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Evaluation of Serum Biochemical Profile of Kidney Disorders in Canine

M. P. Veena[1*], K. Nagarajan[1], S. Vairamuthu[2], S. Subapriya[4], H. Dhanalaksmi[5], G. P. Kalmath[6], H. S. Shwetha[7] and K. Megaha[8]

[1]Department of Physiology, [2]Department of Pathology, Department of Veterinary Physiology Veterinary College, Hassan, KVAFSU, India

**Corresponding author*

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A B S T R A C T

Renal failure is a predominant cause of mortality in pets irrespective of the type of the feed they are fed with. The commercial protein rich diet, homemade diet and feeding methods along with many infectious diseases predispose the pets to renal related problems/disorders. The study was designed to record the incidence of kidney disorders based on the biochemical profile in the dogs that did not exhibit any clinical symptoms. Diagnosis in the earlier stages of the renal disease would aid to undertake the appropriate therapy at the earliest. Blood urea nitrogen (BUN) and creatinine are the two most commonly utilized indicators of renal damage. BUN and creatinine values begin to rise slightly with the loss of the renal function, although BUN elevation of non-renal origin occurs, values seldom exceed 50mg/dL as a result of non-renal causes. Serum phosphorus levels are often not elevated in cases of juvenile renal disease as the reduction in renal function progress slowly so that the puppy could compensates to retain normal serum phosphorus levels. After analyzing the available records it was found that about 75% of renal function would be lost even before the elevation is detectable. Although BUN and creatinine levels were often greatly elevated, serum phosphorus levels were increased in about 50% of cases only, BUN and creatinine levels were the good indicators of renal problems when compared other parameters.

Introduction

Clinical biochemistry in nephrology is mainly used to diagnose and monitor renal dysfunction/damage. Kidney function can be ascertained from the components of plasma that mainly depends on their elimination rate (e.g. creatinine, BUN and phosphorus). These indirect markers can be easily and rapidly measured to ascertain the renal function as against the direct measurements like GFR and renal clearance tests (Seegmiller *et al*., 2018). The frequency of renal disease increases with age, especially in dogs and cats like human beings (Gobar *et al*., 1998)

Direct kidney function tests are time consuming and are based on elimination kinetics of markers of glomerular filtration, blood flow, or tubular reabsorption / secretion

and clearance concept (Guyton and Hall, 2006). However, the serum biochemical parameters are simple, reliable and non invasive protocols that can be done under field conditions to identify renal disorders. Hence a study was designed to record the number cases suffered with renal ailments using available biochemical profile. The examination of blood chemistry profile helps to determine whether the kidneys are functioning normally or not. Among the common blood chemistry profiles used the blood urea nitrogen (BUN), creatinine, phosphorus and calcium are of great importance in identifying the kidney disorders as the results of routine blood serum biochemical profile are early indicators of renal disease.

The study was aimed at identifying the incidence of kidney disorder cases in dogs that did not exhibit any clinical signs, based on serum biochemical profiles. Diagnosis of renal ailments in early stages of disease with the help of biochemical profile would aid in early ignition of treatment. Therapeutic intervention at earlier stages of disease will provide a better and favorable prognosis and thus ameliorate the sufferings of pet animals. Hence a study was undertaken with the following objectives:

To study the prevalence status of kidney disorders in dogs.

To identified the risk factors including advancing age, specific breeds and sex.

To mathematically analyze the collected data and make interpretations.

Materials and Methods

A study was designed to screen the prevalence of kidney disorders in dogs admitted between December 1, 2013 and June 31, 2014, from all the available patient records (PRs) of Centralized Clinical Laboratory. Totally the patient records of 183 animals were screened for the renal ailments.

Variations in the biochemical parameters of cases with history of kidney disorders were thoroughly screened. Elevated serum biochemical parameters truly indicative of kidney disorders were also analyzed from other cases with no salient history of kidney disorder. Data was then further analyzed to identify the associated risk factors of kidney disorders like advancing age, specific breeds and sex.

Results and Discussion

Out of the 183 animals screened for kidney disorder, males were the more frequently presented sex accounting for 117 (63.93 %) cases. The number of females were 66, accounting for 36.06 % of the cases recorded (Fig.2.). This is in agreement with the findings of Neill *et al*., (2013) and Akshay Dwarakanath (2000).

Among the breeds 48 cases belonged to Labrador breeds (39.3 %) followed by Spitz (19.65 %) and Mongrels (15.38 %). The least were Lhasa apso (0.85 %) and Cocker spaniel (1.7%) (Table 1 and Fig. 1). This is in agreement with Akshay Dwarakanath. 2000 who has also reported more incidence of kidney disorders in Spitz breeds. Labrador and Spitz are the two breeds accounting for the major percentage of the canine population in and around Chennai and have comparatively a longer life span over other breeds (Fig 1. and Fig 3). This could be attributed to the greater incidence of kidney disorder in these breeds.

On age wise comparison more animals fell in the age group of more than eight years (39.89 %) followed by 2-4 years (32.78), 5-7 years (22.95 %) and less than one year (2.73%) respectively, in descending order (Table 2 and

Fig.4). In this study we found that the increased level of serum urea nitrogen and creatinine even in animals that showed no clinical signs of kidney disorder. Increased BUN and creatinine values indicated a slight impairment of the renal function, but the values did not exceed the reference range until more than 25% of renal function is lost. This is in agreement with Schrein and Maher (1961) and Treacy *et al*., (2019).

Table.1 Sex wise distribution of dogs affected with kidney disorder

Sl. No.	Breed	Male	Female
1	Lhasa apso	00.85	03.03
2	Boxer	01.70	04.54
3	Rottweiler	03.41	03.03
4	Labrador	39.31	33.33
5	Spitz	19.65	33.33
6	Daschund	06.83	-
7	Cockerspaniel	01.70	01.51
8	Pug	03.41	03.03
9	Doberman	02.56	03.03
10	Germanspherd	02.56	03.03
11	Great dane	02.56	01.51
12	Mongrels	15.38	16.66

Table.2 Age wise distribution of percentage of dogs affected with kidney disorder

Sl. No.	Breed	< 1 year	2-4 years	5-7 years	>8years
1	Lhasa apso	-	-	02.38	02.74
2	Boxer	-	06.66	-	01.37
3	Rottweiler	20	03.33	02.38	02.74
4	Labrador	40	53.33	40.47	23.28
5	Spitz	-	06.66	21.42	34.24
6	Daschund	-	03.33	04.76	05.47
7	Cocker spaniel	-	01.66	-	02.74
8	Pug	-	06.66	02.38	01.36
9	Doberman	-	01.66	02.38	04.11
10	German shepard	-	05.00	-	02.74
11	Great dane	-	05.00	02.38	-
12	Mongrels	20	06.66	21.42	19.17

Fig. 1: Total number of animals affected with renal orders in each breed

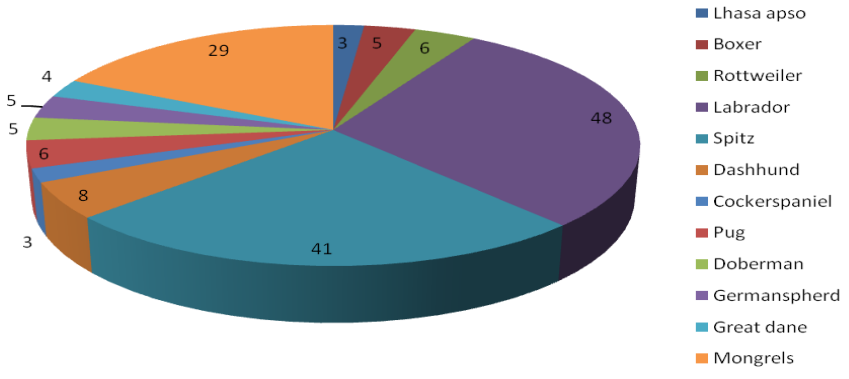


Fig.2 : Percentage of male dogs with renal disorders.

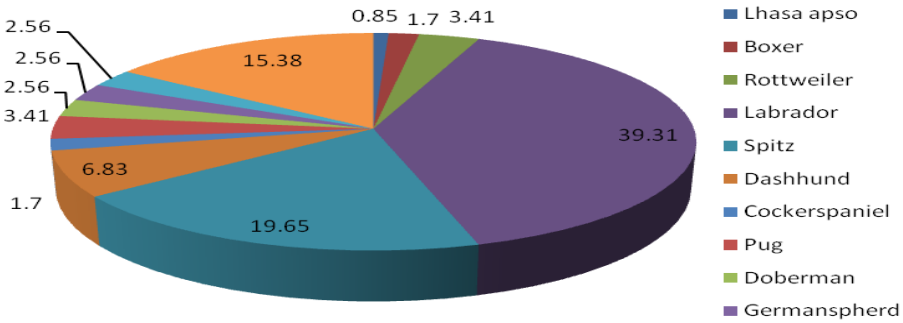
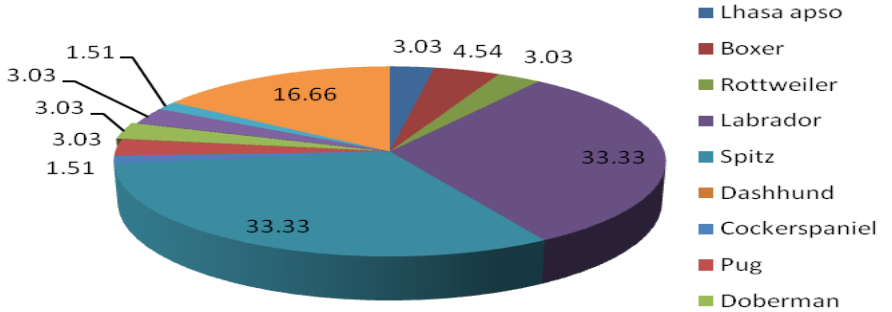


Fig.3 : Percentage of female dogs with renal disorders.



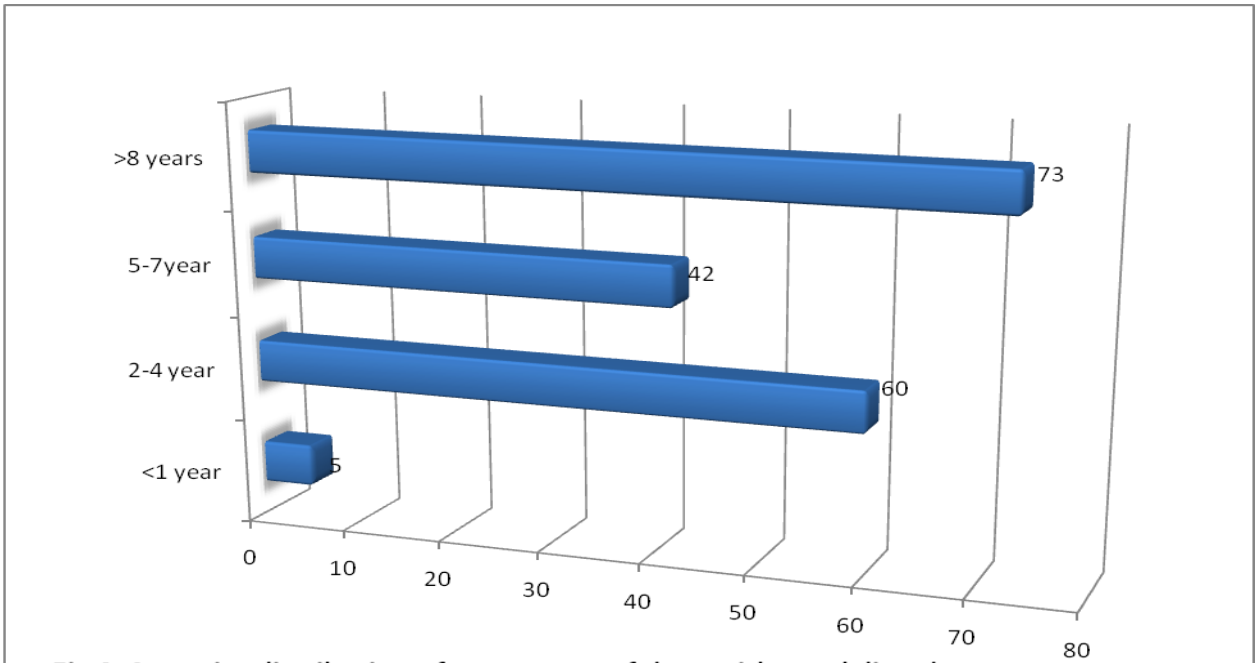


Fig 4: Age-wise distribution of percentage of dogs with renal diosrders.

Few of the animals presented with history of mammary tumor, ascitis, urinary caliculi, perineal hernia, epistaxis, weight loss, preoperative check up, post operative check up, general check up etc. also showed elevated serum levels of BUN, creatinine and phosphorus which truly indicated the kidney disease. This reflects that actual kidney disorders signs will be exhibited only when more than 75 % nephrons stop functioning (McMaw *et al.,* 1989). Jackson **(**1964) reported that in different types of uremia *viz*., pre-renal, primary renal and post renal uremia, abnormal level of BUN ranged from 80 to 380 mg/dL. In this study the BUN values fell within this range.

BUN and creatinine values begin to rise slightly as renal function is lost, but do not exceed the reference range until only 25% of renal function remains. BUN and creatinine levels were often greatly elevated; serum phosphorus levels were increased in only about 50% of cases. Hyperphosphatemia is not typically associated with clinical signs, but high concentrations leading to an elevated calcium **x** phosphorous product (>50) may contribute to soft tissue mineralization (McMaw *et al*., 1989).

In conclusion, the results of this study increase the awareness of various risk factors involved in kidney disorders. Further, thirsts the significance of biochemical study has a routine for a majority of the cases to improve the animal survival and welfare by diagnosing cases without overt clinical signs of renal disorders.

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