

Occurrence and Clinical Characteristics of Canine Rickets: A Retrospective Record Review with A Clinical Case Series

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ABSTRACT

Canine rickets is a metabolic bone disease of growing dogs. This study reports the proportion of rickets in veterinary clinical records and describes the sex, age, breed and clinical characteristics of a separate series of confirmed clinical cases. Records of 45,000 canine cases from veterinary hospitals, private clinics and polyclinics in Pantnagar, Rudrapur, Haldwani, Bareilly, Dehradun, Moradabad and adjoining areas were reviewed retrospectively. Separately, 24 confirmed cases presented for treatment to the Teaching Veterinary Clinical Complex, College of Veterinary and Animal Sciences, G.B. Pant University of Agriculture and Technology, Pantnagar, were characterized clinically. Data were summarized as frequencies and percentages. Locomotor problems were documented in 2,096 of the 45,000 records and 404 cases were recorded as rickets, which is 0.90% of all records and 19.27% of dogs with documented locomotor problems. Area-wise occurrence ranged from 0.54% to 1.06%. Among the 24 clinical cases, 17 (70.83%) were male, 16 (66.67%) were in the 3 to 6 month age group and 22 (91.67%) were up to 6 months old. German Shepherd dogs were the most frequent breed (7/24; 29.17%). Lameness (75.00%) and bowing of the limbs (58.33%) were the most common clinical findings. Rickets accounted for about one in five dogs with documented locomotor problems in the reviewed records. The distributions in the clinical cases describe only the 24 dogs examined and do not indicate group-specific risk, because population denominators were not available.

KEYWORDS: canine rickets, retrospective record review, occurrence, epidemiology, clinical signs, puppies

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1. INTRODUCTION

Rickets in dogs is a metabolic disorder of growing animals in which mineralization of the growth plate and newly formed bone is defective, leading to skeletal deformity (Johnson *et al.*, 1988). Disturbances of vitamin D, calcium and phosphorus metabolism are associated with the disease (Johnson *et al.*, 1988; Schoenmakers *et al.*, 2000) and diet has

been examined as a risk factor for skeletal disease in growing dogs (Slater *et al.*, 1992).

Growing puppies are susceptible, particularly those of rapidly growing and large breeds, in which the skeleton has a high demand for minerals during growth (Dammrich, 1991; Meyer and Zentek, 1992).

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Affected dogs may show lameness, bowing or other limb deformities, enlargement of the metaphyses, pain, difficulty in rising and reluctance to move (Malik *et al.*, 1997; Kumar *et al.*, 2012).

Studies from India have reported the occurrence of rickets in dogs. Kushwaha *et al.* (2009) reported an incidence of 5.16% and Kushwaha *et al.* (2012) reported a prevalence of 5.55% in a 10-year retrospective study of 721 radiographs, in which 40 dogs had rickets. Fewer reports combine an estimate of occurrence across several veterinary centres with the age, sex, breed and clinical profile of confirmed cases.

The present study reviewed 45,000 canine clinical records from six areas to describe the occurrence of rickets and characterized the sex, age, breed and clinical manifestations of 24 confirmed cases presented to the Teaching Veterinary Clinical Complex, College of Veterinary and Animal Sciences, G.B. Pant University of Agriculture and Technology, Pantnagar.

2. MATERIALS AND METHODS

2.1 Study design and ethics

The study had two components that were analysed separately. The first was a retrospective review of canine clinical records. The second was a clinical description of 24 confirmed cases of rickets presented for treatment to the Teaching Veterinary Clinical Complex, College of Veterinary and Animal Sciences, G.B. Pant University of Agriculture and Technology, Pantnagar. The work was associated with the Department of Veterinary Medicine of the same college. Approval for the study entitled "Prevalence, Clinico-Pathological, Diagnostic and Therapeutic-Managerial Aspects of Canine Rickets" was obtained from the Institutional Animal Ethics Committee of the College of Veterinary and Animal Sciences, GBPUAT, Pantnagar (letter no. IAEC/C.V.A.Sc/VMD/492). This approval related to the clinical animals treated at the Teaching Veterinary Clinical Complex. The retrospective component was based on existing clinical records.

2.2 Retrospective clinical records

Records were obtained from veterinary hospitals, private clinics and polyclinics in Pantnagar, Rudrapur, Haldwani, Bareilly, Dehradun, Moradabad and adjoining areas. The dataset comprised 45,000 canine cases. Records of growing dogs up to one year of age presenting with skeletal or

locomotor abnormalities were screened. Locomotor problems, including limb deformities, abnormal gait and lameness, were documented in 2,096 dogs and 404 of these were recorded as rickets. The numbers of canine cases and rickets cases were compiled for each area.

2.3 Clinical cases

The 24 confirmed cases of rickets were presented to the Teaching Veterinary Clinical Complex for treatment. The history recorded, where available, included breed, sex, age, body weight, presenting complaints, duration of illness, diet and food offered, feeding schedule, vaccination, deworming, previous treatment and parental and previous litter history. Physical and clinical examination covered pain, gait abnormalities, lameness, metaphyseal swelling or enlargement, difficulty in rising, inability to bear weight, bowed limbs, delayed growth, reluctance to move, hind-quarter weakness and other locomotor abnormalities. Diagnosis of rickets was based on the history and characteristic clinical findings, supported by radiographic examination and haematobiochemical evaluation. These investigations were used to support the clinical diagnosis of the affected dogs.

2.4 Data analysis

Descriptive statistics were used to summarize frequencies and percentages. For the retrospective records, the proportion of rickets was calculated against all canine cases, overall and for each area and against the 2,096 dogs with documented locomotor problems. For the 24 clinical cases, sex, age and breed were summarized as distributions within this case series, because the numbers of dogs in each sex, age group and breed among all dogs screened were not available. Percentages are given to two decimal places.

3. RESULTS

3.1 Overall occurrence of canine rickets in the reviewed records

Locomotor problems were documented in 2,096 of the 45,000 canine cases (4.66%). Rickets was recorded in 404 dogs, which is 19.27% of dogs with documented locomotor problems and 0.90% of all canine cases reviewed. Among the listed locomotor disorders, rickets was the fourth most frequently recorded, after fractures, canine hip dysplasia and patellar luxation (Table 1).

Table 1. Distribution of listed locomotor disorders among dogs with documented locomotor problems

Locomotor disorder	Number of cases	Percentage (%)
Fractures	627	29.91
Canine hip dysplasia	525	25.05
Patellar luxation	464	22.14
Rickets	404	19.27
Elbow dysplasia	30	1.43
Panosteitis	29	1.38
Hypertrophic osteodystrophy	16	0.76

Note: Percentages use the recorded total of 2,096 locomotor cases as the denominator. The seven listed categories add up to 2,095, so one case in the recorded total could not be assigned to a listed category in the available data.

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3.2 Area-wise occurrence

The 404 rickets cases were distributed across the six areas as shown in Table 2. The proportion of rickets among canine records was highest in Haldwani (1.06%) and Dehradun (1.01%) and lowest in Bareilly (0.54%). The proportions for Rudrapur, Moradabad and Pantnagar were 0.89%, 0.84% and 0.68%, respectively.

Table 2. Area-wise occurrence of canine rickets in the reviewed records

Area	Total canine cases	Rickets cases	Occurrence (%)
Dehradun	11,750	119	1.01
Moradabad	10,000	84	0.84
Rudrapur	8,050	72	0.89
Haldwani	8,600	91	1.06
Bareilly	4,840	26	0.54
Pantnagar	1,760	12	0.68
Total	45,000	404	0.90

3.3 Sex-wise distribution among the clinical cases

Sections 3.3 to 3.6 describe the separate series of 24 clinical cases and not the retrospective records. Of these 24 dogs, 17 were male (70.83%) and 7 were female (29.17%) (Table 3).

3.4 Age-wise distribution among the clinical cases

Six dogs (25.00%) were in the 0 to 3 month age group, 16 (66.67%) in the 3 to 6 month group and 2 (8.33%) in the 6 to 9 month group. No dog was in the 9 to 12 month group.

Overall, 22 of the 24 dogs (91.67%) were up to 6 months old (Table 3).

3.5 Breed-wise distribution among the clinical cases

German Shepherd dogs were the most frequent breed (7 dogs, 29.17%), followed by non-descript dogs (6, 25.00%), Labradors (4, 16.67%) and Spitz (3, 12.50%). The remaining four dogs (16.67%) were two Dobermans, one Rottweiler and one Pomeranian (Table 3).

Table 3. Distribution of the 24 clinical cases of canine rickets according to sex, age and breed

Variable	Category	No. of dogs	Percentage (%)
Sex	Male	17	70.83
	Female	7	29.17
Age	0 to 3 months	6	25.00
	3 to 6 months	16	66.67
	6 to 9 months	2	8.33
	9 to 12 months	0	0.00
Breed	German Shepherd	7	29.17
	Non-descript	6	25.00
	Labrador	4	16.67
	Spitz	3	12.50
	Others (Doberman 2, Rottweiler 1, Pomeranian 1)	4	16.67

Note: Percentages are calculated within the 24 clinical cases. Age group labels follow the categories recorded in the source data.

3.6 Clinical manifestations

Lameness was the most frequently recorded finding (18 dogs, 75.00%), followed by bowing of the limbs (14 dogs, 58.33%). The other recorded signs are given in Table 4. Valgus

deviation of the front paws, paw deviation and elbow abduction were also observed, but counts for these findings were not available.

Table 4. Clinical manifestations observed in the 24 clinical cases of canine rickets

Clinical manifestation	Number of dogs	Percentage (%)
Lameness/limping	18	75.00
Bowing/bending of limbs	14	58.33
Pain on palpation	12	50.00
Difficulty in rising/hind-quarter weakness	12	50.00
Reluctance to move/lethargy	12	50.00

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Clinical manifestation	Number of dogs	Percentage (%)
Broadening of distal metaphyses	8	33.33

Note: Percentages are calculated using 24 clinical cases as the denominator.

4. DISCUSSION

The study used two datasets with different denominators. In the retrospective records, rickets was recorded in 404 of 45,000 canine cases (0.90%) and in 19.27% of the 2,096 dogs with documented locomotor problems. The separate series of 24 clinical cases provided the sex, age, breed and clinical findings. Most dogs in this series were male, two thirds were in the 3 to 6 month age group, German Shepherd dogs were the most frequent breed and lameness and bowing of the limbs were the most common findings.

The 0.90% figure is the proportion of rickets among the reviewed canine clinical records and 19.27% is its proportion among dogs with documented locomotor problems. Both relate to the clinical records reviewed and should not be taken as estimates for the general dog population. The proportion was lower than the 5.16% incidence reported by Kushwaha *et al.* (2009) and the 5.55% prevalence reported by Kushwaha *et al.* (2012), who found 40 cases among 721 radiographs. The denominators differ, which limits direct comparison. In the present records, rickets was the fourth most frequently listed locomotor disorder, after fractures, canine hip dysplasia and patellar luxation.

The proportion of rickets varied by area, from 0.54% in Bareilly to 1.06% in Haldwani. These differences were not tested statistically. They may reflect the number and type of cases seen by the participating clinics and hospitals. Pantnagar contributed the fewest records (12 rickets cases among 1,760 canine cases) and its figure should be read with that in mind.

Males accounted for 17 of the 24 clinical cases (70.83%). A male predominance has also been described by Aithal *et al.* (1999), who reported 75% males and 25% females among affected dogs and by Ghoke *et al.* (2012) and Singh and Gopinathan (2013). The numbers of male and female dogs in the screened population were not available, so this distribution describes the clinical cases and cannot establish a higher risk in males. Differences in which dogs were presented to clinics cannot be excluded.

Twenty-two of the 24 dogs (91.67%) were up to 6 months old and the 3 to 6 month group was the largest (66.67%). Kushwaha *et al.* (2009) also reported the highest occurrence in the 3 to 6 month age group and Meyer and Zentek (1992) reported a greater occurrence in young puppies. Only two dogs in this series were in the 6 to 9 month group and none was in the 9 to 12 month group.

German Shepherd dogs (29.17%), non-descript dogs (25.00%), Labradors (16.67%) and Spitz (12.50%) accounted for most of the clinical cases. Sharma (2002) reported German Shepherd dogs as the most affected breed in a series of 100 clinical cases, followed by Boxer, non-descript dogs and Spitz and Ghoke *et al.* (2012) also described cases in

Labradors and German Shepherd dogs. Breed denominators for the screened population were not available and no statistical comparison among breeds was made, so the distribution here describes the cases presented and not breed-specific occurrence.

Lameness (75.00%) and bowing of the limbs (58.33%) were the most frequent clinical findings. These signs are commonly associated with rickets in growing dogs, but they are not specific to the disease. Other locomotor disorders listed in Table 1 can also cause lameness and limb deformity, so history, clinical examination and additional diagnostic evaluation are needed together.

The study has limitations. The retrospective component relied on clinic and hospital records, so the occurrence figures relate to the reviewed clinical population. Population denominators for sex, age and breed were not available and the clinical series comprised only 24 dogs. No statistical tests were applied to compare areas or subgroups. In Table 1, the seven listed categories add up to 2,095 cases against a recorded total of 2,096 and this difference could not be resolved from the available records. Feeding history was recorded where available but is not analysed in this report.

5. CONCLUSION

Rickets was recorded in 0.90% of 45,000 reviewed canine clinical records and in 19.27% of dogs with documented locomotor problems. In the separate series of 24 clinical cases, most dogs were male and young, with 91.67% up to 6 months old. German Shepherd dogs were the most frequent breed and lameness and bowing of the limbs were the most common signs. These findings may help clinicians suspect rickets in growing dogs presented with lameness or limb deformity.

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