

Exploring the Impact of Curcumin on Osteoarthritis Symptomatology: Correlations and Insights from a Bulgarian Cohort

Krasimir Kraev¹, Petar Uchikov^{2,3}, Bozhidar Hristov⁴, Maria Kraeva⁵, Yordanka Basheva-Kraeva^{6,7}, Mladen Doykov^{8,9}, Stanislava Popova-Belova¹, Mariela Geneva-Popova¹

¹ Department of Propedeutics of Internal Diseases, Faculty of Medicine, Medical University of Plovdiv, Plovdiv, Bulgaria

² Department of Special Surgery, Faculty of Medicine, Medical University of Plovdiv, Bulgaria, Plovdiv, Bulgaria

³ St George University Hospital, Plovdiv, Bulgaria

⁴ Second Department of Internal Diseases, Faculty of Medicine, Medical University of Plovdiv, Plovdiv, Bulgaria

⁵ Department of Otorhinolaryngology, Faculty of Medicine, Medical University of Plovdiv, Plovdiv, Bulgaria

⁶ Department of Ophthalmology, Faculty of Medicine, Medical University of Plovdiv, Plovdiv, Bulgaria

⁷ University Eye Clinic, St George University Hospital, Plovdiv, Bulgaria

⁸ Department of Urology and General Medicine, Faculty of Medicine, Medical University of Plovdiv, Plovdiv, Bulgaria

⁹ Clinic of Urology, Kaspela University Hospital, Plovdiv, Bulgaria

Corresponding author: Krasimir Kraev, Department of Propedeutics of Internal Diseases, Faculty of Medicine, Medical University of Plovdiv, 15A Vassil Aprilov Blvd., 4002 Plovdiv, Bulgaria; Email: kkraev@hotmail.com

Received: 11 May 2024 ♦ **Accepted:** 1 July 2024 ♦ **Published:** 31 August 2024

Citation: Kraev K, Uchikov P, Hristov B, Kraeva M, Basheva-Kraeva Y, Doykov M, Popova-Belova S, Geneva-Popova M. Exploring the impact of curcumin on osteoarthritis symptomatology: correlations and insights from a Bulgarian cohort. *Folia Med (Plovdiv)* 2024;66(4):461-465. doi: 10.3897/folmed.66.e127319.

Abstract

Introduction: Osteoarthritis is a prevalent degenerative joint disorder associated with pain and functional impairment. Curcumin, a natural anti-inflammatory compound, has garnered attention for its potential therapeutic benefits in osteoarthritis management.

Aim: This study aimed to investigate the correlations between curcumin use, patient characteristics, medication use, and changes in health outcomes among osteoarthritis patients. The primary hypothesis was that curcumin use would correlate with positive changes in health metrics.

Materials and methods: A cohort of 60 osteoarthritis patients was enrolled in this observational study and divided into 4 groups according to the type of osteoarthritis. Patient selection criteria included a diagnosis of osteoarthritis and consent for curcumin supplementation. The primary outcome variable was changes in health metrics measured across three visits. Body mass index, nonsteroidal anti-inflammatory drugs (NSAIDs) and paracetamol use were also recorded. Correlation analysis and paired *t*-tests were employed to examine the relationships between variables and changes in health metrics.

Results: Correlation analyses revealed a weak negative correlation between BMI and changes between 'Visit 1' and 'Visit 2' ($r=-0.09$). NSAIDs use exhibited a weak positive correlation with changes during this period ($r=0.17$), while paracetamol use displayed weak correlations ($r=-0.05$) with changes. Statistically significant changes were observed between 'Visit 1' and 'Visit 2' (mean change $=-5.93$, $p<0.05$), aligning with prior studies indicating curcumin's potential in osteoarthritis symptom relief.

Conclusions: This study provides valuable insights into the intricate relationships that exist between the use of curcumin, patient characteristics, medication use, and changes in health metrics in patients with osteoarthritis. Despite many limitations, including sample size and research duration, our correlation analysis indicates that curcumin may have a positive impact on the symptomatology of osteoarthritis. The findings highlight the need for more studies, larger trials, and mechanistic analyses to completely understand the potential therapeutic role of curcumin in osteoarthritis management.

Keywords

curcumin, osteoarthritis, health metrics, BMI, NSAIDs, paracetamol

INTRODUCTION

Osteoarthritis (OA) is a prevalent chronic joint disorder characterized by progressive cartilage degeneration and associated pain. Amidst the evolving landscape of OA management, curcumin, a natural compound with anti-inflammatory properties, has garnered attention for its potential therapeutic effects.^[1-7]

AIM

Our study aimed to investigate the relationships between curcumin use, patient characteristics, and changes in health metrics across multiple visits. By elucidating these associations, we seek to contribute to the understanding of curcumin's potential role in mitigating OA progression and symptomatology.

MATERIALS AND METHODS

A cohort of 60 patients diagnosed with osteoarthritis participated in this study. They were categorized based on the affected joints: 7 had knee osteoarthritis, 5 had hip osteoarthritis, 24 had hand osteoarthritis, and 24 had other types of osteoarthritis. The demographic composition included 34 female and 26 male patients, with a mean age of 67 years (range 51–81 years). Each patient had their body mass index (BMI), NSAID and paracetamol use documented. To reduce any potential side effects, NSAIDs were administered to the patients in the lowest effective doses. OA severity was assessed using the Kellgren-Lawrence grading scale: 20% of patients were classified as grade 1, 50% as grade 2, 20% as grade 3, and 10% as grade 4. Detailed analysis of NSAID use revealed the following distribution: aceclofenac 25%, etoricoxib 15%, nimesulide 22%, diclofenac 13%, ibuprofen 10%, ketoprofen 10%, celecoxib 5%, and naproxen 5%.

Health metrics included pain levels (measured by a visual analogue scale, VAS), joint function (assessed by Western Ontario and McMaster Universities Osteoarthritis Index, WOMAC), and Quality of Life (evaluated using Short Form Health Survey, SF-36). Statistical analyses comprised correlation analysis with Pearson's correlation coefficient examining relationships between BMI, and NSAID and paracetamol use with changes in health metrics between 'Visit 1' and 'Visit 2'. Point-biserial correlation coefficients quantified relationships between binary variables (use of NSAID and paracetamol) and changes,

while paired *t*-tests assessed changes between visits for statistical significance.

RESULTS

In this section, we present the results of our study, including correlations between patient characteristics, medication use, and changes in health metrics over multiple visits.

Table 1 provides descriptive statistics of patient characteristics and changes in health metrics. The cohort had a mean BMI of 28.2, and the mean changes in health metrics between 'Visit 1' and 'Visit 2' were -5.93 , indicating a statistically significant reduction ($t=-2.08$, $p<0.05$). The changes between 'Visit 2' and 'Visit 3' were not statistically significant (mean change $=-0.57$).

Table 1. Descriptive statistics of patient characteristics and health metrics

Variable	Mean	Standard deviation
BMI	28.2	6.23
NSAID use	0.6	-
Paracetamol use	0.23	-
Changes (V1 to V2)	-5.93	13.65
Changes (V2 to V3)	-0.57	13.36

Table 2 displays the correlation coefficients between patient characteristics, medication use, and changes in health metrics. A weak negative correlation was observed between BMI and changes between 'Visit 1' and 'Visit 2'. NSAIDs use exhibited a weak positive correlation with changes during this period, while paracetamol use showed weak correlations with changes between both visits.

These tables enhance the clarity and accessibility of our findings, revealing the relationships and trends among the variables under investigation.

Table 2. Correlations between patient characteristics, medication use, and changes

Variable	Changes (V1 to V2)	Changes (V2 to V3)
BMI	-0.09	0.02
NSAIDs use	0.17	-0.05
Paracetamol use	-0.05	-0.08

DISCUSSION

The discussion presents an analysis and interpretation of the study's results in the context of existing literature and references.

The investigation into the potential effects of curcumin on osteoarthritis symptomatology and progression yields valuable insights into the multifaceted nature of OA management. The correlation analyses conducted between patient characteristics, medication use, and changes in health metrics contribute to the ongoing discourse on curcumin's potential therapeutic role and its interplay with other factors influencing OA progression.

Our findings reveal a weak negative correlation between BMI and changes in health metrics between 'Visit 1' and 'Visit 2'. This finding aligns with earlier research highlighting the influence of BMI on OA risk and severity, as documented by Felson et al.^[8] Our study suggests that higher BMI may be associated with greater changes in health metrics, possibly due to increased mechanical stress on joints, which may exacerbate OA progression. However, the significance of this correlation warrants further investigation, considering the limited sample size and other contributing factors.

Moreover, the observed weak positive correlation between nonsteroidal anti-inflammatory drugs use and changes during the same period is intriguing. This echoes the analysis by Zhang et al., who emphasized the role of NSAIDs in managing OA-related inflammation.^[6] It is plausible that NSAIDs alleviate symptoms in the short term, contributing to the observed changes. However, it is important to consider the potential long-term effects and side effects associated with the use of NSAID.^[9,12]

Interestingly, the analysis of paracetamol use and its correlations with changes suggests a complex relationship. Weak correlations indicate that paracetamol may not significantly influence short-term changes in health metrics. These findings coincide with other systematic reviews which questioned the efficacy of dietary supplements, including paracetamol, in treating OA.^[10,11] Further exploration of paracetamol's role in OA management, particularly in conjunction with curcumin, is warranted.

The changes observed between 'Visit 1' and 'Visit 2' underscore the potential impact of curcumin on OA symptomatology. These results are consistent with previous studies which demonstrated curcumin's potential in attenuating OA progression and relieving associated pain symptoms.^[13-17] Our study, while limited in duration, echoes with other studies which investigated the combined effects of curcumin and exercise in OA treatment.^[18-20]

Despite the promising correlations and changes observed, this study has limitations. The relatively small sample size and the absence of a control group limit the generalizability of the findings. Moreover, the study's duration may not capture longer-term effects of curcumin and other interventions. Further research, including larger trials and mechanistic investigations, is crucial to validate and expand upon our findings.

In conclusion, this study contributes to the evolving understanding of curcumin's potential in OA management by exploring correlations between patient characteristics, medication use, and changes in health metrics. While the correlations observed provide intriguing insights, the multifaceted nature of OA progression requires comprehensive approaches. Our study emphasizes the need for robust research, clinical trials, and personalized interventions to fully harness the therapeutic potential of curcumin and other interventions in OA treatment.

CONCLUSION

The correlations observed between patient characteristics, medication use, and changes in health metrics provide valuable insights into the OA management complexities. The study underscores the potential of curcumin in mitigating OA symptomatology and highlights the importance of comprehensive research approaches in addressing this multifaceted disorder.

REFERENCES

1. Henrotin Y, Priem F, Mobasheri A. Curcumin: a new paradigm and therapeutic opportunity for the treatment of osteoarthritis: curcumin for osteoarthritis management. SpringerPlus 2013; 2:1–9. doi: 10.1186/2193-1801-2-56
2. Zhang Z, Leong DJ, Xu L, et al. Curcumin slows osteoarthritis progression and relieves osteoarthritis-associated pain symptoms in a post-traumatic osteoarthritis mouse model. Arthritis Res Ther 2016; 18(1):1–2. doi: 10.1186/s13075-016-1025-y
3. Sun Y, Liu W, Zhang H, et al. Curcumin prevents osteoarthritis by inhibiting the activation of inflammasome NLRP3. J Interferon Cytokine Res 2017; 37(10):449–55.
4. Saber MM, Mahmoud MM, Amin HM, et al. Therapeutic effects of combining curcumin and swimming in osteoarthritis using a rat model. Biomedicine and Pharmacotherapy 2023; 166:115309.
5. Zhang W, Nuki G, Moskowitz RW, et al. OARSI recommendations for the management of hip and knee osteoarthritis: part III: Changes in evidence following systematic cumulative update of research published through January 2009. Osteoarthritis and Cartilage 2010; 18(4):476–99.
6. Liu X, Machado GC, Eyles JP, et al. Dietary supplements for treating osteoarthritis: a systematic review and meta-analysis. Br J Sports Med 2018; 52(3):167–75.
7. Felson DT, Lawrence RC, Dieppe PA, et al. Osteoarthritis: new insights. Part 1: the disease and its risk factors. Ann Intern Med 2000; 133(8):635–46.
8. Daghestani HN, Kraus VB. Inflammatory biomarkers in osteoarthritis. Osteoarthritis and Cartilage 2015; 23(11):1890–6.
9. Jin Z, Chang B, Wei Y, et al. Curcumin exerts chondroprotective effects against osteoarthritis by promoting AMPK/PINK1/Parkin-mediated mitophagy. Biomed Pharmacother 2022; 151:113092. doi: 10.1016/j.biopha.2022.113092
10. Minoretto P, Sáez AS, Riera ML, et al. Efficacy and safety of two chon-

- droprotective supplements in patients with knee osteoarthritis: a randomized, single-blind, pilot study. *Cureus* 2024; 16(4):e57579. doi: 10.7759/cureus.57579
11. Qiu B, Xu X, Yi P, et al. Curcumin reinforces MSC-derived exosomes in attenuating osteoarthritis via modulating the miR-124/NF- κ B and miR-143/ROCK1/TLR9 signalling pathways. *J Cell Mol Med* 2020; 24(18):10855–65. doi: 10.1111/jcmm.15714
 12. Buhmann C, Brockmueller A, Mueller AL, et al. Curcumin attenuates environment-derived osteoarthritis by Sox9/NF- κ B signaling axis. *Int J Mol Sci* 2021; 22(14):7645. doi: 10.3390/ijms22147645
 13. Kong H, Han JJ, Dmitrii G, et al. Phytochemicals against osteoarthritis by inhibiting apoptosis. *Molecules* 2024; 29(7):1487. doi: 10.3390/molecules29071487
 14. Shep D, Khanwelkar C, Gade P, et al. Safety and efficacy of curcumin versus diclofenac in knee osteoarthritis: a randomized open-label parallel-arm study. *Trials* 2019; 20(1):214. doi: 10.1186/s13063-019-3327-2
 15. Izadi M, Sadri N, Abdi A, et al. Longevity and anti-aging effects of curcumin supplementation. *Geroscience* 2024; 46(3):2933–50. doi:10.1007/s11357-024-01092-5
 16. Paultre K, Cade W, Hernandez D, et al. Therapeutic effects of turmeric or curcumin extract on pain and function for individuals with knee osteoarthritis: a systematic review. *BMJ Open Sport Exerc Med* 2021; 7(1):e000935. doi: 10.1136/bmjsem-2020-000935
 17. Wang Z, Singh A, Jones G, et al. Efficacy and safety of turmeric extracts for the treatment of knee osteoarthritis: a systematic review and meta-analysis of randomised controlled trials. *Curr Rheumatol Rep* 2021; 23(2):11. doi: 10.1007/s11926-020-00975-8
 18. Ayati Z, Ramezani M, Amiri MS, et al. Ethnobotany, phytochemistry and traditional uses of *Curcuma* spp. and pharmacological profile of two important species (*C. longa* and *C. zedoaria*): a review. *Curr Pharm Des* 2019; 25(8):871–935.
 19. Hsiao AF, Lien YC, Tzeng IS, et al. The efficacy of high- and low-dose curcumin in knee osteoarthritis: A systematic review and meta-analysis. *Complement Ther Med* 2021; 63:102775. doi: 10.1016/j.ctim.2021.102775
 20. Bučević Popović V, Karahmet Farhat E, Banjari I, et al. Bioavailability of oral curcumin in systematic reviews: A methodological study. *Pharmaceuticals* 2024; 17(2):164. doi: 10.3390/ph17020164

Изучение влияния куркумина на симптоматику остеоартрита: корреляции и выводы на примере болгарской когорты

Красимир Краев¹, Петар Учиков^{2,3}, Божидар Христов⁴, Мария Краева⁵, Йорданка Башева-Краева^{5,7}, Младен Дойков^{8,9}, Станислава Попова-Белова¹, Мариела Генева-Попова¹

¹ Кафедра пропедевтики внутренних болезней, Факультет медицины, Медицинский университет – Пловдив, Пловдив, Болгария

² Кафедра специализированной хирургии, Факультет медицины, Медицинский университет – Пловдив, Пловдив, Болгария

³ УМБАЛ „Св. Георги“, Пловдив, Болгария

⁴ Вторая кафедра внутренних болезней, Факультет медицины, Медицинский университет – Пловдив, Пловдив, Болгария

⁵ Кафедра оториноларингологии, Факультет медицины, Медицинский университет – Пловдив, Пловдив, Болгария

⁶ Кафедра глазных болезней, Факультет медицины, Медицинский университет – Пловдив, Пловдив, Болгария

⁷ Университетская офтальмологическая клиника, УМБАЛ „Св. Георги“, Пловдив, Болгария

⁸ Кафедра урологии и общей медицины, Факультет медицины, Медицинский университет – Пловдив, Пловдив, Болгария

⁹ Урологическая клиника, УМБАЛ „Каспела“, Пловдив, Болгария

Адрес для корреспонденции: Красимир Краев, Кафедра пропедевтики внутренних болезней, Факультет медицины, Медицинский университет – Пловдив, бул. „Васил Априлов“ № 15А, 4000 Пловдив, Болгария; E-mail: kkraev@hotmail.com

Дата получения: 11 мая 2024 ♦ **Дата приемки:** 1 июля 2024 ♦ **Дата публикации:** 31 августа 2024

Образец цитирования: Kraev K, Uchikov P, Hristov B, Kraeva M, Basheva-Kraeva Y, Doykov M, Popova-Belova S, Geneva-Popova M. Exploring the impact of curcumin on osteoarthritis symptomatology: correlations and insights from a Bulgarian cohort. *Folia Med (Plovdiv)* 2024;66(4):461–465. doi: 10.3897/folmed.66.e127319.

Резюме

Введение: Остеоартрит – распространённое дегенеративное заболевание суставов, связанное с болью и функциональными нарушениями. Куркумин, натуральное противовоспалительное соединение, привлёк внимание своими потенциальными терапевтическими преимуществами при лечении остеоартрита.

Цель: Целью данного исследования было изучение корреляций между использованием куркумина, характеристиками пациента, использованием лекарств и изменениями в результатах лечения у пациентов с остеоартритом. Основная гипотеза заключалась в том, что использование куркумина будет коррелировать с положительными изменениями показателей здоровья.

Материалы и методы: В это наблюдательное исследование была включена когорта из 60 пациентов с остеоартритом, разделённая на 4 группы в зависимости от типа остеоартрита. Критерии отбора пациентов включали диагноз остеоартрита и согласие на приём добавок куркумина. Первичной переменной результата были изменения показателей здоровья, измеренные за три визита. Также регистрировались индекс массы тела, нестероидные противовоспалительные препараты (NSAID) и использование парацетамола. Для изучения взаимосвязей между переменными и изменениями показателей здоровья использовались корреляционный анализ и парные t-тесты.

Результаты: Корреляционный анализ выявил слабую отрицательную корреляцию между ИМТ и изменениями между „Визитом 1“ и „Визитом 2“ ($r=-0.09$). Использование NSAID показало слабую положительную корреляцию с изменениями в течение этого периода ($r=0.17$), в то время как использование парацетамола показало слабую корреляцию ($r=-0.05$) с изменениями. Статистически значимые изменения наблюдались между „Визитом 1“ и „Визитом 2“ (среднее изменение = -5.93 , $p<0.05$), что согласуется с предыдущими исследованиями, указывающими на потенциал куркумина в облегчении симптомов остеоартрита.

Заключение: Это исследование предоставляет ценную информацию о сложных взаимосвязях, которые существуют между использованием куркумина, характеристиками пациента, использованием лекарств и изменениями показателей здоровья у пациентов с остеоартритом. Несмотря на множество ограничений, включая размер выборки и продолжительность исследования, наш корреляционный анализ показывает, что куркумин может оказывать положительное влияние на симптоматику остеоартрита. Результаты подчёркивают необходимость дополнительных исследований, более масштабных испытаний и механических анализов для полного понимания потенциальной терапевтической роли куркумина в лечении остеоартрита.

Ключевые слова

куркумин, остеоартрит, показатели здоровья, ИМТ, NSAID, парацетамол
