

## EFFECT OF A COMBINATION OF GLUCOSAMINE AND CHONDROITIN SULPHATE SUPPLEMENTATION ON THE SYMPTOMATIC RELIEF OBSERVED IN INDIAN PATIENTS WITH KNEE OSTEOARTHRITIS

NISHA BELLARE<sup>1</sup>, HARSHADARGEKAR<sup>2</sup>, ASHOK BHAGWAT<sup>3</sup>, VIPUL SITUT<sup>4</sup>, NANCY PANDITA<sup>5</sup>

<sup>1</sup>School of Science, NMIMS University, <sup>2</sup>Lokmanya Tilak Municipal General Hospital, Sion, <sup>3</sup>C. B. Patel Research Institute, <sup>4</sup>Adwait Nursing Home, Goregaon, Mumbai 400063, <sup>5</sup>Department of Biological Sciences, School of Science, NMIMS (Deemed to be) University.

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### ABSTRACT

**Objective:** Very few trials have been carried out to study the effect of a combination of glucosamine and chondroitin sulphate supplementation on Indian osteoarthritic patients and hence the objective of this pilot study was to study the effect of this combination on the symptoms of knee osteoarthritic patients in terms of anthropometric measurements, clinical scores and frequency of consumption of painkillers.

**Method:** An open randomized intervention trial was conducted on 58 patients suffering from knee osteoarthritis. They received Glucosamine (1500 mg) and Chondroitin Sulphate (1200 mg) in combination per day in two equally divided doses for a period of one year. Anthropometric measurements in terms of height, weight, Body Mass Index and clinical scores such as WOMAC score, Lequesne's score and Visual analogue scale score were measured at baseline, 6 months and 1 year.

**Results:** There was found to be a significant decrease in all the mean clinical scores and a significant increase in the mean anthropometric measurements at 6 months and 1 year from the start of the intervention. The % response rate based on Lequesne's score also improved at the end of the trial.

**Conclusions:** A combination of glucosamine and chondroitin sulphate supplementation causes significant symptomatic relief and decrease in the frequency of consumption of painkillers in patients suffering from knee osteoarthritis.

**Keywords:** Glucosamine, Chondroitin sulphate, WOMAC score, Lequesne's Score, Visual Analogue scale, Osteoarthritis.

### INTRODUCTION

Osteoarthritis is a chronic degenerative joint disease occurring in the elderly population. The prevalence of osteoarthritis worldwide in females [18%] is at a higher rate as compared to males (9.6%) [1-3].

The signs and symptoms include pain, enlarged and deformed joints as well as limitation of the range of motion [3]. The major cause of disability occurring in these patients is the pain and stiffness associated with day to day activities such as climbing up the stairs, walking, sitting etc. At times these symptoms are also accompanied by swelling and inflammation of the knee joint.

Weight gain is said to be associated with osteoarthritis as it increases the load on the knee joints of these patients [4, 5]. The most commonly used treatment for these patients is the administration of painkillers which are used to provide symptomatic relief in these patients but the major issue of concern is the chronic use of painkillers as they are accompanied by side effects [11, 14, 15]. Hence there is an urgent need to develop alternative methods which will target symptomatic relief in these patients.

One of these methods is the use of nutraceutical which are food components which have the potential to cure specific disease conditions [20]. In a clinical survey, a transdermal glucosamine formulation was found to be effective in relieving symptoms of arthritis [21]. For osteoarthritis, glucosamine and chondroitin sulphate which are found in the proteoglycans of the articular cartilage are said to be having anti-arthritic and anti-inflammatory activities [11-13]. This combination is known to provide symptomatic relief [7-10]. Very few trials have been carried out on Indian patients to study the effect of a combination of glucosamine and chondroitin sulphate supplementation on the symptomatic relief obtained. Hence this trial has been carried out to study the effect of this combination on the anthropometric measurements and clinical scores at baseline, 6 months and 1 year.

### MATERIALS AND METHODS

#### Subjects

Patients diagnosed with primary knee osteoarthritis and referred to orthopedic clinics were selected for the study. Two hospitals and one clinic in Mumbai were targeted for recruitment of patients.

The inclusion criteria was as follows-

- Patients of either sex aged more than 50 yrs
- Patients fulfilling the American College of Rheumatology (ACR) Criteria of clinical, physical and radiographic findings.
- Patients diagnosed with primary knee osteoarthritis with Lequesne's score in the range of 5-14.
- Patients who can understand the study procedure so that they can come for regular follow up
- Visual analogue scale (VAS) > 5
- Kellgren and Lawrence grade 1 to 3
- Patients on mild physiotherapy for osteoarthritis

The exclusion criteria was as follows-

- History of significant trauma or surgery in the affected joint
- History or presence of active rheumatic disease that may be responsible for secondary osteoarthritis
- Severe inflammation of the joint confirmed by physical examination
- History of significant trauma or surgery in the affected joint.
- History or presence of active rheumatic disease that may be responsible for secondary osteoarthritis
- Severe inflammation of the joint confirmed by physical examination
- Have made use of glucosamine and/or chondroitin

- Arthroplasty in the affected joint
- Use of narcotic analgesics
- Any condition that, in the opinion of the investigator, renders the patient unable to participate in the study

The patients were randomly selected based on the inclusion criteria. 58 patients were recruited at baseline. At the end of 6 months and one year, 47 and 42 of patients were left respectively. At the time of recruitment the patients were provided with an informed consent form wherein the procedure and purpose of the study was explained in the language best understood by them. A consent form was also signed by each patient, which stated that they had participated voluntarily. The study was approved by the Ethics Committee of Lokmanya Tilak Municipal Medical College & Lokmanya Tilak Municipal General Hospital, Sion. The ethical clearance number of the study is IEC 19/11.

#### Reasons cited by drop outs

A total of 16 patients dropped out of the study and the reasons cited were fear of diabetes (n=1), fear of weight gain (n=3), relief from pain so no need to continue with the supplementation (n=7), acidity and loss of appetite (n=1), constipation (n=1), other medical treatment (n=1) and unknown reason (n=2).

#### Design

An open, randomized observational and intervention study was carried out to study the effect of supplementation on the symptoms of patients with knee osteoarthritis in terms of anthropometric measurements, clinical parameters and reduction of intensity of symptoms. The patients received Glucosamine (1500mg) and Chondroitin Sulphate (1200mg) per day in two equally divided doses.

#### Anthropometric measurements

Height was measured to the nearest centimeter using a measuring tape. Body weight was measured in kilograms with one decimal by a digital weighing scale at 6 months and 1 year. Based on the weight and height measurements, Body Mass Index (BMI) values were calculated. Based on the WHO classification [19] the subjects were classified as underweight, normal, overweight, pre obese, obese and severely obese.

#### Clinical Scores

The clinical outcome of the intervention was measured in terms of WOMAC score [6], Lequesne's score [11] and Visual Analogue scale [18]. WOMAC Score included parameters such as pain, stiffness and

physical function. Lequesne's score included parameters such as pain, maximum distance walked and Activities of Daily Living. The Visual Analogue scale consisted of a 10 point scale which assessed the patient's current perception of pain. All the three scores were used to assess the patients at baseline, 6 months and 1 year.

#### Statistical methods

Data were analyzed with the use of SPSS 19.0 for WINDOWS. Data were reported as mean±SD. The comparison of mean values for pre and post intervention for anthropometric measurements and clinical scores was done using paired t- test. A p value≤0.05 was considered to be significant.

#### RESULTS

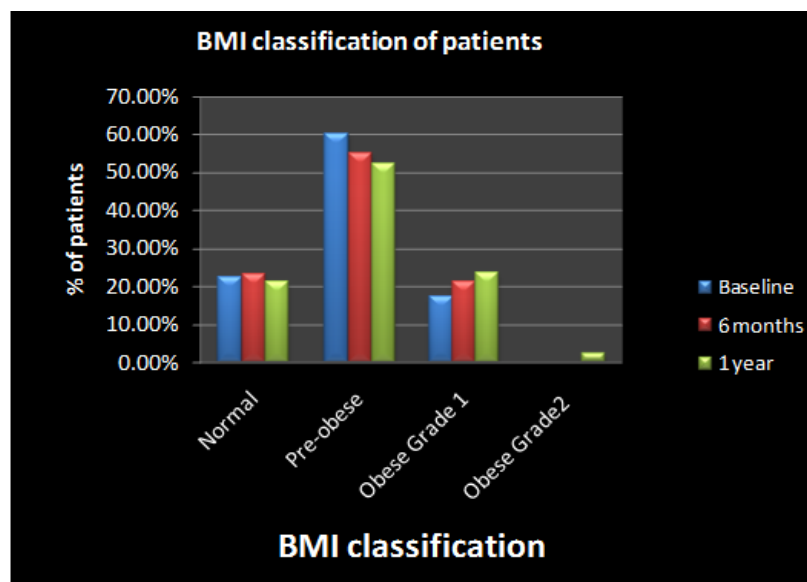
The baseline characteristics of the patients are depicted in Table 1. The anthropometric measurements and clinical scores of the patients at baseline, 6 months and 1 year are presented in Table 2. There was found to be a significant decrease (p≤0.05) in the mean clinical scores and a significant increase (p≤0.05) in the mean anthropometric measurements at 6 months and 1 year. A higher decrease in the mean clinical scores was observed from baseline to 6 months as compared to 1 year. A mean decrease of -5.30±1.19 and -6.78±1.82 for Visual Analogue Scale and Lequesne's Index Score respectively was observed at the end of the treatment.

The classification of subjects based on BMI (Figure 1) demonstrated that there was found to be a decrease in the % of patients in normal category and an increase in the pre-obese and Obese grade 1 category at the end of 1 year which can be related to the significant increase in the mean weight and BMI values observed.

Based on Lequesne's Index Score there was found to be an increase in the % response of patients. At baseline 100% of the patients belonged to the severe category in terms of the handicap experienced whereas at 6 months 80.86% and at 1 year 57.15% were seen in the same category. A shift from severe to moderate was observed in the patients at 6 months and 1 year respectively (Table 3).

**Table 1: Baseline characteristics of the patients**

Age (yrs)	(Mean±SD)
	63.81±10.24
Sex (M:F)	20:38
No. of patients at baseline	58
No. of dropouts at 6 months	11
No. of dropouts at 1 year	5
Total no. of dropouts	16
No. of patients who completed the study	42



**Fig. 1: Classification of patients based on Body Mass Index (BMI)**

Table 2: Effect of the intervention on body weight, Body Mass Index (BMI) and clinical scores

Parameters	Baseline Mean±SD (n=47)	6 months Mean±SD (n=47)	p≤0.05	Baseline to 6months Mean±SD (n=47)	Baseline Mean±SD (n=42)	1 year Mean±SD (n=42)	p≤0.05	Baseline to 1 year Mean±SD (n=42)
Weight (kg)	72.00±13.52	72.55±13.30	0.00	0.55±1.26	71.07±13.88	72.19±13.87	0.00	1.11±1.31
BMI(kg/m <sup>2</sup> )	27.12±3.58	27.31±3.35	0.01	0.19±0.68	27.09±3.75	27.57±3.74	0.00	0.47±0.74
WOMAC(Pain)	13.57±2.01	9.23±1.69	0.00	-4.34±1.06	13.81±1.87	8.21±1.40	0.00	-5.59±1.51
WOMAC(Stiffness)	4.98±1.22	2.55±0.77	0.00	-2.42±0.74	5.02±1.25	1.88±0.83	0.00	-3.14±1.18
WOMAC(Physical function)	44.19±8.17	32.64±6.40	0.00	-11.55±3.99	44.60±8.05	30.29±5.54	0.00	-14.30±4.94
Lequesne's (pain)	6.75±1.28	3.75±0.96	0.00	-2.57±0.58	6.64±1.34	3.26±0.79	0.00	-3.38±1.10
Lequesne's (distance walked)	2.98±1.52	1.87±0.99	0.00	-0.89±0.52	3.19±1.61	2.21±1.22	0.00	-0.97±0.56
Lequesne's (Activities of daily living)	4.54±1.32	2.62±0.88	0.00	-1.68±0.91	4.81±1.36	2.50±0.99	0.00	-2.30±1.07
Lequesne's(Index Score)	14.33±2.65	8.27±1.76	0.00	-5.27±1.17	14.74±2.81	7.95±1.99	0.00	-6.78±1.82
Visual Analogue Scale (VAS)	7.98±0.89	3.27±0.56	0.00	-4.27±0.90	8.02±0.74	2.71±0.83	0.00	-5.30±1.19

Table 3: % response of subjects based on Lequesne's Index Score

Handicap	Baseline (n=58)	6 months (n=47)	1 year (n=42)
Mild	-	-	-
Moderate	-	9(19.14%)	18(42.85%)
Severe	58(100%)	38(80.86%)	24(57.15%)

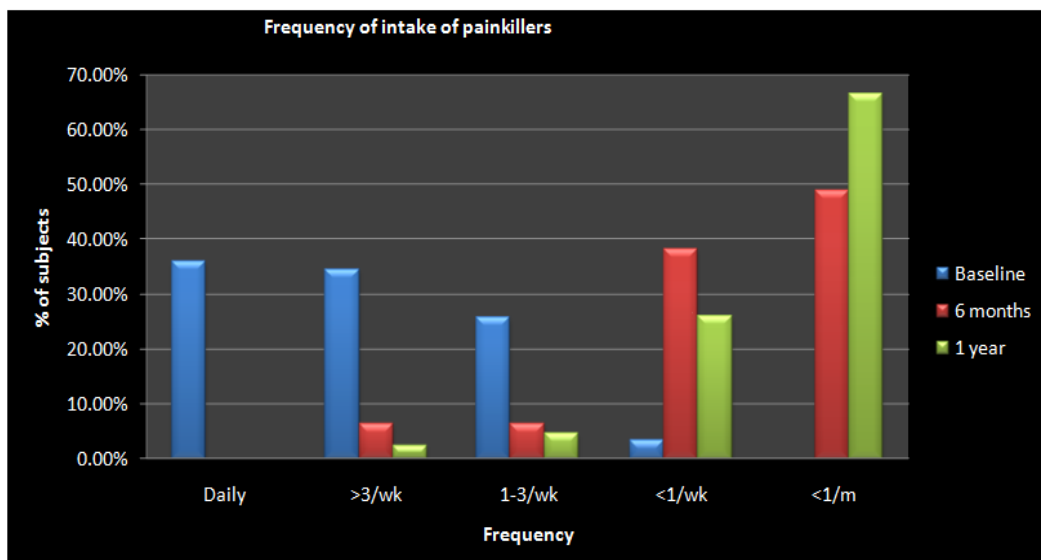


Fig. 2: Frequency of consumption of painkillers at baseline, 6 months and 1 year

There was found to be a decrease in the % of patients consuming painkillers on a daily basis at 6 months and 1 year as the frequency of consumption of painkillers shifted towards <1/month category. This decrease could be related to the significant decrease observed in the mean clinical scores at 6 months and 1 year. At the end of the trial no patients consumed any painkiller on a daily basis.

## DISCUSSIONS

Osteoarthritis (OA) is the most prevalent chronic rheumatic disease and is a leading cause of pain and disability in most countries worldwide. OA is strongly associated with ageing and the Asian region is ageing rapidly. Unfortunately, joint replacement surgery, an effective intervention for people with severe OA involving the hips or knees, is inaccessible to most people in these regions [16].

In this study a combination of glucosamine and chondroitin sulphate supplementation has been used to study its impact in terms of the symptomatic relief obtained in these patients at 6 months and 1 year. A significant decrease ( $p \leq 0.05$ ) was observed for all the

clinical scores during both the follow ups. In our study a significant decrease was observed with respect to the WOMAC Score, VAS Score and Lequesne's Index Score ( $p \leq 0.05$ ) post supplementation. The decrease in the scores could be due to the fact that glucosamine and chondroitin sulphate supplementation does help in providing symptomatic relief in patients with mild to moderate knee osteoarthritis which has also been demonstrated in a study carried out by Daniel .O.Clegg et al, 2006 [17]. In our study the Kellgren and Lawrence Grade for all the patients was found to be the same after 1 year of intervention which proves that this combination is effective in providing symptomatic relief but is not effective in providing anatomical improvements in the joint condition which was also demonstrated by a study carried out by Sudha Vidyasagar et al [11].

Nevertheless further long term studies are needed to study whether glucosamine and chondroitin sulphate supplementation could lead to anatomical changes in the joints. In our study a decrease in the % of patients consuming painkillers on a daily basis was observed, from 36.20% at baseline it went down to 0% at 1 year which to a

great extent fulfills the objective with which this study was carried out. The % response rate also showed a tremendous improvement wherein at baseline 100% of the patients belonged to the severe category and at 1 year only 57.15% of the patients were left in this category, a shift was observed from the severe to moderate category.

There was found to be a significant increase ( $p \leq 0.05$ ) in the mean anthropometric measurements with respect to the weight and BMI values. At baseline 17.24 % of patients belonged to Obese Grade 1 category and at 1 year it increased to 23.80%. This increase could be related to the fact that due to significant improvements in the clinical scores and the feeling of well being associated with it could have led to an increase in the food consumption of these patients but this correlation needs to be studied in detail and hence simultaneously two separate groups were also studied wherein one group was given a combination of weight loss diet and glucosamine with chondroitin sulphate supplementation and the other group was given a weight loss diet alone and the results will be analyzed and published separately. The tolerability of the study was found to be good which can be demonstrated by the retention rate (72.41%) of the patients at the end of the study. However more trials with a larger sample size and a longer duration are warranted to study the long term effects of this supplementation on the anatomical changes occurring in the joints and on the biochemical parameters of osteoarthritic patients.

### CONCLUSIONS

A combination of glucosamine and chondroitin sulphate supplementation causes significant symptomatic relief and decrease in the frequency of consumption of painkillers in patients suffering from knee osteoarthritis.

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