

RISK FACTORS ASSOCIATED WITH OSTEOARTHRITIS IN GERIATRIC DOGS

D. BHAVITHA, G. AMBICA*, K. LAKSHMI and E.L. CHANDRA SHEKAR
Department of Veterinary Medicine, College of Veterinary Science, PVNRTVU,
Rajendranagar-500030, Hyderabad, Telangana, India

Received: 28.11.22; Accepted: 19.03.2023

ABSTRACT

The present study was undertaken with an aim to evaluate the risk factors associated with osteoarthritis affected geriatric dogs. A total 3040 geriatric dogs were presented to Veterinary Clinical Complex, Campus Hospital, College of Veterinary Science, Rajendranagar and Veterinary Hospital, Bhoiguda during the period of January to June 2022. Out of 3040 dogs, 350 geriatric dogs were affected for osteoarthritis, indicating the overall incidence of 11.51%. The risk factors recorded for osteoarthritis were, overweight in 202 (57.71%), neutering in 45 (12.86%), slippery floor in 33 (9.43%), overuse of calcium in 30 (8.57%), heavy exercise in 20 (5.71%), underlying joint diseases in 15 (4.29%) and hypothyroidism in 5 (1.43%) dogs.

Keywords: Geriatric dogs, Heavy exercise, Neutering, Osteoarthritis, Overweight

How to cite: Bhavitha, D., Ambica, G., Lakshmi, K. and Chandra Shekar, E.L. (2023). Risk factors associated with osteoarthritis in geriatric dogs. *Haryana Vet.* 62(2): 133-136.

Osteoarthritis is one of the commonly encountered conditions in geriatric dogs and is characterised by variable degrees of pain, reluctant to jump or climb upstairs, stiffness of gait, lameness, joint swelling and crepitus (Beale, 2004). Obesity causes extra stress to the joint and thereby promoting cycle of inflammation, degradation and chondrocyte damage in osteoarthritis dog. Overfeeding is one of the reasons for development of osteoarthritis in older canines. Restricted movement is one of the direct reasons predisposing to osteoarthritis in dogs (Nesic *et al.*, 2006). The major risk factors associated with Osteoarthritis in dog are obesity, lack of exercise, injury, hormonal imbalances, non-physiological burdens and mixtures of several conditions (Gencoglu *et al.*, 2020). Hip dysplasia is a hereditary orthopaedic condition in certain breeds will predisposes to osteoarthritis in dogs (Lust, 1980). Neutering is a major factor for musculoskeletal disorders like osteoarthritis in dogs (O'Neill *et al.*, 2020). Vigorous exercise (Mele, 2007) and excess calcium supplementation especially during the growth stages may predispose dogs for the development of osteoarthritis. Dogs kept on slippery flooring like tarpaulin and newspapers are more likely to develop hip dysplasia, which may lead to osteoarthritis in later stages of life (Witte, 2019). Hypothyroidism accounts for 3.4% of the osteoarthritic cases in dogs (Juge *et al.*, 2017).

MATERIALS AND METHODS

The present investigation was carried out in the Department of Veterinary Medicine, Veterinary Clinical Complex and Veterinary Surgery and Radiology, Rajendranagar, Hyderabad and Veterinary Hospital, Bhoiguda, Telangana. A total of 3040 geriatric dogs over a period of 6 months from January to June 2022 were screened

to know the incidence of osteoarthritis among geriatric dogs. A detailed history was collected from the owners of all the suspected cases and subsequently tested for joint, bone and soft tissue abnormalities by radiography, ultrasonography and computed tomography. Among these, 350 dogs were affected with osteoarthritis. A detailed investigation from all the positive cases were conducted to record the risk factors associated with osteoarthritis in geriatric dogs.

RESULTS AND DISCUSSION

In the present study, the risk factors recorded for osteoarthritis were reported to be overweight in 202 (57.71%), followed by neutering in 45 (12.86%), slippery floor in 33 (9.43%), overuse of calcium in 30 (8.57%), heavy exercise in 20 (5.71%), underlying joint diseases in 15 (4.29%) and hypothyroidism in 5 (1.43%) geriatric dogs. Among all the risk factors, overweight was found to be major factor involved in occurrence of osteoarthritis in geriatric dogs, followed by neutering, slippery floor, imbalances between Ca: P, heavy exercise, underlying joint diseases and hypothyroidism.

The present results are in near accordance with findings of McLaughlin and Roush (2002), Marshall *et al.* (2009), Runge *et al.* (2010), Sanderson (2012) and Anderson *et al.* (2020). Metabolic and systemic consequences of obesity may play a more significant role in the aetiology of OA, wherein fat produces systemic inflammatory factors like cytokines and adipokines, which were distinct adipose tissue-produced components with considerable inflammatory qualities (Mosley *et al.*, 2022). Further in obese cases increased body weight leads to increased pressure on the weight bearing joints and predisposes for the development of OA (Anderson *et al.*, 2020) and obesity

*Corresponding author: gadigeambica@gmail.com



Fig. 1. Risk factors associated with Osteoarthritis in Geriatric Dogs

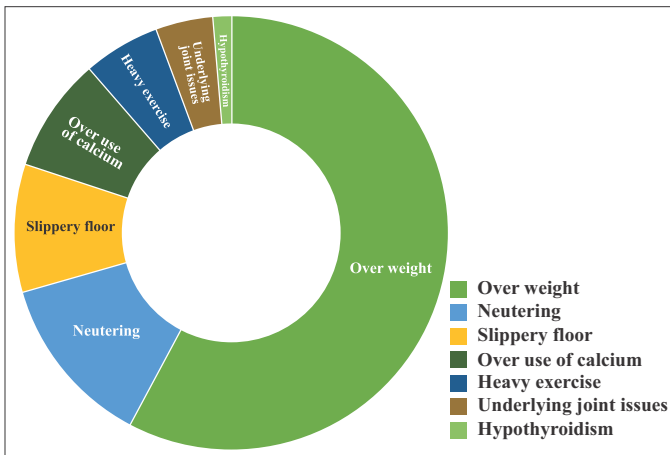


Fig. 2. Radiography of OA dog showing a) unilateral hip osteoarthritis, arrow indicating loss of joint space and degenerating joint

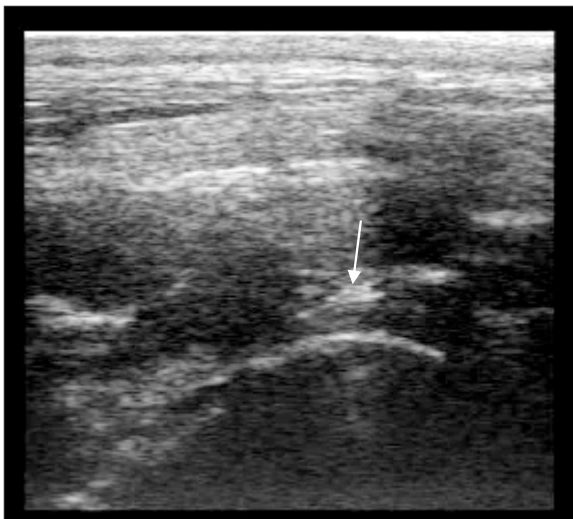


Fig. 5. Presence of osteophyte on the head of femur



Fig. 3. Radiography of OA dog showing a) bilateral hip osteoarthritis, arrow indicating loss of joint space and loss of femoral head contour and arrow indicating sclerosis of bone

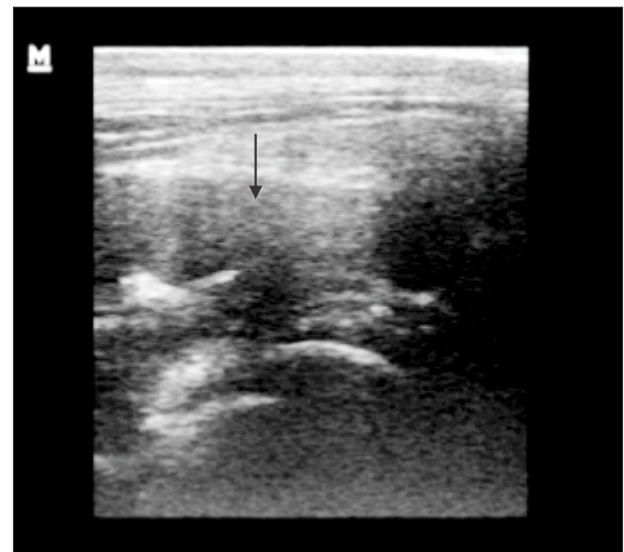


Fig. 4. Sonography of OA dog showing Myositis

primarily causes an increase in mechanical loading, which in turn causes mechanical stress, more wear and tear and ultimately cartilage degeneration and results in OA (Loef *et al.*, 2019).

In the present study, neutering is reported as the second most risk factor associated with OA in geriatric dogs and is in accordance with findings of German (2006), Meeson *et al.* (2019), Preet *et al.* (2021), O'Neill *et al.* (2020) and Anderson *et al.* (2020). Neutering predisposes dogs for the development of osteoarthritis due to the imbalanced gonadal hormones affecting the growth rate and development of the bones (Anderson *et al.*, 2020) and

Table 1. Risk factors associated with Osteoarthritis in Geriatric Dogs

Sl. No.	Factor	No. of Dogs	Percentage (%)
1	Over weight	202	57.71%
2	Neutering	45	12.86%
3	Slippery floor	33	9.43%
4	Over use of calcium	30	8.57%
5	Heavy exercise	20	5.71%
6	Underlying joint issues	15	4.29%
7	Hypothyroidism	05	1.43%
8	Total	350	100

Table 2. Average neutering age of dogs affected with Osteoarthritis

Sl. No.	Breeds	Neutered age (Months)
1	Pugs (18)	6.5
2	Labrador Retrievers (15)	7
3	Golden Retrievers (05)	7.5
4	German Shepherds (07)	1 year

Table 3. Thyroid estimation in dogs affected with Osteoarthritis

Sl. No.	Breed	Average TT4
1	Labrador Retrievers (2)	0.4
2	Pugs (2)	0.6
3	Spitz (1)	0.8

in the absence of gonadal hormones, an abnormal growth plate closure may increase the likelihood of a clinically obvious joint problem as the age advances in dogs (Riva *et al.*, 2013). The changes that occur in sex hormones after neutering, thought to cause behavioural changes, most notably increased food seeking and decreased physical activity leading to OA (Bermingham *et al.*, 2014; Raffan *et al.*, 2015).

Heavy exercise is one of the risk factors for the development of OA in dogs and the present findings are in accordance with the studies conducted by Anderson *et al.* (2020), Bland *et al.* (2015) and Mele (2007). Strenuous exercise particularly at young age may leads to OA which might be due to over use and damage to the developing joints (Anderson *et al.*, 2020).

In the present study, slippery floor is reported as one of the risk factors associated with OA in dogs and is in accordance with the studies of Alsaleem *et al.* (2013), Witte *et al.* (2019), Capon (2021), Goldberg *et al.* (2022) and Capon (2021). Dogs raised on slippery floor may develop osteoarthritis as the age advances, which might be

since as dogs moves on slippery floor, some of the back muscles and joints needs to stabilize themselves on such floors and movement will be restricted in some parts of the dog's body, while other parts will have to work harder than normal to compensate. Over time, this inefficient movement can become habitual and the back muscles and joints may develop osteoarthritis as age advances.

Further, over use of calcium during young age is one of the risk factors for the development of OA in geriatric dogs and similar observations are reported by Richardson and Toll (1997), Raditic and Athens (2019) and Lauten (2006). Excess use of calcium during the young age causes suppression of the parathyroid gland and this excess calcium may leaches out from body if feed continuously and makes bone thin and weak leading to hip dysplasia and inturn leads to OA as the age advances.

In the present study, underlying joint diseases like hip dysplasia accounted for 4.29% in occurrence of OA in dogs, which is in accordance with the findings of Sandell (2012), Alsaleem (2013), Ramirez-Flores *et al.* (2017) and Meeson *et al.* (2019). This might be due to fact that hip dysplasia leads to loss of normal joint conformation in younger stages of life and as age advances the trauma to hip joint increases and leads to OA in geriatric age.

In the present study, Hypothyroidism accounted for 1.43% in occurrence of OA in dogs. This finding is in consistent with the reports of German (2006) and Kutzler (2020) and slightly lower (2.8%) percent reported by Juge *et al.* (2017). This observation could be substantiated that hypothyroidism leads to accumulation of certain proteins in the body especially at the joints resulting in joint and surrounding muscle damage and as the age advances, leads to degenerative changes. However, according to Kutzler (2020), OA in hypothyroid dog might be because of effect of gonadectomy on the joints.

CONCLUSION

Among all the risk factors associated with osteoarthritis, overweight is seen in majority of the cases followed by neutering, slippery floor, overuse of calcium, heavy exercise, underlying joint diseases and hypothyroidism. As obesity is seen in majority of the cases, weight management has to be done for certain breeds like Labrador Retriever, where osteoarthritis is a genetic predisposition condition to avoid the severity of the disease.

REFERENCES

- Al-Saleem, S., Alshahrani, A. and Al-Khaldi, Y. (2013). Obesity among patients attending Primary Care Centers, Aseer Region, Saudi Arabia. *Saudi J. Obesity*. **1**(2): 67-77.
- Anderson, K.L., Zulch, H.O., Neill, D.G., Meeson, R.L. and Collins, L.M. (2020). Risk factors for canine osteoarthritis and its

- predisposing arthropathies: A systematic review. *Front. Vet. Sci.* **7(20)**: 1-38.
- Beale, B.S. (2004). Use of nutraceuticals and chondroprotectants in osteoarthritic dogs and cats. *Veterinary clinics: J. Small Anim. Pract.* **34(1)**: 271-289.
- Bermingham, E.N., Thomas, D.G., Cave, N.J., Morris, P.J., Butterwick, R.F. and German, A.J. (2014). Energy requirements of adult dogs: a meta-analysis. *Plos One.* **9(10)**: 1-23.
- Bland, S.D. (2015). Canine osteoarthritis and treatments: A review. *Vet. Sci. Dev.* **5(2)**: 84-89.
- Capon, H. (2021). Incorporating a rehabilitation into the management of canine osteoarthritis. *Companion Anim. Pract.* **26(7)**: 139-146.
- Gencoglu, H., Orhan, C., Sahin, E. and Sahin, K. (2020). Undenatured type II collagen (UC-II) in joint health and disease: a review on the current knowledge of companion animals. *Animals.* **10(4)**: 697.
- German, A.J. (2006). The growing problem of obesity in dogs and cats. *J. Nutr.* **136(7)**: 1940-1946.
- Goldberg, M.E. (2022). Osteoarthritis in canines part 2: Physical rehabilitation. *Vet. Nurs. J.* **13(1)**: 10-15.
- Juge, P.A., Berard, L., Kotti, S., Doursounian, L., Sautet, A., Simon, T., Berenbaum, F., Nourissat, G. and Sellam, J. (2017). Cardiometabolic risk factors in primary centred and rotator cuff-Related shoulder osteoarthritis: A comparative study. *RMD Open.* **3(1)**: 1-5.
- Kutzler, M.A. (2020). Possible relationship between long-term adverse health effects of gonad-removing surgical sterilization and luteinizing hormone in dogs. *Animals.* **10(4)**: 599-610.
- Lauten, S.D. (2006). Nutritional risks to Large-Breed Dogs: From weaning to the geriatric years. *Veterinary clinics: J. Small Anim. Pract.* **36(6)**: 1345-1359.
- Loef, M., Schoones, J.W., Kloppenburg, M. and Ioan-Facsinay, A. (2019). Fatty acids and osteoarthritis: different types, different effects. *Joint Bone Spine.* **86(4)**: 451-458.
- Lust, G.E.O.R.G.E., Beilman, W.T., Dueland, D.J. and Farrell, P.W., (1980). Intra-articular volume and hip joint instability in dogs with hip dysplasia. *JBJS.* **62(4)**: 576-582.
- Marshall, W.G., Bockstahler, B.A., Hulse, D.A. and Carmichael, S. (2009). A review of osteoarthritis and obesity: current understanding of the relationship and benefit of obesity treatment and prevention in the dog. *Vet. Comp. Orthop. Traumatol.* **22(05)**: 339-345.
- McLaughlin, R.M. and Roush, J.K. (2002). Symposium on Osteoarthritis. *Vet. Med.* **95**: 107-110.
- Meeson, R.L., Todhunter, R.J., Blunn, G., Nuki, G. and Pitsillides, A.A. (2019). Spontaneous dog osteoarthritis-A one medicine vision. *Nat. Rev. Rheumatol.* **15(5)**: 273-287.
- Mele, E. (2007). Epidemiology of osteoarthritis. *Vet. Focus.* **17(3)**: 4-10.
- Mosley, C., Edwards, T., Romano, L., Truchetti, G., Dunbar, L., Schiller, T., Gibson, T., Bruce, C. and Troncy, E. (2022). Proposed canadian consensus guidelines on osteoarthritis treatment based on OA-COAST stages 1-4. *Front. Vet. Sci.* **9(22)**: 1-23.
- Nesic, D., Whiteside, R., Brittberg, M., Wendt, D., Martin, I. and Mainil-Varlet, P. (2006). Cartilage tissue engineering for degenerative joint disease. *Adv. Drug. Deliv. Rev.* **58(2)**: 300-322.
- O'Neill, D.G., Brodbelt, D.C., Hodge, R., Church, D.B. and Meeson, R.L. (2020). Epidemiology and clinical management of elbow joint disease in dogs under primary veterinary care in the UK. *Canine Med. Gene.* **7(1)**: 1-15.
- Preet, G.S., Turkar S., Gupta, S. and Kumar, S. (2021). Dog obesity: epidemiology, risk factors, diagnosis and management: A review paper. *J. Pharm. Innov.* **10(5)**: 698-705.
- Raditic, D. and Athens, G. (2019). Nutrition and osteoarthritis: What do we know? <https://todaysveterinarypractice.com>.
- Raffan, E., Smith S.P., O'Rahilly, S. and Wardle, J. (2015). Development, factor structure and application of the dog obesity risk and appetite (DORA) questionnaire. *PeerJ.* **3**: 2-27.
- Ramirez-Flores, G.I., Angel-Caraza, D., Quijano-Hernández, I.A., Hulse, D.A., Beale B.S. and Victoria-Mora, J.M. (2017). Correlation between osteoarthritic changes in the stifle joint in dogs and the results of orthopaedic, radiographic, ultrasonographic and arthroscopic examinations. *Vet. Res. Commu.* **41(2)**: 129-137.
- Richardson, D.C. and Toll, P.W. (1997). Relationship of nutrition to developmental skeletal disease in young dogs. *Vet. Clin. Nutr.* **4(1)**: 6-13.
- Riva, G.T., Hart, B.L., Farver, T.B., Oberbauer, A.M., Messam, L.L.M., Willits, N. and Hart L.A. (2013). Neutering dogs: effects on joint disorders and cancers in golden retrievers. *PloS one.* **8(2)**: 1-7.
- Runge, J.J., Kelly, S.P., Gregor, T.P., Kotwal, S. and Smith, G.K. (2010). Distraction index as a risk factor for osteoarthritis associated with hip dysplasia in four large dog breeds. *J. Small Anim. Pract.* **51(5)**: 264-269.
- Sandell, L.J. (2012). Etiology of osteoarthritis: Genetics and synovial joint development. *Nat. Rev. Rheumatol.* **8(2)**: 77-89.
- Sanderson, S.L. (2012). The epidemic of canine obesity and its role in osteoarthritis. *Isriel J. Vet. Med.* **67(4)**: 195-202.
- Witte, P.G. (2019). Hip dysplasia: understanding the options (surgical management). *Companion Anim. Prac.* **24(5)**: 249-256.