RESEARCH ARTICLE

Epidemiological Aspects of Renal Disorders in Dogs at South-Saurastra Region of Gujarat- A Prospective Study

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ABSTRACT

Background: Kidney plays a major role in eliminating metabolic wastes from body, in maintaining acid-base balance and production of hormones. Due to their anatomic and physiologic features, kidneys are most susceptible to toxicity and ischemia. No study has been carried out to assess the renal disorders in dog in this region. Hence, the epidemiological study was carried out to record renal disorders in dogs at Junagadh.

Methods: The assessment of the incidence of renal disorders in dogs was performed in the hospital cases presented at Veterinary Clinical Complex, COVSAH, KU from September 2022 to August 2023. A total of 2850 caseloads of dogs with different ailments were screened, out of which 170 dogs were diagnosed as renal disorders based on clinical presentation, hematology, serum biochemistry, urine analysis and nephrosonography.

Result: The overall incidence of renal disorders in dogs was 5.96%. The higher occurrence of renal disorders was noted in age group of 6-8 years (9.62%) and males (6.61%). The dog breeds that were found higher incidence were Labrador retriever (9.68%) followed by German shepherd (7.24%). Month and Season wise higher incidence was recorded in the month of October (10%) of monsoon (7.61%) season. The highest recorded incidence of renal disorder was nephritis and renal failure (AKI/CKD) (each 35.88%).

Key words: Age, Breed, Junagadh, Renal disorder, Season, Sex.

INTRODUCTION

The body's essential kidneys carry out a variety of tasks to keep the system in balance. Because of their distinct anatomical and physiological characteristics, as well as their transport tasks and high metabolic rates, kidneys are vulnerable to ischemia and toxicants. In dogs, renal dysfunction is a prevalent issue that contributes significantly to morbidity and mortality. It always requires emergency attention and treatment since it is life-threatening. The loss of over 75% of the kidney's functional unit (nephrons) is attributed to renal failure. It is frequently too late to save the canines when they receive a diagnosis.

Renal diseases are most common clinical problems, occurring upto 2-5% of dogs (Katoch *et al.*, 2017) and considered as the third leading cause of death (Sosnar *et al.*, 2003). Incidence has been ever increasing as seen from by various authors reporting renal failure as 1.16 per cent (Chand *et al.*, 2024), 2.65 per cent (Pathak *et al.*, 2023), 11.9 per cent (Sosnar *et al.*, 2003) and 12.03 per cent (Nabi *et al.*, 2018). According to a study, renal failure is observed at a high rate of 49.58 per cent in dogs of geriatric age group *i.e.* more than 8 years of age (Tufani *et al.*, 2015). Differences in study design may also explain the variation in occurrence rates (Chand *et al.*, 2024).

The clinical manifestations of renal disorders are multifaceted, which can lead to challenges in diagnosis. The prevalence of various clinical indicators in renal disorders is contingent upon the level of renal impairment, the presence of azotemia and the overall health status of affected canines. Renal disorders have become a significant

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threat to dogs in recent years due to the challenge of timely detection. Often, these disorders are only identified once irreversible kidney damage has occurred, resulting in substantial illness and death (Chand *et al.*, 2024). Epidemiological database regarding renal disorders in dogs is lacking in this area. Hence, this is the first ever study planned to generate baseline database, key trends and challenges in the diagnosis and management of renal disorders in this geographical area, offering insights for veterinary practitioners and public health initiatives.

MATERIALS AND METHODS

A total of 2850 clinical cases of dogs presented at Veterinary clinical Complex (VCC), College of Veterinary Science and Animal Husbandry, Kamdhenu University, Junagadh, Gujarat, India during the study period September 2022 to August 2023 were screened for renal disorders.

Study plan

The clinical cases of dogs presented at VCC during the study period were screened for renal disorders by employing detailed physical examination, haemato-biochemistry, blood smear examination, urinalysis, radiography and ultrasonography. The confirmed cases of renal failure were further analyzed to assess epidemiological parameters *i.e.* Age (0-2, 2-4, 4-6, 6-8, 8-10 and >10 years), Gender (Male/Female), Breed, Month (January to December) and Season (summer, monsoon and winter). The data are presented in either number or percentage.

Diagnosis of renal disorders

Clinical examination

All the animals underwent a clinical examination, gathering comprehensive information about the general condition, clinical signs and vital parameters, *i.e.* rectal temperature, heart rate, respiration rate, the colour of the conjunctival mucus membrane, size of lymph nodes, capillary refilling time and dehydration percentage, were recorded during the examination. A physical examination was carried out by palpation for assessment of abnormities related to the urinary system, *viz.* abdominal pain, enlargement of the urinary bladder, swelling over the prepusal region, tissue growth over the genital organ and micturition pattern (oliguria, straguria, hematuria or hemoglobinuria, anuria and dribbling of urine/urinary incontinence).

Sample collection

Blood samples were collected in a sterile anticoagulant vial containing ethylene diamine tetra acetic acid (K3EDTA) and clot activator vial from clinical cases as well as healthy animals were subjected to analysis to compare the alterations in affected dogs. The collection of urine samples from dogs was carried out as per the standard method described by Sink and Weinstein (2012) depending on the clinical manifestation of renal dysfunction by either of these procedures: Collection of freshly voided urine sample or Collection of the urine sample by gentle compression of the urinary bladder or collection of urine by use of a urinary catheter in cases with urinary incontinence, obstruction or dribbling.

Sample analysis

A complete hemtobiochemical analysis was carried out by automated machines. In addition a physical and semi-quantitative urinalysis was performed by dip-stick method followed by analysis by URISCAN machine.

Nephrosonography

EXAGO B-mode ultrasound machine was used to perform a nephrosonogram. A convex probe with 3.5 MHz, 5 MHz and 7.5 MHz frequencies was used for large, medium and small dogs, respectively. The echogenicity of the identifiable lesion was classified on the basis of grayscale 2-dimensional images, subjectively. A standard procedure was used for ultrasonography includes: Clipping of hair on the entire abdomen, positioned either on its side or its back and a generous amount of coupling gel was applied to ensure good contact. Standard mid-sagittal and mid-transverse planes were obtained as per the established protocol. The grayscale 2-dimensional images were used to identify lesions and the echogenicity of these lesions was classified as usual, increased (hyperechoic), decreased (hypoechoic), or absent (anechoic) compared to the regular echo pattern for canine kidneys (Walter *et al.*, 1987).

RESULTS AND DISCUSSION

In the present investigation, 2850 dogs presented at the Veterinary Clinical Complex were screened for renal disorders from September 2022 to August 2023. Out of 2850 dogs, 170 dogs were suffering from renal disorders. 170 dogs, various clinical abnormalities were observed and the most common signs were weakness/apathy, vomiting, oliguria to polyuria, dehydration and melena in 118 dogs. Subsequently, other signs like ataxia, roupy salivation, ascites and arrhythmia was evident. In addition, some dogs reported to be having petechiae, recumbency, prostration, epilepsy and pleural effusions. The vital parameters like rectal temperature (103.1±0.49 °F) Heart rate (138.7±2.61 beats/min), respiration rate (34.44±2.1 breaths/min) and capillary refilling time (1.2±0.23 sec) in affected animals showed elevation in values but was in normal reference range.

Age wise distribution

Age wise distribution is depicted in Table 1. The overall incidence of renal disorders was 5.96 per cent. Only 1 dog (0.27%) was having renal disorders in the age group of 0-2 year while 28 dogs (5.31%) were having renal disorder in the age group of >10 years. An increase in the incidence of renal disorder was noted with advancement of age as 28 dogs (7.35%), 37 (8.42%) and 56 (9.62%) in the age groups of 2-4, 4-6 and 6-8 years, respectively. The higher incidence

Table 1: Age-wise distribution of renal disorders in dogs.

Age group	Total no. of cases	No. of affected dogs	Percentage of incidence
0-2	373	01	0.27
2-4	381	28	7.35
4-6	439	37	8.42
6-8	582	56	9.62
8-10	548	48	8.76
> 10	527	28	5.31
	2850	170	5.96

of renal disorders was observed in dogs of age group 6-8 years followed by 8-10 years.

These findings was in corroborate with Karunanithy *et al.* (2019) who reported higher incidence rate of kidney diseases in the 6-8 years age group. Sahu *et al.* (2021) recorded the highest prevalence of renal disorders in dogs aged 5-10 years (54.29%) followed by dogs belonging 18 months to 5 years (24.29%) and belonging more than 10 years of age (15.71%).

The incidence of renal disorders is increased with the advancement of age (Nabi *et al.*, 2018; Meena *et al.*, 2022; Ahmed *et al.*, 2023; Chand *et al.*, 2024) while Mshelbwala *et al.* (2016) opinioned that senile age could be a precipitating factor in renal failure. As age increases, their kidney function may decline due to reduced blood flow and a depletion of nephrons. Additionally, the resorption mechanisms within the nephrons may become compromised. These factors can heighten the risk of developing renal dysfunction.

Gender-wise distribution

Table 2 suggest that male dogs had a slightly higher incidence of the health condition compared to female dogs (6.61% vs. 5.17%). The present observation is lined well with findings of (Tufani *et al.*, 2015; Katoch *et al.*, 2017; Sahu *et al.*, 2021; Meena *et al.*, 2022; Ahmed *et al.*, 2023 and Chand *et al.*, 2024).

However, it differs from the findings of and Bhojne *et al.* (2016) and Bouillon *et al.* (2018) who reported a higher incidence of females than males in similar cases. The reason could be environmental variables, rather than hormonal factors, may have contributed to the predisposition to renal disorders Mshelbwala *et al.* (2016) while Kandula and Karlapudi (2014) concluded higher incidence in female dogs might be due to various unhygienic management practices during the puerperal stage that may lead to genital infection and may progress as urogenital complaints. Understanding gender-specific risks can be crucial for veterinarians and pet owners. It may influence screening protocols, treatment strategies and overall health management for dogs. However, further analysis and consideration of factors such as population demographics and potential risk factors should be consider to enhance the understanding of these findings.

Breed-wise distribution

The study found that the Labrador retriever breed has one of the highest incidence rates of renal disorders, with 9.68% of the 558 presented dogs being affected (Table 3). German Shepherds had a slightly lower incidence rate of 7.24%, while smaller breeds like Pomeranians and Pugs had lower incidence rates of 3.64% and 3.92%, respectively. Dalmatians and Lhasa Apsos had no affected dogs in the data set, indicating their remarkable health resilience. This finding was no longer differ from other researcher who found higher incidence in Labrador retriever breed of dog.

i.e. (Tufani *et al.*, 2015; Katoch *et al.*, 2017; Sahu *et al.*, 2021; Ahmed *et al.*, 2023 and Chand *et al.*, 2024).

Due to friendly and gentle temperament, obedience, agility, adaptable to different living environments, Labradors are making them great family pets and companions. In the present investigation, the higher incidence could be due to higher number of dogs presented during study period. This data can be useful for veterinarians, researchers and breeders in managing and addressing health concerns in different breeds and understanding the prevalence of certain conditions or diseases within specific dog breeds.

Month-wise distribution

The data of Table 4 indicates variability in monthly incidence rates, with peaks observed in October (10.0%), September (9.1%) and August (8.5%). Conversely, lower incidence rates were noted in June (3.7%), February (4.1%) and December (4.2%). Currently, there is a dearth of information on the monthly incidence of renal disorders among canines. Hence, this could be first ever study to elucidating month wise incidence. The fluctuations in monthly incidence rates suggest potential seasonal, environmental, or demographic influences on the prevalence of renal disorders in dogs. Factors such as climate changes,

Table 2: Gender-wise distribution of renal disorders in dogs.

Gender	Total presented	No. of affected dogs	Incidence percentage
Male	1574	104	6.61
Female	1276	66	5.17
	2850	170	

Table 3: Breed-wise distribution of renal disorders in dogs.

Breeds	Total presented	No. of affected dogs	Incidence percentage
Labrador retriever	558	54	9.68
German shepherd	414	30	7.24
Pomeranian	498	18	3.64
Pug	102	04	3.92
Shih Tzu	18	01	5.56
Great dane	54	02	3.70
Non-descript	574	39	6.79
Rottweiler	68	02	2.94
Doberman	59	02	3.39
Dalmatian	11	00	0
Goldern retriever	40	02	5.0
Lhasa apso	19	00	0
Saint bernard	61	03	4.92
Spitz	374	12	3.20
	2850	170	5.96

exposure to allergens and variations in dog population dynamics may contribute to these patterns.

Season-wise distribution

Seasonal variations in disease incidence have been documented in various species, including dogs. However, limited research has focused on how seasonal changes impact the prevalence of renal disorders among dogs. This study aims to fill this gap by analyzing data collected over twelve months, categorized into three distinct seasons, to elucidate seasonal patterns in renal disorders among dogs. The data indicate a clear seasonal variation in renal disorders among dogs (Table 5). The Monsoon season shows the highest incidence rate at 7.61%, followed by summer at 5.64% and winter at 5.03%. These findings suggest a potential influence of seasonal factors on the prevalence of renal disorders across different breeds. The higher incidence rates observed during the Monsoon season may be attributed to environmental factors such as increased humidity, changes in allergen exposure, or seasonal variations in infectious agents.

Renal disorders

The data reveal that nephritis and renal failure (AKI/CKD) are the most prevalent renal disorders among the studied dogs, each accounting for 35.88% of cases. Cystitis and urolithiasis also show notable percentages at 10% and 6.47%, respectively. Other renal disorders such as UTI, urethritis, polycystic kidney disease, hydronephrosis and tumors have lower but still significant prevalence rates within the sample population (Table 6).

The present observation were in agreemnt with Vijay Kumar *et al.* (2011) who reported that Nephritis, urolithiasis, end stage kidney and hydronephrosis were the more common renal disorders among dogs. Whereas, Ji-Young *et al.* (2010), reported that urolithiasis (24.30%) and nephritis (22.9%) were the common renal disorders in dogs. Present findings were opposite to Katoch *et al.* (2017) who reported 4.74 per cent (108/2277) renal disorders while Chaitanya *et al.* (2020) noted overall occurrence of renal affection was 3.48% (318/9347). Of 318 affected dogs, 58 (18.24%) suffered with acute kidney injury, while 260 (81.76%) were of chronic kidney disease. Gupta *et al.* (2021) recorded 14 dogs with signs of renal failure while 18 were of urinary obstruction. Kumar *et al.* (2022) studied 576 geriatric dogs and noted 81 dogs had signs suggestive of renal diseases. Amongst, 52 cases diagnosed for different lower urinary tract disorders *viz.*, cystitis (n=22), cystic calculi (n=13), prostate infection (n=8), transitional cell carcinoma (n=5) and both calculi with cystitis (n=4). This might be due to increased urbanization and environmental pollution, unscientific feeding and indiscriminate use of therapeutic agents (Katoch *et al.*, 2017). The variations in the occurrence could be due to several extrinsic factors

like variations in geographical, environmental and manage mental practices or differences in sample size. The high prevalence of nephritis and renal failure underscores the importance of early detection, proper management and targeted interventions for these conditions in dogs. Factors contributing to the incidence of these disorders, such as breed predispositions, environmental influences and underlying health conditions, merit further investigation.

Table 4: Month-wise distribution of renal disorders in dogs.

Month	Total presented	No. of affected dogs	Incidence percentage
September	209	19	9.1
Oct	130	13	10
Nov	217	15	6.9
Dec	311	13	4.2
Jan	275	15	5.5
Feb	271	11	4.1
Mar	296	13	4.4
Apr	211	16	7.6
May	253	18	7.1
June	215	08	3.7
July	238	10	4.2
Aug	224	19	8.5
	2850	170	

Table 5: Season-wise distribution of renal disorders in dogs.

Breeds	Total presented	No. of affected dogs	Incidence percentage
Winter (Nov-Feb)	1074	54	5.03
Summer (Mar-Jun)	975	55	5.64
Monsoon (Jul- Oct)	801	61	7.61
	2850	170	

Table 6: Distribution of renal disorders in dogs.

Renal disorder	No. of dogs affected	Percentage
Nephritis	61	35.88
Urinary tract infection (UTI)	10	5.88
Cystitis	17	10
Urolithiasis	11	6.47
Renal failure (AKI/CKD)	61	35.88
Urethritis	2	1.17
Polycystic kidney disease	1	0.6
Hydronephrosis	1	0.6
Tumour	6	3.52
Total	170	100

CONCLUSION

Canine renal disorders, a medical condition affecting the kidneys of dogs, are a significant concern that requires attention from pet owners and veterinary professionals. Early detection and intervention can mitigate these disorders' adverse effects and improve the affected dogs' quality of life. Therefore, it is critical to have a comprehensive understanding of the signs, symptoms and risk factors associated with such disorders. Pet owners should be vigilant in monitoring their dogs for any signs of renal disorders, such as changes in urination patterns, weight loss, or loss of appetite. Veterinary professionals can provide valuable guidance in managing these conditions through appropriate diagnostic testing, treatment and ongoing monitoring. By working together, pet owners and veterinary professionals can ensure the best possible outcomes for canine patients with renal disorders.

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Conflict of interest

The authors declare no conflicts of interest.

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