

Epidemiological Study on Hypothyroidism in Dogs in Egypt

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1. Abstract

Canine hypothyroidism is one of the common endocrinopathies in dogs. Clinical signs are variable as it's a multi-systemic disease. This study was carried out to investigate epidemiology of hypothyroidism in dogs regarding to clinical signs under effect of age, sex, season and breed and confirmation with evaluation of TT4. A total number of 441 dogs admitted to a private clinic in Cairo Governorate during the period of 2018 till 2020 were subjected to comprehensive clinical examination of which 82 hypothyroid dogs were recorded and incidence of different hypothyroidism features was evaluated.

Hypothyroidism showed higher incidence in middle aged dogs (1-5 years), in males compared to females, in autumn than other seasons, and in large dog breeds. TT4 levels in this study ranged between 0.5-1 µg/dl with mean 0.8 ± 0.017 . TT4 should be put in consideration during diagnosis of suspected cases related to dermatological, gynecological, otitis, CNS, tumors, dwarfism, cardiac, GIT, low BCS, obesity, eye and mixed signs. Special care should be associated with sharp decrease in TT4 in cases of CNS. The obtained data should be put under consideration in diagnosing of canine hypothyroidism and evaluation of clinical signs associated with it and therapeutic regimen to be applied for correction of such dysfunctions.

Key words: *Dogs, Hypothyroidism, Thyroxin TT4, Season*

2. Introduction

Canine hypothyroidism is identified as the low production of hormones of the thyroid gland [6, 15] and arises from any defect in any part of the hypothalamus pituitary thyroid axis [14, 20]. It is the most common thyroid disease in dogs during the past few years [2, 5, 15]. However, it is one of the most over diagnosed diseases [2, 21]. Canine hypothyroidism has multisystem involvement, though dermatological and metabolic features are the most common complaints encountered in practice [19].

Dermatological features include hair deformities, alopecia [11, 19, 24, 7]. Hyperkeratosis and hyperpigmentation of the skin [8, 7], pyoderma, malasezia, demodecosis or bacterial infections superficial or deep may ensue [7],

Pododermatitis [8]. Otitis externa, myxedema facial [17, 19].

Female gynecological problems have been linked with hypothyroidism, for instance infertility, persistent anoestrus, prolonged interestrus intervals and weak silent estrus [11, 19]. Parturition may be prolonged, weak uterine contractions, low puppies survival time, still birth, lower birth weight [17, 4, 19], galactorrhea [18, 19]. Although a decrease in libido and testicular atrophy [1, 12] were recorded, however, other reports recorded no impact on male reproductive system [17].

Other clinical signs include neuromuscular signs [17, 19], cardiovascular signs [9, 20], Ocular signs [23, 17, 15] were reported in hypothyroid dogs. Albeit uncommon, some dogs

presented with gastrointestinal signs [23, 17, 11, 19].

Hypothyroidism causes a decline in metabolic rate in dogs including lethargy, exercise intolerance, cold intolerance, and mental dullness [11, 13, 20]. Obesity and behavioral abnormalities like aggression and irritability may appear [10].

This study was carried out to investigate the epidemiology of hypothyroidism in dogs in Egypt including the effect of age, sex, season and breed with special reference to the variable clinical manifestations and laboratory evaluation of TT4 in such cases.

3. Materials and Methods

Animals:

Total number (No.) of 441 dogs were examined during the period of 2018 till 2020. These animals were admitted to a private clinic in Cairo Governorate, Egypt for various clinical manifestations. Of 441 dogs enrolled, only 82 dogs showed a reduction in TT4, 403 affected have features of hypothyroidism and 38 dogs clinically healthy showed no signs of disease consider as control group.

Animals were thoroughly examined and clinical signs and epidemiological data include age, sex, season and dog breeds were recorded.

Samples:

Blood samples were collected from the jugular or cephalic vein from each dog in lithium heparin cups or on plain tube for serum separation. Heparinized blood or serum were used to determine TT4 levels using veterinary specific kits (Catalyst total T4 slide) and Catalyst One Chemistry Analyzer, IDEXX laboratories, Inc, Westbrook, Maine, according to the manufacturer's instruction, for screening incidence of hypothyroidism in the examined dogs.

Statistical analysis:

Data are represented as Mean \pm SE, data set was compared using graphpad

PRISM, P value < 0.05 considered significant

4. Results

82 dogs were confirmed as hypothyroidism cases (20.34 %) and 38 clinically healthy dogs considered as control group.

Incidence of hypothyroidism under effect of age and sex in dogs (Table. 1) Hypothyroidism was mostly recorded in middle aged dogs (1-5) year (10.66%), followed by older dogs group (>5y) (7.94%). males showed higher incidence to hypothyroidism compared to female (10.91%) and (9.42%) respectively.

Hypothyroidism features in relation to age and sex in dogs are shown in (Table.1) dermatological signs were higher in the middle age group (3.47%) followed by over 5 years (2.72%). While mixed disorders were higher in age group higher than 5 years (2.97%) followed by middle age group (2.23%). In relation to sex, dermatological signs were higher in both sexes in male (3.97%) then female (2.97%) followed by mixed disorders Male affected higher than female (3.47%) and (2.23%) respectively. All gynecological signs appear in middle age group and recorded only in female (2.23%).

Incidence of hypothyroidism under effect of seasons in dogs (Table. 2). Hypothyroidism was mostly recorded in autumn (7.19%) followed by spring (5.45%) then winter (4.71%) and the lowest was in summer (2.97%). Hypothyroidism features in relation to season are shown in (Table.2) dermatological signs were higher in autumn (2.97%) and spring (2.48%). Mixed disorders were higher in autumn (2.23%) followed by summer and winter equally (1.24%) then spring (0.99%).

Incidence of hypothyroidism under effect of breeds of dogs (Table. 3) hypothyroidism was mostly recorded in large breeds (14.64%), followed by medium (2.23%), small (1.48%), giant and mini breeds equally (0.99%) respectively. Hypothyroidism features in relation to dog

breeds are shown in (Table.3) dermatological signs were the highest in large breed dogs (5.45%), while in giant, medium and small breeds was low (0.49%). Followed by gynecological signs in large breed dogs (1.98%), then medium breeds (0.24%) and not recorded in giant, small or mini breeds. Mixed disorders were the highest in large breeds (2.97%), then medium breeds (1.24%).

5. Discussion

Canine hypothyroidism is the most common thyroid disease in dogs during the past few years [2, 5, 15].

The results of clinical examination of the cases suspected to be suffering of hypothyroidism (Tables 1, 2, 3) revealed that dermatological features were the highest record as mentioned by [11, 6, 8, 19, 7].

It was interesting that 23 cases shows mixed hypothyroidism features which confirm that hypothyroidism is a multifactorial and multi systemic disease and manifestations are variable, every case has its own clinical signs and varies according to main causative agent and system affected [22, 16].

In epidemiological factors affecting hypothyroidism age, sex, season and dog breeds revealed that hypothyroidism is a middle aged disease, the total number in this study showed that incidence was the highest in middle age group (10.66%), followed by over 5 years (7.94%) as recorded by [23, 19] as beginning and severity of clinical signs depend on age of dog at the time of thyroid hormone deficiency. As mentioned by [17, 13] hypothyroidism is uncommonly in dogs less than 2 years of old our results showed incidence of (1.73%) in under 1 year group.

Regarding to effect of sex there is no sex predilection, male and female affected equally [3, 6, 19], but in our study male had higher incidence than female (10.91%) and (9.42%) respectively. Owner preference to raise male may be implicate in number of males examined in this study.

We found that seasons had significant effect on occurrence of hypothyroidism features in Egypt as autumn was with most recorded cases, Bruyette, 2020 [2] stated that no known environmental factors have been identified, otherwise Mooney; 2017 [17] mentioned that summer versus fall may influence prevalence of hypothyroidism via unknown mechanisms and Scott-Moncrieff; 2015 [23] found that it is highest in the summer and lowest in the winter. Results of effect breeds agreed with that mentioned by [17, 6] that pure breed dogs most commonly affected, but any breed can have it.

The confirmation of hypothyroidism regarding to TT4 values revealed that reduction in level of TT4 in relation to different features may affect other systemic functions as in case of CNS features followed by otitis then tumors then gynecological features.

6. Conclusion

Incidence of hypothyroidism is high in middle aged dogs (1-5 years), in males, in autumn, and in large dog breeds than others. At TT4 levels ranged between 0.63 to 1 µg/dl hypothyroidism should be put in consideration during diagnosis of suspected cases related to dermatological, gynecological, otitis, CNS, tumors, dwarfism, cardiac, GIT, low BCS, obesity, eye and mixed signs. Special care should be associated with sharp decrease in TT4 in cases of CNS. The obtained data should be put under consideration in diagnosing of canine hypothyroidism and evaluation of clinical signs associated with it and therapeutic regimen to be applied for correction of such dysfunctions.

7. References

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Table 1: Incidence of hypothyroidism under effect of age and sex in dogs

Hypothyroidism features (No.)	Age						Sex			
	< 1 year		1-5 year		> 5 year		F		M	
	No.	%	No.	%	No.	%	No.	%	No.	%
Dermatological (28)	3	0.74	14	3.47	11	2.72	12	2.97	16	3.97
Gynecological (9)	0	0	9	2.23	0	0	9	2.23	0	0
Otitis (5)	0	0	3	0.74	2	0.49	3	0.74	2	0.49
CNS (4)	1	0.24	3	0.74	0	0	2	0.49	2	0.49
Tumor (3)	0	0	1	0.24	2	0.49	0	0	3	0.74
Dwarfism (2)	0	0	1	0.24	1	0.24	1	0.24	1	0.24
Cardiology (2)	0	0	0	0	2	0.49	0	0	2	0.49
GIT (2)	1	0.24	1	0.24	0	0	1	0.24	1	0.24
Low BCS (2)	0	0	1	0.24	1	0.24	1	0.24	1	0.24
Obesity (1)	0	0	0	0	1	0.24	0	0	1	0.24
Eye (1)	0	0	1	0.24	0	0	0	0	1	0.24
Mix Disorders (23)	2	0.49	9	2.23	12	2.97	9	2.23	14	3.47
Total number (82)	7	1.73	43	10.66	32	7.94	38	9.42	44	10.91

Table 2: Incidence of hypothyroidism under effect of seasons in dogs

Hypothyroidism features (No.)	Season							
	Spring		Summer		Autumn		Winter	
	No.	%	No.	%	No.	%	No.	%
Dermatological (28)	10	2.48	2	0.49	12	2.97	4	0.99
Gynecological (9)	1	0.24	0	0	3	0.74	5	1.24
Otitis (5)	2	0.49	0	0	2	0.49	1	0.24
CNS (4)	1	0.24	1	0.24	1	0.24	1	0.24
Tumor (3)	2	0.49	1	0.24	0	0	0	0
Dwarfism (2)	1	0.24	0	0	1	0.24	0	0
Cardiology (2)	0	0	1	0.24	0	0	1	0.24
GIT (2)	0	0	1	0.24	1	0.24	0	0
Low BCS (2)	1	0.24	0	0	0	0	1	0.24
Obesity (1)	0	0	1	0.24	0	0	0	0
Eye (1)	0	0	0	0	0	0	1	0.24
Mix Disorders (23)	4	0.99	5	1.24	9	2.23	5	1.24
Total number (82)	22	5.45	12	2.97	29	7.19	19	4.71

Table 3: Incidence of hypothyroidism under effect of dog breed

Hypothyroidism features (No.)	Giant Breeds		Large Breeds		Medium Breeds		Small Breeds		Mini Breeds	
	No.	%	No.	%	No.	%	No.	%	No.	%
Dermatological (28)	2	0.49	22	5.45	2	0.49	2	0.49	0	
Gynecological (9)	0		8	1.98	1	0.24	0		0	
Otitis (5)	0		5	1.24	0		0		0	
CNS (4)	0		2	0.49	0		0		2	0.49
Tumor (3)	0		3	0.74	0		0		0	
Dwarfism (2)	0		2	0.49	0		0		0	
Cardiology (2)	0		1	0.24	1	0.24	0		0	
GIT (2)	0		1	0.24	0		0		1	0.24
Low BCS (2)	0		1	0.24	0		1	0.24	0	
Obesity (1)	0		1	0.24	0		0		0	
Eye (1)	0		1	0.24	0		0		0	
Mixed Disorders (23)	2	0.49	12	2.97	5	1.24	3	0.74	1	0.24
Total number (82)	4	0.99	59	14.64	9	2.23	6	1.48	4	0.99

Table 4: Total Thyroxine (TT4) in healthy and hypothyroid dogs

Hypothyroidism features (No.)	Range and mean \pm SE
Dermatological (28)	(0.5-<1) 0.86 \pm 0.02
Gynecological (9)	(0.6-<1) 0.75 \pm 0.04
Otitis (5)	(0.6-<1) 0.72 \pm 0.07
CNS (4)	(0.5-0.8) 0.63 \pm 0.08
Tumor (3)	(0.5-<1) 0.73 \pm 0.15
Dwarfism (2)	(0.8-0.9) 0.85 \pm 0.05
Cardiology (2)	(0.8-0.9) 0.85 \pm 0.05
GIT (2)	(0.8-0.9) 0.85 \pm 0.05
Low BCS (2)	(0.7-<1) 0.85 \pm 0.15
Obesity (1)	0.9
Eye (1)	<1
Mixed Disorders (23)	(0.5-<1) 0.78 \pm 0.041
Over all hypothyroidism mean	(0.5-<1) 0.8 \pm 0.017 *
Control group(38)	(1-3.8) 2.15\pm 0.11

* P value \leq 0.0001