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Evaluation of The Clinical Safety and Effectiveness of A Daily Joint Care & Protect Tablet in Osteoarthritis Management

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Abstract:

Introduction: *Osteoarthritis (OA) is a debilitating condition affecting millions worldwide, with increasing prevalence and limited treatment options. Current pharmaceutical interventions often present significant side effects, necessitating the exploration of alternative nutraceutical approaches. This study aimed to clinically validate the safety and effectiveness of a novel Daily Joint Care & Protect Tablet in managing osteoarthritis symptoms.*

Materials and Methods: *A single-arm, open-label safety study was conducted with 32 participants (15 males, 17 females) aged 25-60 years. Participants received one Daily Joint Care & Protect Tablet daily for 30 days. Comprehensive assessments included WOMAC score evaluation, Pain Visual Analog Scale (VAS), hematological and biochemical parameters, vital signs, and adverse event monitoring.*

Results: *Significant improvements were observed across WOMAC subscales: pain scores decreased by 37.58%, stiffness by 36.52%, and physical function by 33.94%. VAS pain scores demonstrated a 28.87% reduction. Hematological and biochemical parameters remained stable, with only a statistically significant increase in hematocrit levels. Only 4 out of 32 participants (12.5%) reported mild, non-product-related adverse events. No clinically significant changes in vital signs were detected.*

Conclusion: *The Daily Joint Care & Protect Tablet demonstrated excellent safety, tolerability, and potential efficacy in managing osteoarthritis symptoms. The nutraceutical formulation showed promising results in reducing pain, and stiffness, and improving physical function without significant adverse effects.*

Key Words: *Osteoarthritis, Nutraceuticals, Joint Health, WOMAC Score, Pain Management, Boswellia serrata.*

1. INTRODUCTION:

Osteoarthritis (OA) is a debilitating condition influenced by factors like age, genetics, joint trauma, misalignment, and molecular inflammation. It is common in the elderly, causing significant pain and functional impairment in millions worldwide (1,2,3). Symptomatic OA is less common than asymptomatic (radiographic) OA, with the knee being the most commonly affected joint. A survey of 819 individuals found that 77% of men and 61% of women with knee pain had knee OA. However, the reliability of self-reported symptoms and knee pain as indicators of knee OA remains unclear (3).

In 1990, around 23.46 million persons in India were affected with OA, which increased to 62.35 million by 2019 (4). This surge highlights the critical need for appropriate management techniques, including pharmaceutical and non-pharmacological interventions, to reduce symptoms and enhance the quality of life for persons suffering from this painful condition.

The medication to halt the degenerative progression of OA is still unidentified. Current oa therapies are symptomatic, with treatment typically combining multiple approaches focused on pain relief and functional improvement (5). Acetaminophen, NSAIDS, and intra-articular corticosteroid injections are first-line treatments for oa. However, long-term use of these medications can lead to serious side effects, including gastrointestinal issues, cardiovascular effects, kidney and liver toxicity, and an increased risk of overdose (6,7).

Given the significant side effects of NSAIDS and acetaminophen, there is increasing interest in exploring herbal or nutraceutical alternatives for managing osteoarthritis with fewer risks of adverse reactions (8). Nutraceutical combinations of acujoint, calcium fructoborate, undenatured type-ii collagen, *boswellia serrata*, and hadjod stem extract effectively reduce joint stiffness and discomfort while improving physical function. Studies show improved WOMAC scores with no adverse effects, indicating these combinations as safe options for managing osteoarthritis symptoms (9,10).

The main bioactive components of *boswellia serrata* extract (BSE) are boswellic acids, specifically acetyl-keto-beta-boswellic acid (akba) (11). Their lipophilic character has been linked to their low oral bioavailability, as demonstrated by pharmacokinetic investigations (12). *Boswellia serrata* extract, when taken with high-fat meals, increases plasma levels of akba and boswellic acids. Enhanced bioavailability is observed in formulations combining boswellia with other herbal extracts and phospholipid-based delivery systems. Used orally in pills or capsules for osteoarthritis, BSE has demonstrated a good safety profile with no significant harm at therapeutic doses (13,14).
In conclusion, the nutraceutical containing acujoint as an active ingredient demonstrates superior efficacy in alleviating pain, reducing stiffness, and improving WOMAC scores.

2. MATERIALS AND METHODS:

2.1 Study Design

The study was designed as an open-label, single-arm, safety investigation focusing on the evaluation of Daily Joint Care & Protect Tablet. A total of 32 subjects were enrolled and completed the entire 30-day treatment protocol at the Lokmanya Medical Research Centre & Hospital in Pune, India. The study was officially registered on the Clinical Trial Registry of India (CTRI/2024/03/064117) and received approval from the Institutional Ethics Committee at Lokmanya Medical Research Centre. The study aimed to clinically validate the safety and effectiveness of the investigational product among male and female participants. No subject dropouts were recorded during the study period, ensuring complete data collection from all enrolled participants. The study duration was calculated from the initial enrolment to the day 30 visit, providing a comprehensive assessment of the product's impact.

2.2 Investigational Product Details

Daily Joint Care & Protect Tablet is a proprietary formulation comprising a carefully selected blend of natural active ingredients. The Daily Joint Care & Protect Tablet contains Acujoint Extract (Blend of *Kaempferia galanga* Rhizome Extract, *Curcuma longa* Rhizome Extract, *Boswellia serrata* Gum Resin Extract, *Piper nigrum* extract)- 250 mg, Calcium Fructoborate (113 mg) Undenatured Type-II Collagen 40 mg, Hadjod Stem Extract (*Cissus quadrangularis*) 200 mg, Calcium as Calcium Citrate 400 mg, Vitamin K2 (MK-7) (Menaquinone) 55 mcg, Vitamin D3 7.50 mcg (300IU) Magnesium Oxide 50 mg. The investigational products were carefully stored in PET bottle containers, each containing 30 tablets, and maintained in a cool, dark, and dry environment away from direct sunlight and heat to preserve their integrity.

2.3 Inclusion Criteria

The study enrolled participants meeting specific demographic and health criteria. Subjects between 25-60 years of age (both inclusive) were considered for screening and potential enrolment. Participants were required to provide written informed consent approved by the ethics committee and demonstrate a willingness to complete the entire study intervention and follow-up protocol.

2.4 Exclusion Criteria

The study excluded various participant groups to ensure research integrity: women without adequate contraception, pregnant and lactating women, individuals with substance abuse history, neurological conditions, recent surgeries, comorbidities, and those using specific medications or supplements. Exclusion criteria also covered patients with joint diseases, mobility limitations, severe medical conditions, ongoing treatments with specific drugs, and those who received recent interventional therapies or had specific medical interventions in the preceding months.

2.5 Methodology

The study methodology followed a structured approach to data collection and participant management. During the screening/baseline visit, comprehensive demographic details were recorded for each subject, including sex, age, body weight, height, and relevant personal habits. A complete general clinical and physical examination was conducted to establish baseline health parameters. Written informed consent was obtained from all participants, confirming their understanding and willingness to participate in the study.

The research adhered to the consolidated standards of reporting trials (CONSORT) guidelines, with the entire study flow depicted in a dedicated figure 1. Comprehensive assessments were performed to evaluate multiple parameters, including compliance, clinical observations, vital signs, and the investigational product's tolerability. Specific diagnostic evaluations were conducted at screening and at the end of the study, encompassing complete blood count (CBC), liver function tests (LFT), renal function tests (RFT), WOMAC score assessment (covering pain, stiffness, and physical function domains), and VAS score questionnaire.

2.6 Statistical Analysis

Analysis of hematological and biochemical parameters, vitals, and WOMAC questionnaire was done using a dependent student t-test (within the group) and Wilcoxon signed rank test (within the group). Analysis of VAS was done by Wilcoxon signed rank test (within the group). The normality of the study data was calculated by the Kolmogorov-Smirnov Test. Adverse events were reported as several events observed during the study period. Statistical analysis has been done by using SPSS.

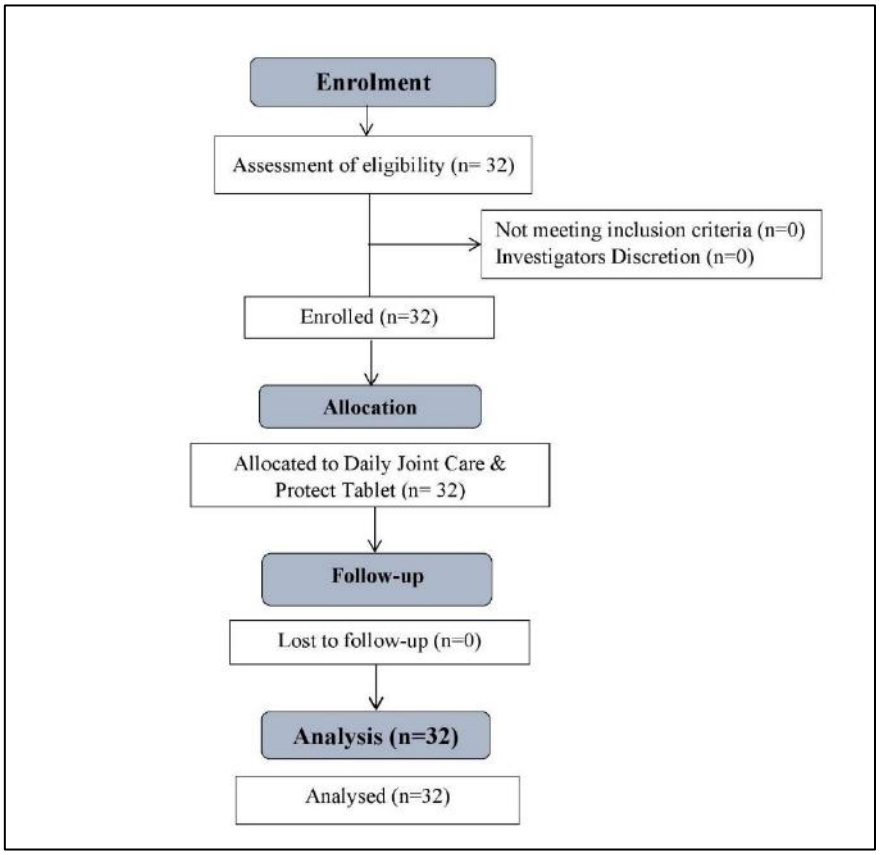

Figure 1: CONSORT flow diagram of the study.

3. RESULTS:

Demographic Characteristics

All thirty-two participants (15 males and 17 females) completed the study. The average age of the subjects was 50.88±7.26. Male participants had an average weight of 69.17 kg, a height of 164.13cm, and a BMI of 25.64 kg/m². Female participants had an average weight of 66.82 kg, a height of 156.00 cm, and a BMI of 27.53 kg/m². These demographic details are summarized in **Table 1**.

Table 1: Demographic Details

Parameter	Male Mean ± SD (n=15)	Female Mean ± SD (n=17)	P Value
Average Age (Years)	51.20±7.49	50.59±7.27	0.816
	50.88±7.26		
Anthropometric Parameters			
Height (cm)	164.13±4.94	156.00±6.58	<0.001
Weight (kg)	69.17±9.56	66.82±8.35	0.464
BMI (kg/m^2)	25.64±3.08	27.53±3.62	0.125

Data is represented as Mean ± S.D. Analysis was done using the Independent student t-test. Significant at p< 0.05.

Assessment of hematological and biochemical investigations

The analysis of the hematological and biochemical parameters showed no statistically significant differences as well as not clinically significant between the screening and day 30-time points for the majority of the measured variables. The only exception was a statistically significant increase in hematocrit (PCV) levels from screening to day 30 (p<0.001). All other blood parameters, including white and red blood cell counts, hemoglobin, liver function tests, and kidney function tests, remained stable and within the respective reference ranges throughout the study period (**Table 2**).

Table 2: Assessment of hematological and biochemical investigations

Hematological And Biochemical Investigations				
Parameters	**Screening**	**Day 30**	**P Value**	**Reference range**
Hematological Parameters				
White Blood Cell Count (WBC)	7817.50±1883.89	7916.56±1738.65	0.647	(4000 - 11000 cell/cu.mm)
Red Blood Cell Count (RBC)	4.71±0.57	4.90±0.57	0.094	(4.7 - 6.0 mil/cu.mm)
Hemoglobin (Hb)	12.66±1.66	12.85±1.52	0.238	(Female: 11.6 - 15 gm/dL & Male: 13.2-16.6 gm/dL)
Haematocrit (PCV)	39.73±4.73	41.45±4.68	<0.001	(42 - 52 %)
Mean Corpuscular Volume (MCV)	84.13±6.81	82.05±7.24	0.157	(78 - 100 fL)
Mean Corpuscular Haemoglobin (MCH)	27.02±2.83	26.44±2.96	0.390	(27 - 31 pg)
Mean Corpuscular Haemoglobin Concentration (MCHC)	31.94±1.14	32.10±1.46	0.528	(32-36 gm/dL)
Platelet Count	314.56±83.55	310.09±74.77	0.620	(150 - 450 10^3/ul)
Neutrophils	53.06±9.31	54.97±8.55	0.075	(40 - 75 %)
Lymphocytes	38.09±8.57	37.44±7.50	0.385	(20 - 40 %)
Monocytes	5.28±1.33	5.28±1.35	1	(2-10 %)
Eosinophils	3.56±0.67	3.72±0.85	0.222	(1-6 %)
Basophils	0.00±0.00	0.00±0.00	1	(0-1 %)
Liver Function				
Protein Total	6.83±0.49	6.89±0.53	0.159	(6.0 - 8.3 g/dL)

Albumin	4.25±0.22	4.30±0.26	0.106	(3.2 - 5.5 g/dL)
Globulin	2.58±0.47	2.60±0.52	0.701	(1.8 - 3.6 g/dL)
A/G Ratio	1.70±0.31	1.72±0.37	0.379	(1.2 - 2.2)
Bilirubin Total	0.52±0.22	0.52±0.18	0.737	(0.1-1.2 mg/dL)
Bilirubin Direct	0.20±0.10	0.20±0.08	0.872	(0-0.4 mg/dL)
Bilirubin Indirect	0.32±0.14	0.32±0.13	0.450	(0.1-0.8 mg/dL)
Aspartate Transaminase (AST/SGOT)	28.86±11.65	29.43±10.35	0.368	(49 U/ L)
Alanine Transaminase (ALT/SGPT)	33.22±11.37	32.12±10.65	0.085	(49 U/ L)
Alkaline Phosphatase	130.04±30.16	131.29±31.47	0.697	(80 - 306 U/ L)
Kidney Function				
Urea	21.77±5.29	21.56±4.68	0.773	(7-40 mg/dL)
Creatinine	0.89±0.26	0.87±0.26	0.204	(0.5-1.5 mg/dL)
Uric Acid	4.72±0.99	4.73±1.01	0.898	(3.0 to 7.2 mg/dL)

Data is represented as Mean ± S.D. Analysis was done using the dependent student t-test (within the group) and Wilcoxon signed rank test (within the group). Significant at p< 0.05.

Assessment of vital signs

There were no significant differences in systolic blood pressure, diastolic blood pressure, heart rate, body temperature, or respiratory rate between the two study visits. These findings indicate the study intervention did not have any clinically relevant impact on the participants' vital sign parameters over the 30-day evaluation period **Table 3**.

Table 3: Assessment of vital signs

Parameters	Duration	Test (n = 32)	P value
Systolic BP (mmHg)	Screening	119.94±9.82	0.055
	Day 30	123.59±7.58	
Diastolic BP (mmHg)	Screening	78.13±6.51	0.052
	Day 30	80.63±5.49	
Heart Rate (BPM)	Screening	73.50±9.88	0.268
	Day-30	76.06±7.56	
Body Temperature (^{O}F)	Screening	97.15±0.83	0.163
	Day-30	96.84±1.03	
Respiratory Rate (Breaths per minute)	Screening	18.41±1.68	0.464
	Day-30	18.25±1.37	

Data is represented as Mean ± S.D. Analysis was done using the dependent student t-test (within the group) and Wilcoxon signed rank test (within the group). Significant at p< 0.05.

Assessment of adverse events

The adverse events observed during the study are presented in **Table 4**. Out of the 32 participants, a total of 4 subjects (12.5 %) experienced at least one adverse event. The reported adverse events were headache, dizziness, nausea, and common cold. For each adverse event, the number of subjects affected and the corresponding rescue medication used are shown. None of AE's were related to the investigational product. All thirty-two subjects were compliant and showed excellent tolerability to the investigational product.

Table 4: Adverse Events Observed in the Study (N=32)

Adverse Events	No (N=32)	Rescue Medication
Headache	1	Aspirin
Dizziness	1	Betahistine
Nausea	1	Omeprazole
Common cold	1	Cetirizine
Total No. of Events	4	-
Total No. of subjects (%)	4 (12.5%)	-

Assessment of WOMAC Score

The WOMAC questionnaire comprises three subscales: pain, stiffness, and physical function. Each question or activity is assessed on a difficulty scale ranging from 0 (None), 1 (Slight), 2 (Moderate), 3 (Very), and 4 (Extremely), with higher scores indicating greater difficulty and poorer function. The total score for each subscale is obtained by summing the response scores for that subscale. Improvement is reflected as a reduction in the score.

After 30 days of treatment, significant reductions were observed across all subscales of the WOMAC assessment. Specifically, the pain score decreased by 37.58%, indicating a significant alleviation of pain. Likewise, the stiffness score decreased significantly by 36.52%, demonstrating a notable improvement in stiffness symptoms. Additionally, there was a significant decrease of 33.94% in the physical function score, suggesting enhanced physical function following the treatment period (**Table 5**).

Table 5: Assessment of WOMAC Score

Assessment of WOMAC Score				
Subscale	**Screening**	**Day 30**	**% change**	**P value**
Pain	9.66±1.64	6.03±1.36	37.58	< 0.001
Stiffness	4.19±1.09	2.66±0.90	36.52	< 0.001
Physical Function	35.06±2.79	23.16±2.19	33.94	< 0.001

Data is represented as Mean ± S.D. Analysis was done using the dependent student t-test (within the group) and Wilcoxon signed rank test (within the group). Significant at $p < 0.05$.

Assessment of Pain VAS Score

The visual analogue scale for pain assessment is a 10-point scale ranging from 0 (no pain) to 10 (severe pain), with higher scores indicating greater pain intensity. The analysis of the VAS pain scores revealed a statistically significant decrease by 28.87% improvement in self-reported pain intensity over the 30-day study period (**Table 6**).

Table 6: Assessment of Pain VAS Score

Assessment of VAS Pain Score (% change)			
Parameter	**Screening**	**Day 30**	**P value**
VAS Pain Score	5.75±0.80	4.09±0.82 (28.87)	< 0.001

Data is represented as Mean ± S.D. Analysis was done using the Wilcoxon signed rank test (within the group). Significant at $p < 0.05$.

4. DISCUSSION:

The current study provides valuable insights into the efficacy and safety of a daily joint care and protect tablet containing key nutraceutical ingredients for managing osteoarthritis symptoms. Our open-label, single-arm safety trial enrolled participants aged 25-60 and administered the investigational product daily for 30 days, focusing on comprehensive assessments of clinical outcomes and safety parameters. The research design adhered to CONSORT guidelines, ensuring rigorous methodological integrity (15,16).

The most significant findings emerged from the WOMAC and VAS assessments, which demonstrated remarkable improvements across multiple domains. Participants experienced a substantial 37.58% reduction in pain scores, indicating considerable pain alleviation. Simultaneously, stiffness ratings decreased by 36.52%, and physical function scores improved by 33.94%. These clinically meaningful improvements align with previous research documenting the potential of nutraceutical interventions in osteoarthritis management (17, 18). The VAS pain score analysis revealed a statistically significant 28.87% decrease in self-reported pain intensity, further substantiating the intervention's therapeutic potential.

From a safety perspective, the study demonstrated exceptional tolerability. Hematological and biochemical parameters remained largely consistent throughout the 30-day intervention, with only a statistically significant increase in hematocrit levels. Notably, all other blood parameters, including white and red blood cell counts, hemoglobin levels, liver function tests, and kidney function tests, remained stable within established reference ranges (19). Vital signs such as blood pressure, heart rate, body temperature, and respiratory rate showed no clinically significant variations, suggesting the intervention's minimal physiological impact.

The adverse event profile was remarkably low, with only 4 out of 32 participants (12.5%) reporting mild events such as headache, dizziness, nausea, and common cold. Importantly, these events were not attributed to the investigational product, underscoring its safety profile. This finding is consistent with previous studies investigating similar nutraceutical formulations, particularly those containing Boswellia serrata extract (20,21).

The study's comprehensive formulation, which includes Acujoint Extract, calcium fructoborate, undenatured type-II collagen, and essential nutrients like calcium citrate, vitamin K2, vitamin D3, and magnesium oxide, likely contributes to its efficacy. The synergistic effects of these ingredients, particularly the Boswellia extract with its bioactive boswellic acids, may explain the observed improvements in osteoarthritis symptoms (11-14).

While the results are promising, several limitations warrant acknowledgment. The single-arm, open-label design without a control group necessitates cautious interpretation. Future research should incorporate randomized, double-blind, placebo-controlled trials to definitively establish the intervention's efficacy. Moreover, long-term studies are needed to understand the sustained effects and potential cumulative benefits of this nutraceutical approach.

The findings contribute to a growing body of evidence supporting nutraceutical interventions as potential alternatives or complementary treatments to traditional pharmacological approaches for osteoarthritis management. By demonstrating significant symptom improvement with minimal side effects, this study offers hope for patients seeking safer, more natural management strategies for joint health.

Recommendations for future research include investigating optimal dosage protocols, exploring potential interactions with other treatments, and conducting more extensive longitudinal studies to comprehensively understand the long-term implications of this nutraceutical intervention. Additionally, exploring the mechanism of action for the observed improvements could provide deeper insights into how these natural compounds interact with joint physiology.

5. CONCLUSION:

This study provides compelling evidence for the safety and efficacy of a daily joint care and protect tablet in managing osteoarthritis symptoms. The significant improvements in pain, stiffness, and physical function, coupled with an excellent safety profile, suggest a promising therapeutic approach for individuals suffering from osteoarthritis.

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8. CONFLICT OF INTEREST

Dr. Kriti Soni and Dr. Sachin Mulik are part of Herbolab India Pvt. Ltd. Other author declares no conflict of interest.

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