RESEARCH ARTICLE

Canine Prostatic Disorders: A Comprehensive Pathophysiology and Clinical Management

Pratyastha Singh[1], Aditya Prasad Acharya[1], Anjan Kumar Sahoo[2]*, Chinmoy Mishra[3], Arpita Mohapatra[4], Susen Kumar Panda[1]

Abstract

In small animal practice, diseases that affect the canine prostate gland are very common. Benign prostatic hyperplasia, prostatitis, prostatic cysts, and prostatic neoplasia are the most prevalent disorders affecting the canine prostate. Clinical indications linked with each of these illnesses often coincide. Consequently, it is necessary to establish a firm diagnosis prior to treatment. The most reliable and efficient method for diagnosing prostatic conditions in dogs is through ultrasonography. Ten dogs (2.82%) with prostatic illnesses were found out of 355 male dogs that were screened at the Veterinary Clinical Complex, OUAT, Bhubaneswar. Common clinical symptoms recorded were tenesmus, dysuria, and haematuria in dogs that were between the ages of 5 and 13 years. Radiography, ultrasonography, cytology, microbiological analysis, urinalysis, and haemato-biochemical analysis were performed to confirm the disease to be of prostatic origin. Survey abdominal (lateral and VD) radiography and pneumocystography showed prostate size >50% of pelvic inlet and around 90% in prostatic abscess and tumors. In B-mode abdominal ultrasonography images, anechoic, hypoechoic and homogenous area of echoes were visualized in cases of prostatic cyst, prostatic abscess, and benign prostatic hyperplasia respectively. Urine culture from affected animals in nutrient agar showed growth of *E. coli* colony and was responsive to Nitrofurantoin antibiotic disc. This study emphasizes the effectiveness of castration in treating canine prostatic illnesses as well as the use of ultrasonography in identifying disorders of the prostate gland providing an appropriate strategy for future treatment.

Key words: B-mode ultrasonography, Fine needle aspiration cytology, Prostate, Prostatic hyperplasia, Radiography

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Introduction

In male dogs, the prostate gland is a vital accessory sex organ that is crucial to both reproductive health and general wellbeing. In older male dogs, prostate illnesses such as prostatitis, prostatic neoplasia and benign prostatic hyperplasia (BPH) (Barsanti and Finco, 1986; Angrimani *et al*., 2020; Derakhshandeh *et al*., 2025) are common and can have a major negative influence on their quality of life. The health and fertility of the animal may be jeopardized by these disorders, which frequently present with clinical symptoms such as preputial discharge, haematuria, haemospermia and dysuria. Dogs are an excellent model for studying prostate disorders because of the remarkable similarities in the appearance, histology, physiology, and function of the canine and human prostate glands. In order to improve breeding results, ensure animal welfare, and inform human prostate health, it is essential to comprehend the etiopathogenesis, diagnosis, and treatment of prostate illnesses in dogs.

Very few thorough investigations have been conducted on the clinico-haemato-biochemical and pathological changes linked to prostate illnesses in dogs, especially in the Indian subcontinent, despite the importance of these conditions in veterinary medicine (Gautam *et al*., 2019; Palmieri *et al*., 2022). By examining the prevalence, clinical presentation, and diagnostic value of several investigative modalities, such as ultrasonography, radiography (Atalan *et al.,* 1999; Debiak and Balicki, 2009; Abdulla, 2014), haemato-biochemical analysis, and cytological evaluation, in dogs with prostate diseases, this study seeks to close this information gap. The present study describes advance knowledge of

[1]Department of Pathology, College of Veterinary Science & Animal Husbandry, Odisha University of Agriculture and Technology (OUAT), Bhubaneswar-751003, India

[2]Department of Veterinary Surgery & Radiology, College of Veterinary Science & Animal Husbandry, OUAT, Bhubaneswar-751003, India

[3]Department of Animal Genetics and Breeding, College of Veterinary Science & Animal Husbandry, OUAT, Bhubaneswar-751003, India

[4]ICAR- Central Institute for Women in Agriculture (CIWA), Bhubaneswar-751003, Odisha, India

Corresponding Author: Dr. Anjan Kumar Sahoo, Assistant Professor, Department of Veterinary Surgery & Radiology, College of Veterinary Science & AH, OUAT, Bhubaneswar-751003, India. e-mail: aksahoo@ouat.ac.in

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canine prostate disorders, guide evidence-based veterinary care and shed light on human prostate health with an aim to improve treatment outcomes, increase diagnostic precision, and advance animal welfare by examining the intricate interactions among them in canine prostate disorders.

Materials and Methods

In order to assess prostate gland problems in dogs, the current study was carried out in and around Bhubaneswar during March to October 2024. Tenesmus, ribbon-like feces, dysuria, haematuria, preputial discharge, and irregular gait were among the clinical indicators used to screen 355 male dogs presented to the Veterinary Clinical Complex (VCC), College of Veterinary Science and Animal Husbandry, OUAT, Bhubaneswar (India). Age, breed, body weight, and overall health were all noted. 16 suspected cases were found through initial screening using history, clinical examination, and per rectal palpation. These cases were then subjected to confirmatory diagnostics, such as radiography, ultrasonography, prostatic fluid cytology, haemato-biochemical analysis, urinalysis, culture, and sensitivity tests.

Using conventional procedures blood samples were drawn from the cephalic vein for haematological (Hb, PCV, TLC, DLC) and biochemical (BUN, creatinine, AST, ALT, ALP, total protein, albumin) tests. Urine samples were taken aseptically and their physical, chemical, microscopic and bacteriological characteristics were examined. When necessary, a fine needle aspiration biopsy was carried out for cytological analysis. The size, shape, and internal architecture of the prostate were evaluated using radiography and ultrasonography. Ten cases (2.82%) of uncastrated dogs, including seven Labrador Retrievers, two German Shepherds, and one Pomeranian, were diagnosed with prostatic diseases based on confirmatory findings.

Haematological, biochemical, urine, and prostatic data were compared before and after treatment with surgical castration and antibiotic therapy. Nitrofurantoin tablet was administered orally at 8 h intervals @ 4.4 mg/kg body weight for 7 days in prostatic abscess. In addition, Enrofloxacin injection @ 2.5 mg/kg body weight at 12 h intervals, Erythromycin injection @ 10 mg/kg body weight were administered in bacterial infection like *Escherichia coli* which acts more effectively by crossing blood-prostate barrier due to higher pH than prostatic fluid.

Results and Discussion

The current study highlights the multifaceted character and diagnostic complexity of canine prostatic illnesses by offering a thorough assessment of the pathological and clinico-haemato-biochemical changes linked to these conditions. The clinical signs observed in 10 affected dogs were tenesmus (10), dysuria (10), fecal impaction (8), ribbon-like feces (8), haematuria (7), preputial discharge and frequent urination (6 each), and painful prostate and irregular gait (3 each). In animals exhibiting above clinical symptoms, preclinical assessment was done through haemato-biochemical analysis, urine routine microscopic, culture and sensitivity tests, radiographic images of prostatic and urinary bladder affections, and ultrasonographic echogenic changes within the prostate in diseases such as prostatic cysts, prostatic abscess, prostatic tumors and benign prostatic hyperplasia.

Prostatic volume showed marked variation across breed and age groups. Larger breeds such as German Shepherds and Labradors exhibited considerably higher mean prostate volumes compared to smaller breeds like Pomeranians, indicating a clear deviation from normal expected prostate size (≈15-25 cm^3 depending on body weight), and it reduced to near normal post-treatment (Table 1). Prostate volume was shown to be significantly positively correlated with age, body weight, and breed size, supporting previous findings (Lowseth *et al*., 1990; Atalan *et al*., 1999; Gadelha *et al*., 2009; Spada *et al*., 2025). The age-related progression revealed increased prostatic enlargement in dogs above 10 years (40.50 ± 1.50 cm^3), followed by 6-10 years (37.14 ± 0.51 cm^3), compared to younger dogs (<6 years: 17.00 ± 0.77 cm^3), suggesting a strong correlation between advancing age and prostatic hypertrophy. The breed predilection found in this study, especially among German Shepherds and Labrador Retrievers, was consistent with earlier findings (Palmieri *et al*., 2022). This highlights the significance of taking breed-specific risk variables into account during clinical assessment by pointing to a potential genetic or physiological sensitivity in some breeds. Early detection and preventative healthcare strategies can be improved by being aware of certain predispositions.

Table 1: Size of prostate gland in different breeds pre- and post-treatment

Breeds	No	Pre-treatment (cm^3)	Post-treatment (cm^3)
German Shepherd	2	40.50±1.50	25.50±0.50
Labrador	7	37.14±0.51	25.00±0.22**
Pomeranian	1	17.00±0.77	15.00±0.89

**Significantly reduced following treatment ($p<0.01$).

Physiological parameters showed notable deviations from normal ranges, indicating systemic stress. Heart rate (118.40 ± 3.03 bpm) and respiratory rate (40.50 ± 2.02 breaths/min) were elevated, while rectal temperature (103.60 ± 0.23°F) indicated mild pyrexia. These alterations reflect inflammatory and discomfort-related responses. This relationship between prostatic size and age can be explained by androgen-dependent prostatic growth, namely the stimulation of prostatic hyperplasia by testosterone and its metabolite dihydrotestosterone. Prostatic enlargement is more common in older and large-breed dogs, which may be explained by greater glandular proliferation brought on by extended hormone exposure. Clinically, the affected dogs showed symptoms like vomiting, constipation, and haematuria, which are similar to symptoms detected by earlier authors (Gautam *et al*., 2019). This is due to anatomical location of

prostate ventral to pelvic cavity and below the rectum and bilateral positioning of gland with opening to urethra near to bladder accounts for urethral compliance because of it's affection. Urinary and gastrointestinal problems may result from the gland's enlargement or pathological alterations pressing on nearby organs. In order to prevent misdiagnosis, such nonspecific clinical indicators highlight the necessity of a comprehensive clinical and diagnostic investigation.

The presence of underlying pathology was further substantiated by changes in haemato-biochemical parameters and urinalysis results such as turbidity, haematuria, and the presence of cells and bacteria. Haematological analysis revealed reduced haemoglobin levels (7.90 ± 0.55 g/dL), suggesting anaemia. Neutrophilia (60.00 ± 5.38%) along with lymphopenia (34.60 ± 4.07%) indicated inflammatory or infectious conditions. Total leukocyte count remained within range but showed an upward trend. Platelet count (1.98 ± 0.16 × 10^5/µL) was slightly reduced, while TEC remained within lower limits (Table 2). Biochemical parameters indicated altered protein metabolism and organ function. Total protein remained within range but albumin levels (26.07 ± 0.48 g/L) were reduced, resulting in a decreased A/G ratio. Liver enzymes such as AST (42.04 ± 5.94 U/L) and ALT (28.49 ± 2.34 U/L) were slightly elevated, while ALP remained within range. Renal markers showed significant deviation with elevated BUN (30.58 ± 9.15 mg/dL) and creatinine (2.04 ± 0.17 mg/dL), indicating compromised renal function (Table 2). All these altered haemato-biochemical parameters assume normal values post-castration and antibiotic treatment.

Table 2: Average values of haemato-biochemical parameters

Parameters	Pre-treatment	Post-treatment
Haematology		
Hemoglobin (g/dL)	7.90±0.55	11.20±0.55
Neutrophils (%)	60.00±5.38	70.10±0.43
Lymphocyte (%)	34.60±4.07	23.60±0.73
Monocyte (%)	0.90±0.10	2.10±0.18
Eosinophils (%)	3.10±0.31	2.20±0.44
Basophiles (%)	0.70±0.15	1.10±0.22
TLC (10^3/µL)	12080±746.5	10460±1102.2
PLT (10^5/µL)	1.98±0.16	2.16±0.15
TEC (10^6/UL)	5.95±0.64	7.95±0.09
Serum Biochemistry		
Total protein (g/L)	62.94±3.92	56.50±1.03
Albumin (g/L)	26.07±0.48	30.80±0.84
A/G ratio	0.62±0.06	0.96±0.13
AST (U/L)	42.04±5.94	27.70±1.60
ALT (U/L)	28.49±2.34	23.10±0.59**
ALP (U/L)	71.92±17.23	58.12±13.29
Total bilirubin (mg/dL)	0.29±0.00	0.19±0.03
BUN (mg/dL)	30.58±9.15	11.62±0.74

**Significantly reduced following treatment (p<0.01).

Urinalysis further supported pathological involvement. Urine pH was acidic, and specific gravity was elevated, suggesting concentrated urine (Table 3). Proteinuria (300 ± 10 mg/dL; normally absent) and occasional bilirubin presence indicated renal and hepatic involvement. Microscopic examination revealed increased RBCs (60 ± 10/µL) and leukocytes (25 ± 12/µL) (Table 4), along with crystals and microbial presence, confirming infection and inflammation. Urine culture in Eosin-Methylene blue showed growth of *E. coli* colony (Fig. 1a) and culture sensitivity test in nutrient agar medium of prostatic abscess showed highest sensitivity to Nitrofurantoin antimicrobial disc (Fig. 1b). Nitrofurantoin tablet @ 4 mg/kg orally at 8 h intervals was administered for 5 days that acts effectively against Gram negative organism like *E. coli.* Urinalysis appeared normal following treatment as compared to initial values.

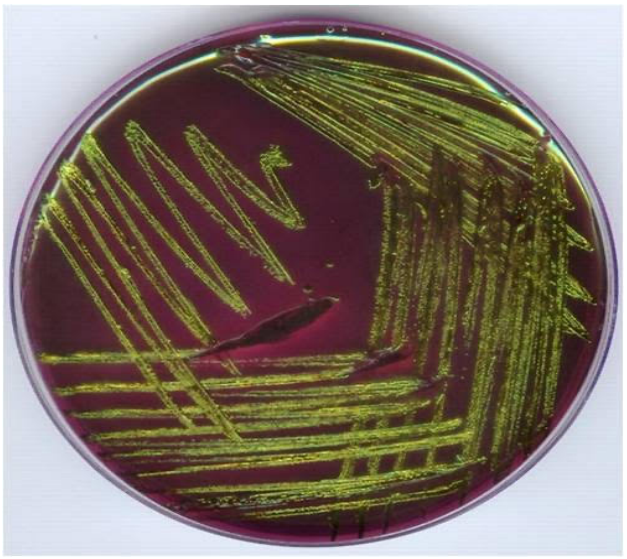

Fig. 1a: *E. coli* growth on eosin-methylene blue (EMB) agar

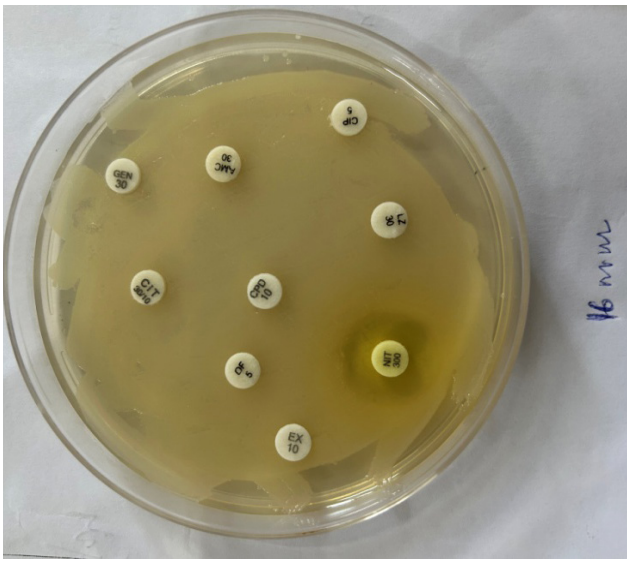

Fig. 1b: Culture sensitivity test showing inhibition zone of nitrofurantoin disc

Table 3: Result of physical and chemical examination of urine

Parameters	Pre-treatment	Post-treatment
Color	Dark yellow to red(6)	Yellow
Odor	Foul(9)	No
Turbidity	Mild turbid to clear	Clear
pH	5.72±	7.3
Specific gravity	1.045±	1.022±0.001
Protein	300±mg/dL(7)	Negative
Ketone body	Negative	Negative
Bilirubin	Present (2)	Negative

Table 4: Result of microscopic examination of urine

Parameters	Pre-treatment	Post-treatment
RBCs	60±10/UL(6)	0-6
Leucocytes/ Pus cells	25±12WBCs/UL(8)	0-5
Crystals	Present (7)	Absent
Epithelial cells	10-20 Present(6)	0-5
Spermatozoa	Present(3)	Present
Fungus	Present(1)	Absent
Culture sensitivity test	*E. coli* present(4)	Negative

For determining the size of the prostate and identifying different prostatic diseases, diagnostic imaging methods, especially radiography and ultrasonography, proved to be dependable and efficient. Radiographic measurements demonstrated increased cranio-caudal length (5.92 ± 0.83 cm) and ventrodorsal depth (4.01 ± 0.08 cm; normal ≈2-3 cm), indicating enlargement (Table 5). Ultrasonographic findings further confirmed this with increased longitudinal length, height, and transverse dimensions, along with altered echotexture, which returned to near normal after castration and antibiotic therapy (Table 5). In lateral views of the caudal abdomen in cases of prostatic abscess, prostatomegally (enlarged prostate), prostatic size is >50% of width of pelvic inlet and it was even >90% of pelvic inlet (Fig. 2a,b), leading to exhibit clinical signs of renal compromise. B-mode abdominal ultrasonography was performed with dog in dorsal recumbency without the need for sedation (Fig. 3a,b,c,d). Urinary bladder was landmark in all these cases. Anechoic cystic fluid was observed in prostatic tumor, and hypoechoic fluid in prostatic abscess which on needle aspiration revealed pus. Homogenous echodense mass was observed in prostatic hyperplasia which was subsided after routine neuter surgery. In the current investigation, ultrasonography turned out to be a very useful non-invasive diagnostic technique.

The detection of distinctive ultrasonographic patterns, such as hypoechoic regions in prostatic abscesses and isoechoic parenchyma with a hyperechoic capsule in benign prostatic hyperplasia (BPH), was consistent with previous research (Gibson *et al*., 2024). These characteristics made it easier to distinguish between different prostatic diseases, such as cysts, abscesses and hyperplasia or enlargement, which helped with clinical decision-making and correct diagnosis. Furthermore, the differentiation between prostatic abscess, cyst, tumor were obtained by ultrasonography-guided fine-needle aspiration cytology (FNAC) which guided the surgeon in clinical assessment and successful treatment outcome. Thus, FNAC provided a dependable and least invasive cytological examination technique, confirming previous findings (Mahajan *et al*., 2010).

Table 5: Radiographic and ultrasonographic parameters (cm) of prostate in dogs

Modality	Parameters (cm)	Pre-treatment	Post-treatment
Radiography	Cranio-caudal length	5.92±0.83	2.59±0.74
	Ventrodorsal depth	4.01±0.08	2.28±0.05**
	Sacral promontory-pubic brim distance	4.28±0.06	4.17±0.09**
Ultra-sonography	Longitudinal length	4.38±0.34	3.17±0.07**
	Longitudinal height	4.14±0.26	2.46±0.04**
	Transverse height	4.15±0.71	2.61±0.06**
	Transverse width	5.13±0.76	3.31±0.07**

**Significantly reduced following treatment ($p<0.01$).

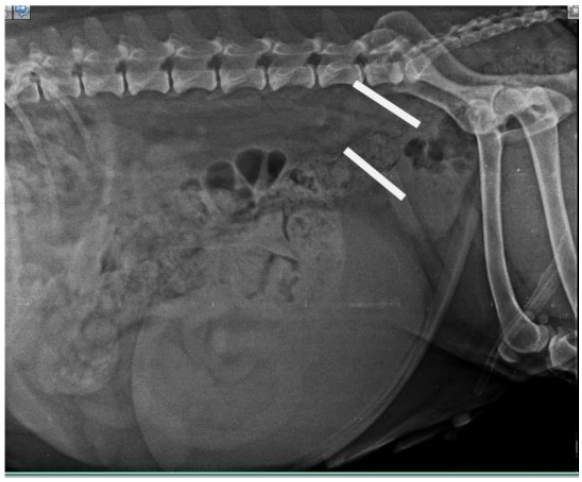

Fig. 2a: Radiography of prostate gland with abscess

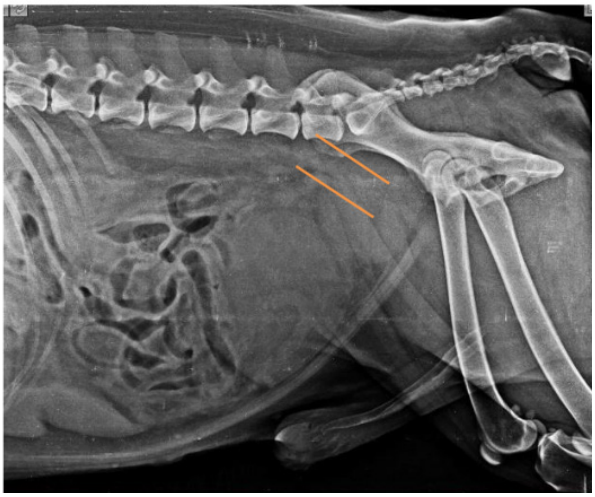

Fig. 2b: Radiography of enlarged prostate gland

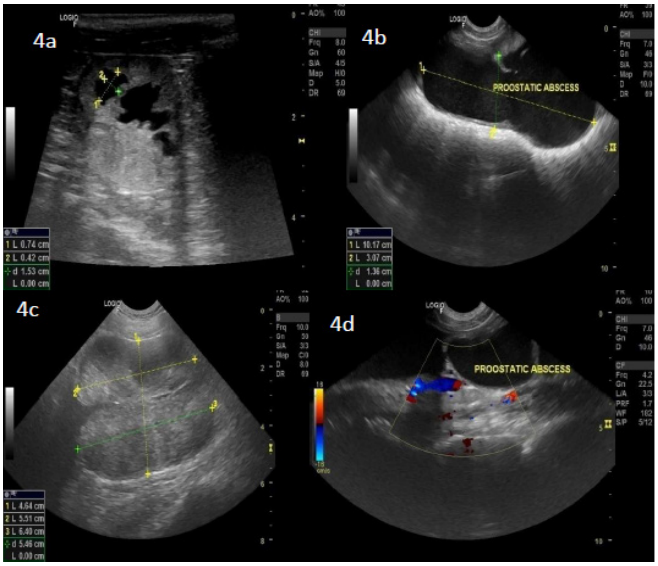

Fig. 3: B-mode abdominal ultrasonography of the prostate in dogs across young and adult age group. **(3a)**. prostatic tumor with hyperechoic peripheral mass and anechoic cystic fluid.**(3b)**. A large prostatic abscess with hypoechoic fluid which on USG guided aspiration evacuating plenty of pus.**(3c)**. Bilateral prostatomegally with homogenous echogenic prostate which subsided on routine neuter surgery.**(3d)**. Prostatic abscess in a German shepherd (M,32kg, 9yr) with signs of continuous pus discharge and occasionally blockage of urination.

Conclusion

The prevalence, clinical manifestation, and diagnostic assessment of prostatic disorders in dogs in and around Bhubaneswar were thoroughly studied. Prostatic diseases in dogs are associated with significant deviations from normal physiological, haematological, biochemical, urinary, and imaging parameters showing clinical symptoms of urinary tract infection and progressive enlargement of the prostate, particularly in older and larger breed dogs. Although the screened population's total prevalence was comparatively low (2.82%, 10/355), the results show that the risk of prostatic diseases rises with age and is strongly correlated with body weight and breed size. In addition to demonstrating that ultrasonography is now the most effective method for diagnosing prostate gland disease, the study emphasizes the importance of early diagnosis through a comprehensive approach combining clinical examination, laboratory analysis, and imaging techniques.

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