*Original Research*

# Management of Arthritis using Nutraceuticals in Dogs – Clinical, Physiological and Haemato-Biochemical Evaluation

**Thara Singh D. Lamani*, L. Ranganath, B. N. Nagaraja, M. L. Satyanarayana, K. V. Jamuna and C. Ansar Kamran**

Department of Veterinary Surgery and Radiology, Veterinary College, Hebbal, Bengaluru – 560024, Karnataka, INDIA

***Corresponding author:** vet549@gmail.com

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**Abstract**

*The present study was carried out to evaluate influence of Nutraceuticals in arthritis in Dogs. There was no significance variations observed in physiological (rectal temperature, heart rate and respiratory rate), haematological (Hb, TEC, TLC and DLC) and biochemical parameters (serum creatinine, ALT and AST) in the both groups of dogs. There was gradual improvement and changes in clinical (weight bearing, joint motion and pain score), radiographic score and synovial fluid (volume, protein, TEC and DLC). Group I dogs showed significant improvement in condition confirmed by clinical and radiographical evaluation. On the basis of observation and the evaluation during the present study it was concluded that the Nutraceuticals were found to be a useful for the management of arthritis in dogs in terms of alleviation of pain and owner's satisfaction and without any complications in dogs.*

**Key words:** Arthritis, Clinical, Haemato-Biochemical Analysis, Nutraceuticals, Physiological

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## Introduction

Arthritis is a chronic degenerative disease of the joints causing pain, stiffness, swelling and lameness (McLaughlin, 2000), commonly affecting large breed dogs (Richardson *et al*., 1997). It is characterized by the degeneration of cartilage, hypertrophy of bone at the margins in the synovial membrane and eventually pain and stiffness of joints (Vaughan-Scott & Taylor, 1997). Arthritis can affect one or more joints and may lead to pain, stiffness, joint swelling, lameness and reduced mobility. As the disease progress, there can be additional destruction of cartilage on the articular bone surface and production of new bone around the joint (Ranganath, 2012). Fossum (1997) and (Mortellaro, 2003) indicated that in osteoarthritis (OA) there is progressive degeneration of joint characterised by degeneration of articular cartilage, hypertrophy of

marginal bone, synovial membrane changes, matrix loss, fibrillation and formation of fissures that can result in significant pain and complete loss of the cartilage surface.

Nutraceuticals are the foods (or part of a food) that provides medical or health benefits, including the prevention and/ or treatment of a disease" (Brower, 1998). Chondroprotectivc agents (Nutraceuticals) are slow-acting disease modifying agents, when given orally are absorbed by the gastrointestinal tract, become incorporated into the joint tissues and provide the necessary precursors to maintain cartilage health and perhaps even promote cartilage repair. These agents stimulate production of new cartilage, protect existing hyaline cartilage and also inhibit degenerative enzymes. Scientific clinical trials of chondroprotective agents in dogs with natural osteoarthritis are few (McNamara *et al*., 1997 and McLaughlin, 2000). The present study was undertaken to study the management of arthritis using Nutraceuticals and its evaluation in dogs suffering from osteoarthritis.

**History and Clinical Examination**

Twelve dogs with the history of joint pain and lameness presented to Department of Surgery and Radiology, Veterinary College, Hebbal, Bangalore were selected for the study. History revealed progressive lameness, difficulty in getting up and lying down, stiff gait on hind limbs, inclination towards prolonged recumbency and restricted movement. Physical examination revealed pain on palpation of hip joint and abnormal weight bearing gait. Confirmatory diagnosis of osteoarthritis was done based on radiographic examination.

**Materials and Methods**

12 dogs with arthritis involving hip joint were selected for the study and were divided into two groups I and II comprising six dogs in each. Group I dogs were administered with Glucosamine hydrochloride – 500 mg, Chondroitin sulphate – 400 mg and Vitamin C – 12.5 mg orally twice daily for 90 days. While, Group II dogs received Glucosamine hydrochloride – 400 mg, Chondroitin sulphate – 20 mg, Methyl sulphonyl methane (MSM) – 100 mg and Vitamin C – 50 mg orally twice daily for 90 days. All the animals were subjected to mild exercise of swimming and hot fomentation over hind quarters. For reducing body weight of the animal, reduction of total quantity of food to 2/3 rd the normal quantity was indicated. The efficacy of these drugs was compared based on physiological, clinical and haemato-biochemical evaluation. Various physiological parameters evaluated included rectal temperature ($^0$F), heart rate (beats/ minute) and respiratory rate (breaths/ minute). The clinical parameters viz. weight bearing, joint motion, pain score and lameness were measured as indicated by McCarthy *et al*. (2007). Heamato-biochemical parameters included, Hb (g%), TEC (Millions/ cmm), TLC (Thousand/ cmm), DLC (%), Serum creatinine (mg/dl), ALT (IU/L) and AST (IU/L). These parameters were recorded before the treatment and on 7$^{th}$, 14$^{th}$, 28$^{th}$, 45$^{th}$, and 90$^{th}$ days post treatment. The results of clinical, haematological and biochemical values were





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presented as mean ± SE. Differences between groups and within the groups were calculated by a two way analysis of variance (ANOVA) using computer based statistical programme, Graph pad prism and interpreted as per the procedure described by Snedecor and Cochran (1989) to arrive at a conclusion ($P \leq 0.05$).

## Results and Discussion

### Physiological Parameters

The temperature, heart and respiratory rates in Group I and Group II dogs within the groups and between the groups were statistically non-significant ($P \leq 0.05$). Alam *et al.* (2006) have also recorded non-significant variations in the physiological parameters in control and experimentally induced joint disorders in dogs throughout the experimental period (Table 1).

**Table 1:** Mean ± SE values of respiratory rate, rectal temperature and hart rate in Group I and Group II dogs.

| Days | Respiratory Rate (breaths per minute) | | Rectal Temperature (ºF) | | Heart Rate (beats per minute) | |
|---|---|---|---|---|---|---|
| | Group I | Group II | Group I | Group II | Group I | Group II |
| 0 | 34.67 ± 0.80 | 32.83 ± 1.27 | 102.1 ± 0.26 | 101.91 ± 0.33 | 97.83 ± 1.98 | 96.16 ± 1.51 |
| 7 | 32.17 ± 1.1 | 31.00 ± 1.21 | 102.2 ± 0.26 | 101.98 ± 0.38 | 96.16 ± 1.10 | 95.00 ± 1.23 |
| 14 | 26.00 ± 0.77 | 25.16 ± 1.47 | 102.26 ± 0.22 | 101.83 ± 0.23 | 100.00 ± 1.18 | 99.83 ± 1.09 |
| 28 | 27.00 ± 0.51 | 25.33 ± 1.02 | 102.4 ± 0.14 | 102.2 ± 0.37 | 100.83 ± 1.09 | 99.96 ± 1.65 |
| 45 | 35.1 ± 0.71 | 34.33 ± 0.66 | 102.0 ± 0.45 | 101.69 ± 0.16 | 97.65 ± 1.54 | 96.23 ± 1.89 |
| 90 | 34.52 ± 1.1 | 33.66 ± 0.49 | 102.4 ± 0.24 | 101.95 ± 0.35 | 98.16 ± 1.34 | 97.83 ± 1.98 |

### Clinical Parameters

There was significant improvement in weight bearing, joint motion and pain score in Group I as compared with Group II due to therapy. There was improvement in weight bearing in both groups on the day 90. These values were in agreement with those of McCarthy *et al*. (2007). Exercise might have helped in improving joint mobility there by strengthening the associated musculature as reported by Millis (2009). Group I as compared with Group II animals had a significant reduction in lameness on day 90 as compared to day 0 indicating the effectiveness of Glucosamine, Chondroitin sulphate, Methyl sulphonyl methane (MSM) and Vitamin C in managing osteoarthritis in dogs. This may be attributed to the slow acting effects of glucosamine – chondroitin sulphate combination as mentioned by Hulse (1998). Reduced growth rate and subsequent reduction in weight gain due to dietary correction and controlled exercise might have also influenced the lameness score as reported by Millis (2009).







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**Table 2:** Mean ± SE values of clinical parameters in Group I and Group II dogs

| Days | Weight Bearing | | Joint Motion | | Pain Score | | Lameness Score | |
|---|---|---|---|---|---|---|---|---|
| | Group I | Group II | Group I | Group II | Group I | Group II | Group I | Group II |
| 0 | 4.05 ± 0.21 | 4.33 ± 0.21 | 4.5 ±0.22 | 4.66 ± 0.22 | 4.33 ± 0.22 | 4.5 ±0.22 | 4.33 ± 0.22 | 4.5 ± 0.22 |
| 7 | 3.16 ± 0.21 | 3.50 ± 0.22 | 3.83 ± 0.16 | 4.0 ± 0.16 | 4.00 ± 0.16 | 4.25 ± 0.16 | 4.00 ± 0.16 | 4.25 ± 0.16 |
| 14 | 3.05 ± 0.16 | 3.16 ± 0.30 | 3.33 ± 0.21 | 3.5 ± 0.21 | 3.95 ± 0.21 | 4.00 ± 0.21 | 3.95 ± 0.21 | 4.00 ± 0.21 |
| 28 | 2.50 ± 0.21 | 2.66 ± 0.21 | 3.0 ± 0.00 | 3.63 ± 0.00 | 3.25 ± 0.00 | 3.5 ± 0.00 | 3.25 ± 0.00 | 3.5 ± 0.00 |
| 45 | 2.0 ± 0.00*a | 1.5 ± 0.22*a | 1.5 ± 0.00*a | 2.5 ± 0.00 *a | 2.88 ± 0.00*a | 3.00 ± 0.00*a | 2.88 ± 0.00*a | 3.00 ± 0.00*a |
| 90 | 1.0 ± 0.00**a*b | 1.5 ± 0.00**a*b | 1.0 ± 0.00**a*b | 2.0 ± 0.00**a*b | 2.00± 0.00**a*b | 2.5 ± 0.00**a*b | 2.00± 0.00**a*b | 2.5 ± 0.00**a*b |

**Significant, ** Highly significant, 'a' represents significant difference within a group and 'b' represents significance between groups.*

**Haemato-biochemical Parameters**

The haematological parameters studied viz. TEC, Hb, TLC and differential leukocyte counts were found to remain within the normal range in all groups and had non-significant changes between the different periods of study. Alam *et al.* (2006) have also recorded non-significant variations in the haematological parameters in control and experimentally induced joint disorders in dogs were within the reference range throughout the experimental period. In Group I and Group II the Hb and total erythrocyte count continuously remained marginally suppressed on day 7 (Table 3).

**Table 3:** Mean ± SE values of Haematological parameters in Group I and Group II dogs

| Days | Total Erythrocyte Count ($10^6$ cells/ $mm^3$) | | Haemoglobin (g %) | | Total Leukocyte Count ($10^3$ cells/ $mm^3$) | |
|---|---|---|---|---|---|---|
| | Group I | Group II | Group I | Group II | Group I | Group II |
| 0 | 7.68 ± 0.31 | 7.89 ± 0.11 | 11.00 ± 0.49 | 11.78 ± 0.64 | 11.70 ± 0.26 | 11.90 ± 0.41 |
| 7 | 7.08 ± 0.23 | 7.69 ± 0.16 | 11.43 ± 0.14 | 11.58 ± 0.68 | 11.20 ± 0.28 | 12.05 ± 0.31 |
| 14 | 7.13 ± 0.25 | 7.63 ± 0.16 | 11.96 ± 0.25 | 11.71 ± 0.61 | 11.70 ± 0.28 | 13.30 ± 0.19 |
| 28 | 7.37 ± 0.19 | 7.23 ± 0.29 | 12.00 ± 0.43 | 11.03 ± 0.78 | 11.70 ± 0.20 | 13.55± 0.18 |
| 45 | 7.76 ± 0.20 | 7.50 ± 0.07 | 11.56 ± 0.69 | 10.98 ± 0.65 | 11.30 ± 0.28 | 12.55 ± 0.13 |
| 90 | 7.45 ± 0.28 | 7.09 ± 0.36 | 11.95 ± 0.65 | 11.65 ± 0.31 | 11.20 ± 0.17 | 12.70 ±0.21 |

**Table 4:** Mean ± SE values of differential leucocyte counts in Group I and Group II dogs

| Days | Neutrophils (%) | | Lymphocytes (%) | | Eosinophils (%) | | Monocytes (%) | |
|---|---|---|---|---|---|---|---|---|
| | Group I | Group II | Group I | Group II | Group I | Group II | Group I | Group II |
| 0 | 71.68 ± 0.42 | 71.66 ± 0.80 | 23.66 ± 0.49 | 23.66 ± 0.61 | 2.50 ± 0.34 | 2.5 ± 0.40 | 2.16 ± 0.16 | 2.18 ± 0.21 |
| 7 | 72.00 ± 0.73 | 71.83 ± 0.40 | 23.00 ± 0.79 | 23.00 ± 0.51 | 3.00 ± 0.36 | 3.17 ± 0.33 | 2.00 ± 0.31 | 2.00 ± 0.25 |
| 14 | 73.66 ± 0.42 | 73.0 ± 0.62 | 22.00 ± 0.50 | 22.2 ± 0.61 | 2.01 ± 0.16 | 2.00 ± 0.25 | 2.33 ± 0.21 | 2.8 ± 0.16 |
| 28 | 71.16 ± 0.30 | 71.01 ± 0.76 | 23.36 ± 0.55 | 23.5 ± 0.61 | 3.33 ± 0.33 | 3.19 ± 0.16 | 2.16 ± 0.65 | 2.33 ± 0.30 |
| 45 | 71.58 ± 0.63 | 71.83 ± 0.65 | 23.83 ± 0.40 | 23.66 ± 0.61 | 2.26 ± 0.33 | 2.26 ± 0.25 | 2.33 ± 0.21 | 2.31 ± 0.33 |
| 90 | 72.01 ± 1.10 | 71.16 ± 0.47 | 23.66 ± 0.49 | 23.35 ± 1.50 | 2.00 ± 0.00 | 2.83 ± 0.47 | 2.33 ± 0.61 | 2.66 ± 0.42 |

These findings are in agreement with those of McNamara *et al.* (1996). However, they had observed significant reductions in these parameters up to one month. The total leucocyte counts and differential leucocyte counts varied non-significantly in both the groups (Table 3 & 4). But as a whole the TLC levels were on a lower side compared to Group II. This may be due to the anti-inflammatory effects of





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Glucosamine and chondroitin sulphate in combination. These finding are in agreement with that of Anderson *et al*. (1999b) and McNamara *et al*. (1996). No basophils were recorded in this study.

Serum biochemical parameters estimated viz. creatinine, ALT and AST were found to be within the normal range of values as described by Coles (1986). The values did not show any significant differences within the groups or between group I and II (Table 5). Alam *et al.* (2006) have also observed non-significant changes in the values throughout the experimental period of their study over osteoarthritis of stifle in dogs.

**Table 5:** Mean ± SE values of biochemical parameters in Group I and Group II dogs

| Days | Serum Creatinine (mg/dl) | | Serum Alanine Aminotransferase (iu/l) | | Serum Aspartate Aminotransferase (iu/l) | |
|---|---|---|---|---|---|---|
| | Group I | Group II | Group I | Group II | Group I | Group II |
| 0 | 0.94 ± 0.04 | 1.04 ± 0.11 | 27.55 ± 7.39 | 28.43 ± 8.42 | 20.98 ± 1.11 | 21.45 ± 0.69 |
| 7 | 1.10 ± 0.06 | 1.32 ± 0.19 | 22.74 ± 3.56 | 24.58 ± 5.90 | 18.81 ± 0.82 | 19.95 ± 2.25 |
| 14 | 0.84 ± 0.05 | 1.06 ± 0.09 | 25.34 ± 5.06 | 29.82 ± 7.25 | 17.51 ± 0.62 | 18.41 ± 0.54 |
| 28 | 0.78 ± 0.04 | 1.02 ± 0.11 | 28.80 ± 1.45 | 29.68 ± 1.43 | 17.18 ± 1.29 | 18.01 ± 1.88 |
| 45 | 0.80 ± 0.04 | 1.07 ± 0.12 | 33.33 ± 1.77 | 34.13 ± 2.55 | 20.13 ± 2.55 | 21.18 ± 0.90 |
| 90 | 0.82 ± 0.06 | 1.10 ± 0.10 | 35.83 ± 1.90 | 37.95 ± 1.42 | 21.66 ± 2.84 | 22.51 ± 1.88 |

## Conclusion

It could be concluded that nutraceuticals are effective for management for osteoarthritis. Further Nutraceuticals formulations administered to Group I (Glucosamine hydrochloride (500 mg), Chondroitin sulphate (400 mg) and Vitamin C (12.5 mg) orally twice daily for 90 days) dogs was more effective in alleviating pain, reducing lameness and owners satisfaction in OA by 90 days than the formulations used for Group II (Glucosamine hydrochloride (400 mg), Chondroitin sulphate (20 mg), Methyl sulphonyl methane (100 mg) and Vitamin C (50 mg) orally twice daily for 90 days) dogs. Successful management of osteoarthritis using nutraceuticals in twelve dogs is reported.

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