healthy Control group (10.17±2.39 cells per microliter). All treatment group values followed same trend of decrease significantly (p<.01) from day 0 to day14 and from day14 to day28: CVP group (day 0: 17.05±0.85 cells per microliter, day14: 14.96±0.73 cells per microliter, day 28:12.96±1.00 cells per microliter), ADMD group (day 0:17.45±1.15 cells per microliter, day 14:16.23±1.07 cells per microliter, day 28:15.04±0.36 cells per microliter) and ADSD group (day 0:17.60±1.39 cells per microliter, day 14:15.51±1.26 cells per microliter, day 28 :13.09±1.13 cells per microliter). Upon treatment on day 28, the mean ±SD values of CVP group (12.96±1.00 cells per microliter) was the lowest value followed by the values of ADSD group (13.09±1. 13 cells per microliter) and ADMD group (15.04±0.36 cells per microliter). On day 28, the values of all three treatment groups CVP (12.96±1.00 cells per microliter), ADSD group (13.09±1.13 cells per microliter) and ADMD group (15.04±0.36 cells per microliter) lied significantly (p<.01) at the same range of healthy Control group (10.47±2.37 cells per microliter) which indicating the effectiveness of the treatment. The combination of metronidazole, tylosin, and prednisolone in IBD management aims to reduce gastrointestinal inflammation, which often leads to a normalization or reduction of elevated WBC counts,

especially as inflammation subsides, similar observation was made by *Allenspach, et al. (2016)* [1], *Dandrieux (2016)* [13] and *Craven, et al. (2019)* [12]. The herbal preparation used this trial are known for their anti-inflammatory, antioxidant, and antimicrobial properties, which can influence white blood cell (WBC) counts and overall gastrointestinal health which corroborated with the findings of *Sharma, et al. (2015)* [31], *Sahu, et al. (2017)* [34] and *Balakrishnan, et al. (2018)* [4].

Table 8: Effect of different treatments on WBC (per microliter), (Mean ± SD) of different four groups of dog

White Blood Corpuscles (WBC)			
Treatment	**0 days**	**14 days**	**28 days**
Control	10.17±2.39^{b}	10.30±2.65^{b}	10.47±2.37^{b}
CVP	17.05±.85^{a}	14.96±.73^{a}	12.96±1.00^{a}
ADMD	17.45±1.15^{a}	16.23±1.07^{a}	15.04±.36^{a}
ADSD	17.60±1.39^{a}	15.51±1.26^{a}	13.09±1.13^{a}
P-Value	< 0.001**	< 0.001**	< 0.001**

**Significant at 1% (p<0.01) level; N.B: Different superscripts (column wise) differ significantly according to Tukey's HSD test for multiple comparisons.

Hematological Parameters-Neutrophil (NEU)

The data shows the mean ± SD values of Neutrophil (neutrophils per microliter) on day 0, 14 and 28 of the control and three treatment groups. On day 0, CVP group (76.50±1.64 neutrophils per microliter), ADMD group (73.00±1.41 neutrophils per microliter) and ADSD group (76.16±1.60 neutrophils per microliter), showed greater values compared to control group (71.16±2.04 neutrophils per microliter), but the values of respective group are not significant. CVP Group and ADSD group showed major decrease from day 0 (CVP group: 76.50±1.64 neutrophils per microliter, ADSD group: 76.16±1.60 neutrophils per microliter) today14 (CVP group: 71.16±1.47 neutrophils per microliter, ADSD group: 72.16±1.32 neutrophils per microliter). But from day 0 to day 14, ADMD group showed slight decrease (day 0: 73.00±1.41 neutrophils per microliter and day 14: 71.66±1.63 neutrophils per microliter) but not significant. From day14 to day 28, in comparison with the healthy Control group value (70.83±1.94 neutrophils per microliter), CVP group and ADSD group showed a significant (p<0.01) decrease in value (CVP group: 67.33±2.33 neutrophils per microliter, ADSD group: 69.16±.75 neutrophils per microliter) whereas on the same day ADMD group showed significant (p<0.01) higher value (72.00±.89 neutrophils per microliter). *McCarthy & Lascelles (2018)* [25] *and Craven, et al. (2019)* [12] highlighted that dog receiving allopathic management for IBD indicating an improvement in clinical signs. Research by *Bhattacharyya, et al. (2015)* [8], *Awasthi, et al. (2016)* [3], *and Kumar, et al. (2018)* [22] indicates that the herbal management can significantly reduce inflammation markers, suggesting a decrease in neutrophil activation in inflammatory conditions.

Table 9: Effect of the different treatments on Neutrophils (per microliter), (Mean ± SD) of different four groups of dog

Neutrophils			
Treatment	**0 days**	**14 days**	**28 days**
Control	71.16±2.04^{b}	72.33±2.160	70.83±1.94^{ab}
CVP	76.50±1.64^{a}	71.16±1.47	67.33±2.33^{c}
ADMD	73.00±1.41^{b}	71.66±1.63	72.00±.89^{a}
ADSD	76.16±1.60^{a}	72.16±1.32	69.16±.75^{b}
P-Value	0.043	0.628	0.001**

**Significant at 1% (p<0.01) level; N.B: Different superscripts (column wise) differ significantly according to Tukey's HSD test for multiple comparisons.

Hematological Parameters-Lymphocyte (LYM)

The data represents the mean ± SD values of lymphocytes (%). On day 0, CVP group (16.16±2.31%), ADMD group (17.83±2.04%) and ADSD group (14.83±1.94%) had values significantly (p<0.01) lower than that of the healthy Control group (21.00±2.75%). After treatment CVP group (day 0:16.16±2.31%, day 14:23.66±2.25%), ADMD group (day 0:17.83±2.04%, day14:20.00±1.67%) and ADSD group (day 0:14.83±1.94%, day14:20.83±1.94%) showed significant (p<0.05) increase from day 0. On day14 of treatment, CVP group (23.66±2.25%) showed significantly (p<0.05) higher values than Control group (21.00±2.75%). Whereas on day 14 of treatment, ADMD group (20.00±1.67%) and ADSD group (20.83±1.94%) still showing significantly (p<0.05) lower value compared to healthy Control group (21.00±2.75%). On day 28 of treatment, CVP group (28.16±2.13%) and ADSD group (25.16±1.16%) showed mean ± SD values to be significantly (p<0.01) higher than healthy Control group (23.33±2.42%) and on the same day, the value of ADMD group (19.16±1.72%) is still lower significantly (p<0.05) than Healthy Control group (23.33±2.42%).Metronidazole, tylosin, and prednisolone are frequently used in combination to manage IBD in dogs. Each of these drugs contributes to reducing lymphocyte counts, either through direct immunosuppressive action or by controlling inflammation, observed by *Allenspach, et al. (2016)* [1], *German, et al. (2017)* [16] and *Pereira, S., et al. (2018)* [30]. The combined use of herbal treatments shows promise for modulating lymphocyte activity, which is beneficial in controlling inflammation and immune deregulation in dogs with IBD, the findings are simulated with the report of *Sharma, et al. (2015)* [31], *Srinivasan, et al. (2016)* [38], *Patil, et al. (2017)* [28].

Table 10: Effect of the different treatments on LYM (%) (Mean ± SD) of different four groups of dog

Lymphocytes			
Treatment	**0 days**	**14 days**	**28 days**
Control	21.00±2.36^{a}	21.00±2.75^{ab}	23.33±2.42^{b}
CVP	16.16±2.31^{b}	23.66±2.25^{a}	28.16±2.13^{a}
ADMD	17.83±2.04^{ab}	20.00±1.67^{b}	19.16±1.72^{c}
ADSD	14.83±1.94^{b}	20.83±1.94^{ab}	25.16±1.16^{ab}
P-Value	< 0.001**	0.048*	< 0.001**

*Significant at 5% (p<0.05) level** Highly Significant at 1% (p<0.01) level; N.B: Different superscripts (column wise) differ significantly according to Tukey's HSD test for multiple comparisons.

Hematological Parameters-Eosinophil (EOS)

The table and figure represent that the mean ± SD values of Eosinophils (%) on day 0, 14 and 28 of the healthy Control and three treatment groups. On day 0, ADMD group (4.66±.81%), ADSD group (4.83±.98%) showed values significantly (p<0.01) greater than Control group

(3.50±.54%). But CVP group showed gradual decrease (significant at $p<0.01$) from day 0 (2.33±1.03%) to14 and from14 (1.16±.75%) to 28 (0.83±.40%). On day14 of treatment, ADMD group (4.16±1.16%) and ADSD group: (4.00±1.09%) showed significant ($p<0.01$) higher value than that of CVP group (1.16±.75%). On day 28, the same pattern of alteration (significant at $p<0.01$) were observed among Control group and all three group values (Control group: 2.33±.51%, CVP group: 83±.40%, ADMD group: 4.33±.81% and ADSD group: 3.33±.51%). On day 28, it is also evidenced that the value of CVP group (.83±.40%) was significantly ($p<0.01$) lower than that of the other three groups indicating the efficacy of the intervention. The combination of metronidazole, tylosin, and prednisolone is effective in reducing eosinophil counts in dogs with IBD by controlling inflammation and modulating immune responses, similar study was in confirmation with the findings of *Allenspach, et al. (2016)* [1], *German, et al. (2017)* [16] and *Pereira, et al. (2018)* [30]. The use of herbal treatments shows promise in reducing eosinophil-related inflammation in dogs with IBD, primarily through their anti-inflammatory and immune modulatory effects, similar study was confirmed by *Sharma, et al. (2015), Srinivasan, et al. (2016)* [38] *and Kumar, et al. (2018*) [22].

Table 11: Effect of different treatments on EOS (%) (Mean ± SD) of four different groups of dog

Eosinophils			
Treatment	**0 days**	**14 days**	**28 days**
Control	3.50±.54^{ab}	2.83±.75^{a}	2.33±.51^{c}
CVP	2.33±1.03^{b}	1.16±.75^{b}	.83±.40^{d}
ADMD	4.66±.81^{a}	4.16±1.16^{a}	4.33±.81^{a}
ADSD	4.83±.98^{a}	4.00±1.09^{a}	3.33±.51^{b}
P-value	< 0.001**	< 0.001**	< 0.001**

**Highly Significant at 1% ($p<0.01$) level; N.B: Different superscripts (column wise) differ significantly according to Tukey's HSD test for multiple comparisons.

Hematological Parameters-Monocyte (MONO)

The mean ± SD values of Monocytes (%) on day 0, 14 and 28 of the healthy Control and three treatment groups, on day 0, among the three treatment groups, the value of CVP group (5.00±.89%) was highest than that of ADMD group (4.50±1.04%) and ADSD group (4.17±.75%) which is not very significant. Gradual decrease from day 0 to day 14 were seen in case of CVP group (day 0: 5.00±.89%, day 14: 4.00±0.89) and ADSD group (day 0: 4.17±0.75%, day 14: 3.00±0.63) and ADMD group (day 0: 4.50±1.04%, day 14:4.17±0.42%). But On day 28 of treatment, ADSD group: (2.33±0.52$^{b\%}$) and CVP group (3.67±0.52$^{)}$ showed significant ($p<0.01$) lower value than that of ADMD group (4.50±0.83%). On day 28, it is also evidenced that the value of CVP group (3.67±0.52%) was almost nearer to the value of Control group (3.50±1.38) in comparison to other treatment groups. The allopathic treatments have shown significant impacts on immune modulation, gut microbiota, and inflammation markers, including monocyte activity which is found in the studies of *Cassmann, et al., 2016* [9] and *Peiravan, et al., 2024* [29]. The herbal medications have unique bioactive compounds that reduced inflammatory processes, support gut health, and modulate immune cell activity, including that of monocytes, corroborated with the studies of *Choudhary, et al. (2018)* [10], *Shashidhara & Mohanty (2016)* [36] *and Patel (2019)* [27].

Table 12: Effect of the different treatments on Monocyte (%) (Mean ± SD) of different four groups of dog

Monocytes			
Treatment	**0 days**	**14 days**	**28 days**
Control	4.33±1.36	3.83±1.17	3.50±1.38^{ab}
CVP	5.00±0.89	4.00±0.89	3.67±0.52^{ab}
ADMD	4.50±1.04	4.17±0.42	4.50±0.83^{a}
ADSD	4.17±0.75	3.00±0.63	2.33±0.52^{b}
P-Value	0.553	0.102	0.004**

**Highly Significant at 1% ($p<0.01$) level; N.B: Different superscripts (column wise) differ significantly according to Tukey's HSD test for multiple comparisons.

Hematological Parameters-Platelet (PLT)

The result of different treatments on the Platelet count of groups CVP, ADMD and ADSD. On day 0, group CVP (260.33±19.82 platelet per microliter), group ADMD (200.17±24.02 platelet per microliter) and group ADSD (271.83±10.61 platelet per microliter) showed significantly ($p<0.01$) lower values compared to control (306.67±17.63 platelet per microliter). However, after treatment significant increase in platelet was observed in group CVP (day 0:260.33±19.82 platelet per microliter, day 14:298.83±25.22 platelet per microliter, day 28:336.50±23.48 platelet per microliter), group ADMD (day 0:200.17±24.02 platelet per microliter, day14: 220.83±23.11 platelet per microliter, day 28:235.66±29.76 platelet per microliter) and Group ADSD (day 0:271.83±10.61 platelet per microliter, day 14: 313.83±15.77 platelet per microliter, day 28: 348.33±17.22 platelet per microliter) all followed the similar trend of significant increase in mean ± SD values of platelets from day 0 onwards. On day 28, value of ADSD group (348.33±17.22 platelet per microliter) and CVP group (336.50±23.48 platelet per microliter) were almost in the same range of that of the healthy Control group (369.83±12.62 platelet per microliter). Combination of metronidazole, tylosin, and prednisolone primarily reduces inflammation, which indirectly helps normalize platelet counts, the findings are corroborated with the study findings of *Basson, et al. (2016)* [5] and *Khandelwal, et al. (2018)* [21]. The herbal compounds have shown potential in modulating platelet counts in dogs with inflammatory conditions such as IBD, also reported by the study of *Sharma, et al. (2015)* [31], *Srinivasan, et al. (2016)* [38], *Patil, et al. (2017)* [28].

Table 13: Effect of the different treatments on PLT (platelet per microliter), (Mean ± SD) of different four groups of dog

Platelets			
Treatment	**0 days**	**14 days**	**28 days**
Control	306.67±17.63[a]	343.00±12.19[a]	369.83±12.62[a]
CVP	260.33±19.82[b]	298.83±25.22[b]	336.50±23.48[a]
ADMD	200.17±24.02[c]	220.83±23.11[c]	235.66±29.76[b]
ADSD	271.83±10.61[b]	313.83±15.77[ab]	348.33±17.22[a]
P-Value	< 0.001**	< 0.001**	< 0.001**

**Significant at 1% (p<0.01) level; Different superscripts (column wise) differ significantly according to Tukey's HSD test for multiple comparisons.

Hematological Parameters-Erythrocyte Sedimentation Rate (ESR)

The effect of the different treatments on ESR (mm/hr) of the affected animals. On day 0, CVP group (36.16±3.31 mm/hr), ADMD group (34.33±2.50 mm/hr) and ADSD group (32.83±2.04 mm/hr) showed significantly (p<0.01) higher values compared to the values of healthy Control group (18.50±6.83 mm/hr). CVP Groups (day 0: 36.16±3.31 mm/hr; day14:31.00±3.57 mm/hr; day28:25.00±2.52 mm/hr), ADMD group (day 0: 34.33±2.50 mm/hr; day14:32.00±2.00 mm/hr; day 28:29.50±1.51 mm/hr) and ADSD group (day 0:32.83±2.04 mm/hr; day14:27.66±2.33 mm/hr; day 28 :22.66±1.96 mm/hr) showed similar pattern of decrease (significantly at p<0.01) from day 0 to day 14 and from day 14 to day 28. On day 28, values of ADSD group (22.66±1.96 mm/hr) and CVP group (25.00±2.52 mm/hr) were seem to be more nearer to that of the Control group (16.00±3.89 mm/hr) than the value of ADMD group (29.50±1.51 mm/hr) (significant at p<0.01).The use of metronidazole, tylosin, and prednisolone in dogs with IBD significantly affects ESR levels and a decreasing ESR may indicate successful management of inflammation, while persistent elevations could suggest inadequate response or complications. The findings of this study is supported by the study findings of *Farah (2018)* [15], *Sullivan, et al., (2018)* [40], *Holt, et al., (2019)* [18], *Cohen, (2020)* [11]. The combination of these herbal remedies could potentially help manage IBD in dogs by reducing systemic inflammation, as indicated by ESR levels corroborated with the findings of *Ranjan, et al., (2020)* [33], *Shukla, et al., (2020)* [37] *and Hassan (2021)* [17].

Table 14: Effect of the different treatments on ESR (mm/hr), (Mean ± SD) of different four groups of dog

Erythrocyte Sedimentation Rate			
Treatment	**0 days**	**14 days**	**28 days**
Control	18.50±6.83[b]	15.50±3.78[b]	16.00±3.89[c]
CVP	36.16±3.31[a]	31.00±3.57[a]	25.00±2.52[b]
ADMD	34.33±2.50[a]	32.00±2.00[a]	29.50±1.51[a]
ADSD	32.83±2.04[a]	27.66±2.33[a]	22.66±1.96[b]
P-Value	< 0.001**	< 0.001**	< 0.001**

**Significant at 1% (p<0.01) level; N.B: Different superscripts (column wise) differ significantly according to Tukey's HSD test for multiple comparisons.

Conclusion

The study demonstrated that both conventional allopathic therapy and Ayurveda interventions, particularly at standard doses, effectively improved clinical, physiological, and haematological parameters in dogs with Inflammatory Bowel Disease (IBD). Physiological parameters-temperature, pulse, and respiration gradually normalized in affected dogs, with CVP and ADSD groups showing values comparable to healthy controls by day 28. Haematological improvements, including haemoglobin, RBC, PCV, MCV, WBC, and platelet counts, reflected recovery from inflammation-induced alterations, while ESR values indicated significant reduction in systemic inflammation. Herbal preparations exhibited anti-inflammatory, antioxidant, and immune modulatory effects, contributing to stabilization of neutrophil, lymphocyte, eosinophil, and monocyte profiles. Overall, the findings suggest that veterinary Ayurveda, particularly at standard doses, can serve as a promising adjunct or alternative to conventional therapy in managing canine IBD, promoting recovery of physiological homeostasis, haematological health, and immune modulation, thereby enhancing overall well-being and quality of life in affected dogs.

Conflict of Interest

Not available

Financial Support

Not available

Reference

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How to Cite This Article
Pal A, Sarkar S, Dutta S, Biswas S. Comparative efficacy of veterinary Ayurveda over conventional allopathic practices on various physiological & hematological parameters in relation to IBD as complex digestive disorder in canine pets of India. International Journal of Veterinary Sciences and Animal Husbandry. 2025;10(10):231-238.