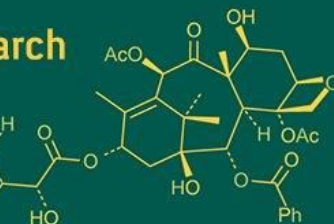


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
IJABR 2026; 10(2): 918-923
www.biochemjournal.com
Received: 08-11-2025
Accepted: 10-12-2025

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Incidence and haemato-biochemical alterations in dermatoses associated with hypothyroidism in dogs

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DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i2l.7752>

Abstract

Considering critical role of thyroid hormones in hair growth and skin homeostasis, the present study was planned to report incidence and hormonal as well as haemato-biochemical alterations in dermatoses associated with hypothyroidism in dogs from March to August 2025. Out of 720 were fresh cases, nineteen dogs were clinically suspected for dermatoses associated with hypothyroidism and were subjected to detailed clinical, haemato-biochemical and hormonal evaluations. Twelve dogs were confirmed with an overall incidence of 1.67% and a hospital-based incidence of 63.16% among suspected cases. The highest incidence was observed in dogs aged 6-10 years (50%), with males being predominantly affected (75%). Labrador Retrievers showed the highest breed predisposition (66.67%). Common clinical signs included alopecia (91.67%), bradycardia (83.33%), obesity (75.00%), seborrhoea (66.67%), pruritus and rat-tail appearance (58.33% each). Secondary infections were detected in 25% of cases, including pyoderma and Malassezia dermatitis. Among the various haematological parameters, the means of TLC ($\times 10^3/\mu\text{l}$) and neutrophils (%) were significantly higher in dermatoses affected dogs associated with hypothyroidism (14.03 ± 1.97 ; 73.75 ± 3.15 ; respectively) as compared to healthy dogs (09.37 ± 5.15 ; 55.83 ± 1.42 , respectively). Whereas, the mean of eosinophils (%) was significantly lower in dermatoses affected dogs associated with hypothyroidism (1.42 ± 0.26) than healthy dogs (6.67 ± 0.49). Other haematological parameters were varied non-significantly between the groups. Among various biochemical parameters, the means of ALT (U/L), cholesterol (mg/dl) and triglyceride (mg/dl) were found significantly higher in dermatoses affected dogs associated with hypothyroidism (78.06 ± 11.41 , 200.17 ± 23.11 , 112.99 ± 12.25 , respectively) than healthy dogs (42.82 ± 3.63 , 122.73 ± 2.99 , 75.03 ± 4.32 , respectively). The means of Free T₄ (0.65 ± 0.09 ng/dl) and Total T₄ (0.60 ± 0.07 $\mu\text{g/dl}$) were found significantly lower than the values observed for healthy dogs (1.61 ± 0.21 , 2.22 ± 0.22 , respectively).

Keywords: Dermatoses, dogs, haemato-biochemical and hormonal alterations, hypothyroidism

Introduction

Originating from *Canis lupus*, dogs are believed to have begun scavenging near human settlements, initiating the domestication process. Today, dogs are globally distributed, with an estimated population of nearly 700 million. In India, the pet dog population was approximately 19.5 million in 2018 and is projected to exceed 50 million by 2030. A healthy, glossy coat is one of the most valued aesthetic features of dogs and is often perceived as a reflection of good health (Smith *et al.*, 2019) ^[1]. Skin disorders are among the most common reasons for veterinary consultation, accounting for approximately 12-75% of primary or secondary complaints in small animal practice (Scott and Paradis, 1990) ^[2]. Canine dermatoses may arise from a wide range of environmental and internal factors, including infections, parasitic infestations, allergic conditions and endocrine disorders. Alopecia unrelated to inflammatory or infectious causes is particularly distressing and may result in chronic morbidity, financial burden and, in severe cases, euthanasia (Medleau and Hnilica, 2006) ^[3].

Endocrine disorders frequently manifest with dermatological signs, as hormones such as thyroxine, cortisol and oestrogen play critical roles in hair growth and skin homeostasis. Endocrine dermatoses, commonly associated with hypothyroidism, hyperadrenocorticism and hyperestrogenism, are major causes of bilateral symmetrical alopecia in dogs (Credille *et al.*, 2001) ^[4].

Hypothyroidism is the most prevalent endocrine disorder in dogs and results from deficient production of thyroid hormones, thyroxine (T₄) and triiodothyronine (T₃). Based on the site of dysfunction, hypothyroidism may be primary, secondary or tertiary, with over 95% of cases being primary in origin due to lymphocytic thyroiditis or idiopathic thyroid atrophy (Ettinger *et al.*, 2017) [5].

Clinically, hypothyroid dogs commonly exhibit bilateral symmetrical alopecia, seborrhoea, delayed hair regrowth, obesity, lethargy, hyper pigmentation and recurrent pyoderma. Characteristic hair loss occurs over frictional areas, pressure points and the tail, producing a “rat-tail” appearance, while selective loss of guard hairs imparts a puppy-like coat (Feldman *et al.*, 2004) [6]. Diagnosis relies on clinical signs supported by laboratory findings, typically low serum T₄ concentrations with elevated thyroid-stimulating hormone levels. Levothyroxine (LT₄) remains the treatment of choice and is generally administered lifelong. Appropriate therapy leads to significant clinical improvement, though regular monitoring is essential to optimize dosage and ensure long-term therapeutic success (Elgalfy *et al.*, 2025) [7].

Materials and Methods

The study on “Incidence and haemato-biochemical and hormonal alterations in dermatoses associated with hypothyroidism in Dogs” was conducted at the Department of Veterinary Medicine, College of Veterinary Science and Animal Husbandry, Kamdhenu University, Navsari, Gujarat, from March to August 2025. Initially, dogs presented at Veterinary Clinical Complex, Navsari with dermatological lesions such as alopecia, seborrhoea, and recurrent skin infections along with clinical signs suggestive of hypothyroidism were screened.

Samples including skin scrapings, impression smears, pus/exudate swabs and blood/serum were collected at the time of first presentation for diagnostic evaluation. Impression smears were prepared by pressing clean glass slides onto clipped lesions, air-dried, methanol-fixed and stained with new methylene blue before microscopic examination (Muse, 2000) [8]. Deep skin scrapings were obtained using a dulled scalpel blade until capillary oozing appeared; samples were processed in 10% KOH, centrifuged and examined microscopically for mites based on

morphological features (Soulsby, 1986; Hnilica and Patterson, 2016) [9, 10]. Swabs from deep and superficial purulent lesions were collected aseptically for bacterial culture and identification, following appropriate lesion preparation to minimize contamination, and antimicrobial susceptibility was determined using the Kirby-Bauer disc diffusion method (CLSI, 2017) [11]. Various haematological parameters were estimated using automatic blood cell counter, while, serum biochemical parameters were analyzed using commercially available diagnostic kits in a semi-automatic biochemical analyzer. Quantitative analysis of free T₄, Total thyroxine (TT₄) and TSH was carried out using the Chemiluminescent Immunoassay (CLIA) method, with the results expressed in ng/dL, µg/dl, and µIU/mL, respectively (Nelson and Couto, 2020) [12].

Results and Discussion

Overall, Age, Sex and Breed-wise Incidence

During the study, a total of 1867 cases of dogs were registered at Veterinary Clinical Complex for medical treatment. Of which, 720 cases were fresh cases and the rest were as follow up cases. Among 720 fresh cases, 19 were suspected for dermatoses associated with hypothyroidism based on clinical sings. Of which, 12 cases were identified as cases of dermatoses associated with hypothyroidism in dog with overall incidence of 1.67% (12/720). The hospital-based incidence among the suspected cases was 63.16% (12/19).

During study, the highest incidence of dermatoses associated with hypothyroidism was observed in dogs aged between 6-10 years (50.0 %) followed by 2.5-6-year (25.00%) and >10-year (25.00%) age group with statistically non-significant difference between groups (Table 1). Similarly, Gupta (2016) [13] observed that the majority of affected dogs were between 5 and 10 years old (16 cases; 64%) followed by those aged 1-5 years (7 cases; 28%) and the least in dogs over 10 years (2 cases; 8%). Later on, Roopali *et al.* (2020) [14] also reported that dogs between 6-8 years of age (52.381%) were more prone to hypothyroidism. The increased susceptibility in adult dogs was in agreement with the reports of Kumar *et al.* (2007) [15] reported that thyroid hormone concentrations are expected to decrease with age and may actually be above adult normal levels in puppies.

Table 1: Age, sex and breed wise incidence of dermatoses associated with hypothyroidism in dogs (n = 12)

Parameters	Groups	No of affected	Percentage	χ ² value	P value
Age	< 6 years	03	25.00	1.50	0.472
	6-10 years	06	50.00		
	>10 years	03	25.00		
Total		12	100.00		
Sex	Intact Male	07	58.33	7.33	0.062
	Castrated Male	02	16.67		
	Intact Female	02	16.67		
	Spayed Female	01	08.33		
Total		12	100.00		
Breeds	Labrador Retriever	08	66.67	11.33	0.010**
	Beagle	01	08.33		
	German Shepherd	01	08.33		
	Pomeranian	02	16.67		
Total		12	100.00		

** indicates significant at $p \leq 0.01$

In the present study, males (9/12) constituted 75.00% of the cases, indicating a higher occurrence of dermatoses associated with hypothyroidism in male dogs as compared to females (3/12; 25.00%) (Table-1). Similarly, Kour *et al.* (2020) ^[16] reported that males (74.29%) were more commonly affected than females (25.71%). Later on, Naveen (2024) ^[17] also reported higher incidence of hypothyroidism in male dogs (70.37%) than females (29.63%). Of total 12 affected dogs, seven were intact males (58.33%), two each of castrated males (16.67%) & intact females (16.67%) and one was a spayed female (8.33%). Including seven intact males and two intact females, a greater proportion of affected dogs were sexually intact (75.00%) as compared to neutered or spayed dogs (25.00%). Similarly, Guglielmini *et al.* (2019) ^[18] reported higher relative risk of hypothyroidism in intact males (19/40) dogs followed by spayed female (11/40) and intact females (10/40). The present study showed higher incidence in males and intact dogs than their counter parts. This may be due to the higher representation of male dogs, possibly reflecting pet owners' preference for male dogs (Naveen, 2024) ^[17].

The higher incidence of dermatoses associated with hypothyroidism in dogs was observed in Labrador Retriever (66.67%) followed by Pomeranian (16.67%), Beagle (08.33%) and German Shepherd (08.33%) (Table-1). Previously, Gulzar *et al.* (2014) ^[19] reported a higher prevalence in Labrador Retrievers (14.70%), followed by German Shepherds (15.38%) and Pomeranians (3.57%). Later on, Gupta (2016) ^[13] also observed the highest incidence in Labrador Retrievers (36%) followed by non-descript dogs (32%), while German Shepherds showed a lower occurrence (8%). Kour *et al.* (2020) ^[16] documented that Labrador Retrievers exhibited the highest prevalence (51.43%), followed by Pugs (20.00%) and Samoyeds (8.57%). Lastly, Naveen (2024) ^[17] also observed a higher incidence in Labrador Retrievers (33.33%) followed by Golden Retrievers and Pomeranians (18.52% each). The higher incidence in Labrador Retrievers may reflect both breed predisposition and their greater population among pet dogs (Raja *et al.* 2021) ^[20]. On contrary to our finding of higher incidence of hypothyroidism in Labrador Retriever dogs, Kumar *et al.* (2007) ^[15] reported a higher occurrence in Spitz dogs, followed by Labrador Retrievers and German Shepherds. Similarly, Jyothi (2017) ^[21] also reported higher prevalence in Pomeranians (40.80%), followed by Labrador Retrievers (18.36%). The variability in breed wise distribution across different studies may be attributed to the habitation of different breeds in different regions, breed popularity and sample size (Elgalfy *et al.*, 2025) ^[7].

Clinical findings

The major clinical signs observed were alopecia/hair fall (91.67%), bradycardia (83.33%), obesity (75.00%) (Fig. 1), seborrhoea (66.67%) (Fig. 2), pruritus (58.33%), rat-tailed appearance (58.33%) (Fig. 3), failure to hair regrowth (33.33%), inappetence (25.00%), pustules/pyoderma (16.67%) (Fig. 4), hyper-pigmentation (16.67%) and lichenification (16.67%) (Table-2). Earlier, Kumar *et al.* (2007) ^[15] reported generalized hair loss in 88% cases followed by "rat tail" appearance (83%), brittle, dry & dull coats (83%), pigmentation and pruritus (27%), obesity (88%), anaemia (33%) and puppy-like coat (22%). Similarly, Gupta (2016) ^[13] reported alopecia (80%) as

predominant clinical signs followed by lethargy (76%), obesity or weight gain (44%), exercise intolerance (24%), poor coat quality (30%), hyper-pigmentation (20%) and "Rat tail" appearance (12%). Lokes-Krupka *et al.* (2020) ^[22] also documented the common clinical signs of hypothyroidism including depression, weakness & fatigue (100.0%), symmetrical alopecia (90.9%), anaemia (81.8%), bradycardia & shortness of breath during exercise (72.7%), obesity (63.60%), polydipsia & hypothermia (45.5%) and corneal dystrophy (36.4%). Later on Naveen (2024) ^[17] reported alopecia either localized or widespread in 74.07% cases followed by "rat tail" appearance (66.67%), obesity (59.26%), lethargy (48.15%), exercise intolerance (44.44%), seborrhoea (40.74%), pyoderma & pruritus (each, 37.04%), lichenification (18.52%), hyperpigmentation (11.11%) and myxoedema & hair regeneration failure (7.41%).

Table 2: Frequency distribution of clinical signs in dermatoses affected dogs associated with hypothyroidism (n = 12)

S. N.	Clinical signs	Affected cases	Percentage
1	Alopecia/Hair fall	11	91.67
2	Bradycardia	10	83.33
3	Obesity	09	75.00
4	Seborrhoea	08	66.67
5	Lethargy	08	66.67
6	Rat tailed appearance	07	58.33
7	Pruritus	06	58.33
8	Failure of hair regrowth	04	33.33
9	Inappetence	03	25.00
10	Hyperpigmentation	02	16.67
11	Lichenification	02	16.67
12	Pustules/pyoderma	02	16.67



Fig 1: Obesity



Fig 2: Seborrhoea with alopecia



Fig 3: Rat tailed appearance



Fig 4: Pustules and erythema with alopecia

In a recent report of Elgalfy *et al.* (2025) ^[7], they classified various clinical findings and found that dermatological manifestations were most prevalent (92.85%), followed by metabolic (46.42%), psychological (42.85%), reproductive (14.28%), neuromuscular (10.71%), gastrointestinal and cardiovascular signs (each 7.14%). Further, they observed non-inflammatory, non-pruritic alopecia, asymmetric hair loss at friction sites, bilateral symmetrical truncal alopecia, patchy alopecia and hyperpigmentation with comedone formation as common cutaneous lesions. Metabolic alterations observed were obesity (46.42%), psychological changes included depression and lethargy (42.85%), reproductive signs were infertility (14.28%), neuromuscular involvement comprised ataxia and hind-limb paresis (10.71%), gastrointestinal signs included vomiting (7.14%) and cardiovascular signs consisted of oedema, cough & exercise intolerance (7.14%).

The variation in clinical signs is dependent on thyroid hormone deficiency which alters sebaceous gland function and epidermal maturation, causing abnormal keratinization and oily seborrhoea due to impaired secretion. Reduced thyroid hormones also inhibit hair follicle anagen, resulting in dull, brittle hair, and impair cardiac and neural function through decreased myocardial contractility, adrenergic responsiveness, ATP production and Na⁺/K⁺ pump activity (Elgalfy *et al.*, 2025) ^[7].

Dermatological profile

During present study, 3 out of 12 dogs (25%) were found positive for presence of either bacterial or fungal isolates. Of which, pyoderma was observed in 2 dogs (16.67%) and

Malassezia dermatitis was identified in one dog (8.33%). Recently, Naveen (2024) ^[17] reported that 40.74% had concurrent skin disorders in which Pyoderma was observed in 37.04% followed by Malassezia dermatitis (18.52%) and demodectic mange (11.11%). Earlier, Bacterial, fungal or mite infection in hypothyroid dogs had been consistently reported by several authors (Reddy and Sivajothi, 2015; Haritha, 2017; Ko *et al.*, 2018; Ramesh *et al.*, 2018) ^[24-27].

Haemato-biochemical & Hormonal alterations

Among the various haematological parameters, the means of TLC ($\times 10^3/\mu\text{l}$) and neutrophils (%) were significantly higher in dermatoses affected dogs associated with hypothyroidism (14.03 ± 1.97 ; 73.75 ± 3.15 ; respectively) as compared to healthy dogs (09.37 ± 5.15 ; 55.83 ± 1.42 , respectively). Whereas, the mean of eosinophils (%) was significantly lower in dermatoses affected dogs associated with hypothyroidism (1.42 ± 0.26) than healthy dogs (6.67 ± 0.49). Other haematological parameters were varied non-significantly between the groups (Table-3). The finding of significant higher value of neutrophils and lower value of eosinophils in affected dogs is in accordance with report of Jyothi (2017) ^[21] who observed increased neutrophil(%) counts (76.27 ± 1.09) with a concurrent decrease in eosinophils counts (0.53 ± 0.11) in hypothyroid dogs compared to healthy controls (70.09 ± 1.57 and 1.18 ± 0.33 , respectively). Neutrophilia in hypothyroid dogs has been consistently reported by several authors (Gupta, 2016; Ramesh *et al.*, 2018; Dhillon *et al.*, 2020) ^[13, 27, 29].

Table 3: Haemato-biochemical and hormonal alteration in dermatoses affected dogs associated with hypothyroidism

S. N.	Parameters	Healthy dogs (n = 6)	Affected dogs (n = 12)	p value
1	Haemoglobin (g/dl)	13.4 $\pm$ 0.57	11.61 $\pm$ 1.30	0.362
2	TEC ($\times 10^6/\mu\text{l}$)	07.33 $\pm$ 0.42	06.41 $\pm$ 0.29	0.107
3	TLC ($\times 10^3/\mu\text{l}$)	09.37 $\pm$ 5.15	14.03 $\pm$ 1.97	0.041*
4	Neutrophils (%)	55.83 $\pm$ 1.42	73.75 $\pm$ 3.15	0.001**
5	Lymphocytes (%)	24.33 $\pm$ 1.76	22.33 $\pm$ 3.22	0.293
6	Monocytes (%)	02.83 $\pm$ 0.48	04.00 $\pm$ 0.78	0.331
7	Eosinophils (%)	6.67 $\pm$ 0.49	1.42 $\pm$ 0.26	0.0002**
8	Platelets ($\times 10^3/\mu\text{l}$)	03.01 $\pm$ 0.16	02.36 $\pm$ 0.31	0.066
9	PCV (%)	44.22 $\pm$ 1.83	37.32 $\pm$ 2.65	0.104
10	MCV (fL)	59.90 $\pm$ 2.08	60.01 $\pm$ 1.61	0.969
11	MCH (pg)	20.18 $\pm$ 0.49	19.84 $\pm$ 0.62	0.724
12	MCHC (g/dL)	32.05 $\pm$ 0.66	32.04 $\pm$ 0.44	0.992
13	ALT (U/L)	42.82 $\pm$ 3.63	78.06 $\pm$ 11.41	0.011*
14	Total Protein (g/dl)	6.36 $\pm$ 0.16	6.69 $\pm$ 0.26	0.408
15	Albumin (g/dl)	3.02 $\pm$ 0.23	3.33 $\pm$ 0.16	0.288
16	Globulin (g/dl)	3.34 $\pm$ 0.17	3.36 $\pm$ 0.32	0.971
17	A:G ratio	0.93 $\pm$ 0.16	1.09 $\pm$ 0.11	0.415
18	Cholesterol (mg/dl)	122.73 $\pm$ 2.99	200.17 $\pm$ 23.11	0.007**
19	Triglyceride (mg/dl)	75.03 $\pm$ 4.32	112.99 $\pm$ 12.25	0.012*
20	Free T ₄ (ng/dl)	1.61 $\pm$ 0.21	0.65 $\pm$ 0.09	0.0001**
21	TSH ($\mu\text{IU/ml}$)	0.150 $\pm$ 0.04	0.222 $\pm$ 0.05	0.300
22	Total T ₄ ($\mu\text{g/dl}$)	2.22 $\pm$ 0.22	0.6 $\pm$ 0.07	0.0004**

* indicates significant at $p \leq 0.05$ ** indicates highly significant at $p \leq 0.01$

Similar to our finding, Naveen (2024) ^[17] also reported significantly higher TLC ($16.05 \pm 1.13 \times 10^3/\mu\text{l}$) in hypothyroid dogs than healthy dogs. Further, he reported non-significant variation in differential leukocyte counts (neutrophils, lymphocytes, monocytes, and eosinophils) in hypothyroid dogs than healthy dogs with significantly lower ($p < 0.01$), haemoglobin (10.89 ± 0.60 g/dL), packed cell

volume ($33.79 \pm 1.47\%$) and total erythrocyte count ($4.99 \pm 0.17 \times 10^6/\text{mm}^3$) compared to healthy controls, indicating anaemia associated with hypothyroidism.

Among various biochemical parameters, the means of ALT (78.06 ± 11.41 U/L), cholesterol (200.17 ± 23.11 mg/dl) and triglyceride (112.99 ± 12.25 mg/dl) were found significantly higher in dermatoses-affected dogs associated with hypothyroidism than healthy dogs (42.82 ± 3.63 , 122.73 ± 2.99 , 75.03 ± 4.32 , respectively) (Table-3). Earlier, Higgins *et al.* (2006) [30] documented hyper-triglyceridemia (1, 098 mg/dL) and hypercholesterolemia (791 mg/dL) in hypothyroid dogs. Scientists had also reported elevated cholesterol (>250 mg/dL) and triglycerides (>100 mg/dL) in hypothyroid dogs (Gupta, 2016; Jyothi, 2017; Ko *et al.*, 2018; Dhillon *et al.*, 2020) [13, 21, 26, 29]. In context to significant increased value of ALT in hypothyroid dogs, Naveen (2024) [17] reported documented significantly elevated ALT (77.52 ± 26.05 IU/L) along with cholesterol (262.44 ± 17.64 mg/dL) and triglycerides (109.21 ± 5.62 mg/dL) in hypothyroid dogs as compared to healthy controls (44.24 ± 1.07 , 136.11 ± 4.32 , 79.38 ± 7.81 , respectively). Hypercholesterolemia and hyper-triglyceridemia are frequently observed in hypothyroidism due to impaired lipid metabolism. Reduced thyroid hormone activity leads to decreased HMG-CoA reductase function, resulting in elevated total cholesterol and LDL-C concentrations. The catabolism of LDL and IDL may also be reduced because of diminished LDL-receptor activity. Furthermore, hypothyroidism is associated with lowered lipoprotein lipase (LPL) activity, which impairs the clearance of triglyceride-rich lipoproteins. Consequently, individuals with overt hypothyroidism often exhibit increased triglyceride levels accompanied by elevated VLDL concentrations. (Kour *et al.*, 2020) [16].

During the study, the means of FT4 and TT4 were found significantly lower in dogs with dermatoses associated with hypothyroidism than healthy dogs (Table-3). Similarly, significantly lower FT4 and TT4 in hypothyroid dogs than healthy dogs were observed previously by scientists (Higgins *et al.*, 2006; Kumar *et al.*, 2007; Reddy and Sivajothi, 2015; Jyothi, 2017) [15, 21, 24, 30]. In a present study, mean value of TSH ($\mu\text{IU/ml}$) was found comparatively higher (0.222 ± 0.05) in dermatoses affected dogs associated with hypothyroidism than healthy dogs (0.150 ± 0.04) along with significant lower values of FT4 and TT4. In context to higher values of TSH, Kour *et al.* (2021) [16] reported reduced Total T₄ (0.44 ± 0.61 $\mu\text{g/dL}$) with elevated TSH (6.79 ± 0.01 ng/mL). While, Mohanambal *et al.* (2023) [29] and Naveen (2024) [17] reported significantly reduced Total T₄ (0.5 $\mu\text{g/dL}$), Free T₄ (<0.3 ng/dL), and elevated TSH (2.61 ng/mL). Lowered Free T₄ and Total T₄ in hypothyroid dogs result due to progressive destruction of functional thyroid tissue as a result of lymphocytic thyroiditis or idiopathic thyroid atrophy. Loss of thyroid follicles reduces iodination of thyroglobulin, leading to decreased synthesis and secretion of Total T₄ and Free T₄. In some cases, reduced circulating thyroid hormones may also be influenced by dysfunction of the hypothalamic-pituitary axis. Impaired secretion of thyroid-stimulating hormone (TSH) from the pituitary, as seen in secondary hypothyroidism, results in inadequate stimulation of the thyroid gland. Similarly, insufficient release of thyrotropin-releasing hormone (TRH) from the hypothalamus can lead to tertiary hypothyroidism (Ettinger *et al.*, 2017) [5].

Conclusions

Comparatively higher incidences of dermatoses associated with hypothyroidism in dogs were observed in older aged dogs (>6 years), in males and Labrador retriever dogs. Most frequently observed clinical signs in dermatoses affected dogs associated with hypothyroidism were alopecia/hair fall, bradycardia, obesity, seborrhoea, lethargy, rat tailed appearance and pruritus. Dermatoses affected dogs associated with hypothyroidism showed significant increased values of ALT, cholesterol and triglyceride along with significant decreased Free T₄ and Total T₄ value than the healthy dogs.

Acknowledgements

The authors are thankful to Principal, College of Veterinary Science & A. H., KU, Navsari and Head of Department of Veterinary Medicine and Veterinary Clinical Complex for providing necessary facilities to conduct this study.

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