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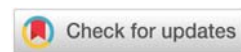
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***Corresponding author:** Unal Mehmet, Kocaeli Flex&Form, Turkey, E-mail: munal@st.medipol.edu.tr

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Research Article

The effects of vitamin D, C, E and zinc supplementation in chronic non specific low back pain

Unal Mehmet^{1*}, Gulcelik Ertunc Gonul², Sezgin Burak Ahmet³ and Kocaturk Muammer⁴

¹Kocaeli Flex&Form, Turkey

²Istanbul Gedik University, Turkey

³Istanbul ABS Holistik Sağlık, Turkey

⁴Kocaeli Cihan Hospital, Turkey

Abstract

Objective: We aimed to investigate the effects of vitamin D3, vitamin C, vitamin E and zinc supplements on pain and functional capacity in Chronic Low Back Pain (CLBP).

Methods: 20 patients (female/male:10/10) with CLBLP, aged between 28 and 57 years (mean age: 41.25±9.12), participated in the study. McGill Pain Questionnaire (MPQ) was used to measure the state of pain. Pain-related functional capacity was evaluated through Roland Morris Disability Questionnaire (RMDQ). Fear-Avoidance Beliefs Questionnaire (FABQ) used to assess fear-avoiding beliefs based on physical activity and the effects of work in chronic low back pain. The Finger Floor Test (FFT) used to assess the flexibility of trunk flexion. Evaluations were performed before and after treatment.

Result: Before treatment; the mean of MPQ was 50,55±6,03, the mean of FFT was 5,5±2,35 cm, the mean of RMDQ was 14,9±2,38, the mean of FABQ was 50,7±5,68. After treatment; the mean of MPQ was 23,45±5,35, the mean of FFT was 2,45±0,89 cm, the mean of RMDQ was 6,95±1,70, the mean of FABQ was 22,5±5,73. The results were statistically significant difference between before and after assesment scores (p<0,05).

Conclusion: Vitamin D, C, E and zinc have been found to be effective in the treatment of patients with chronic low back pain.

Introduction

Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage [1]. Back pain is the most common pain complaint, second only to headache. Chronic Low Back Pain (CLBP) is often progressive and the cause may be difficult to ascertain. Despite the availability of many pharmacological and invasive methods of treatment, many patients still suffer from considerable morbidity [2]. Vitamin D deficiency has been associated with chronic musculoskeletal pain, including Low Back Pain (LBP). In addition, vitamin D deficiency affects the flexibility of the body both directly and indirectly due to pain. High prevalence of vitamin-D deficiency (up to 83%) has been reported in patients with CLBP in comparison to the general population [2-5].

The mechanisms underlying these associations remain unclear [6,7]. Theoretically, 2 possible links have been postulated. Firstly, the diffuse pain in bones and muscles, weakness, and paresthesia may be caused by hypovitaminosis D. Secondly, hypovitaminosis D could play a role in the development of modic changes via the increased susceptibility to inflammation in the vertebral end plates [8]. Vitamin E, is one of the essential nutrients that functions as an antioxidant in the human body. It is the major chain-breaking antioxidant in the body and the first line of defense against lipid peroxidation, protecting cell membranes from free radical attack [9]. The antinociceptive effects of vitamin E have been reported in earlier studies. For example, dietary supplement vitamin E (12 g/kg per day, p.o. for 3 months) ameliorated nerve conduction deficits in streptozotocin induced diabetic neuropathy in rats [10]. It was reported that a single injection of vitamin E (0.1-5

g/kg i.p.) attenuated mechanical allodynia in rats with spinal nerve ligation [11].

Vitamin C (ascorbic acid) is essential for the activity of some enzymes (proline hydroxylase and lysine hydroxylase) that are necessary to maintain stable collagen helices that characterize healthy connective tissues. Vitamin C is also known to have an antioxidant role preventing oxidizing action on the DNA, proteins, and cellular walls. Antioxidant vitamins are essential to human, not only because of their preventive action against the damages caused by free radicals, but also because they contribute to regenerate the redox (oxidoreduction) potential of cells and circulating fluids, and to maintain a stable and active antioxidant system [12].

Zinc is a trace element essential for human health. It has roles in cellular differentiation and production and is vital in the synthesis of proteins and nucleic acids. It is also involved in many biochemical reactions as a micro element [13,14]. Zinc also plays an important role in the function of RNA enzyme and DNA polymerases, and to over three hundred metalloenzymes. Furthermore, zinc plays a role in the optimal performance of the immune system. The effects of zinc deficiency include growth restriction, iron deficiency anemia, organomegaly, suboptimal repair of wounds, weight loss, impaired immune response, and increased susceptibility to infection [15-17]. Zinc has been demonstrated in the improvement of gastrointestinal infections and diarrhea, and in wound healing by activating enzymes involved in collagen synthesis.

The present study is performed with an aim to assess the efficacy and safety of vitamin-D₃, vitamin-C, vitamin E and zinc supplements in improving pain and other outcomes in CLBP.

Material and Method

Open Label, Single Arm Clinical Trial. This study was performed on patients with chronic low back pain who applied to the orthopedics and traumatology polyclinic and fulfilled the necessary criteria. 20 patients between June 2018 – January 2019, in Kocaeli Cihan Hospital Department of Orthopedics and Traumatology were included to the study.

Inclusion criteria

Patients of either gender, aged 20–65 years with CLBP for ≥ 3 months, without leg pain not responding to medications and physical therapies, having a pain score of at least 5 as assessed on 0 – 10 Visual Analogue Scale (VAS) at baseline, and having low plasma 25-Hydroxyvitamin D₃ levels (<30 ng/mL) were eligible for study recruitment. 25-Hydroxyvitamin D₃, after overnight fasting, a blood sample was taken and evaluated. The diagnosis of CLBP was established based on signs and symptoms and investigations like Magnetic Resonance Imaging (MRI).

Exclusion criteria

Patients were excluded if they had evidence of other causes of neuropathy or painful conditions like diabetes mellitus, rheumatoid arthritis, and symptomatic osteoarthritis of the

hip, knee, and ankle. Patients consuming drugs altering bone metabolism like corticosteroids or bisphosphonates, pregnant and lactating mothers, and women intending to be pregnant were also excluded. Patients taking vitamin-D, zinc and vitamin C supplements during the past 3 months were also excluded from the present study.

Measurements

Before and after 8 weeks treatment protocol, McGill Pain Questionnaire, The Finger Floor Test, Roland Morris Disability Questionnaire, Fear-Avoidance Beliefs Questionnaire were evaluated.

McGill Pain Questionnaire (MPQ) developed by Melzack and Targerson in 1971. The validity and reliability of this scale, was done by Kuğoğlu et al. The scale examines the place of pain, the feeling it creates in the individual, its relationship with time, severity and the level of living pain for the individual [18].

The Finger Floor Test (FFT) is an evaluation method used to assess the flexibility of trunk flexion. The person who is going to be tested is asked to stand on a 15 cm high block and lean forward without bending his knees. The block is considered the edil o olarak point. The distance between the middle finger and the board is measured and recorded in centimeters. In our study, this test was performed in the sitting position due to better stability of the pelvis. The distance between the third finger of the right hand and the block was measured, the test was repeated three times, and the mean value was recorded in cm [19].

The Roland Morris Disability Questionnaire (RMDQ) was used to determine the physical competence level of the patients. The survey consists of 24 items. For each item, yes / no is answered. 1 point for yes, 0 for no. The total score is collected and the total score is calculated. The smallest score in this scale is 0, and the biggest score is twenty-four. High scores indicate inadequate physical activity [20].

In 1993, Waddell et al. Developed the Fear-Avoidance Beliefs Questionnaire (FABQ) to assess fear-avoiding beliefs based on physical activity and the effects of work in low back pain. The validity and reliability studies of the questionnaire are included in the literature. FABQ has 16 questions and 2 parts. In the first part, physical activity and the second part are beliefs about the work. Physical activity consists of 5 questions, 11 parts of the job division. The scoring of the questionnaire is done with 7-point Likert type scale. The score in each section is used independently. The Physical Activity section is scored between 0-24 and the Work section is scored between 0-36 [21].

Protocol

Active vitamin-D₃ sachet in a dose of 60,000 IU every week orally for a period of 8 weeks was given to the enrolled patients. Patients having serum vitamin-D level <5 ng/mL were given 60,000 IU daily orally for the initial 5 days and then 60,000 IU every week for the next 8 weeks. Vitamin E was recommended to be 100iu per day for 8 weeks. Vitamin C recommended as



1000 mg per day for 8 weeks. Finally, zinc was recommended as 25 mg daily for 8 weeks. Analyses of vitamin levels were not performed before the intervention.

Patients with vitamin D were advised to take it with a glass of water in the morning. Vitamin E was recommended to take 2 hours after vitamin D intake. Vitamin c and zinc were recommended to be taken together 2 hours after vitamin e intake.

Statistical analysis

Statistical Package for Social Science (SPSS) 20.0 was used in the analysis of data obtained from research. Identifying characteristics of the patients were expressed with mean value and standard deviation. To query whether the study is showing normal distribution, One Sample Kolmogorov-Smirnov Test was used. For investigation of statistical significance between results, Student 's-t Paired Test was used.

Results

10 women (50%) and 10 men (50%) a total of 20 patients (mean age 41,25±9,12 years) with chronic low back pain were completed in this study. The mean of Body Mass Index was 24,65±2,30 kg/m². Also, the patients' occupational conditionals were desk-bound (45%) and standing (55%) positions.

Before and after treatment, MPQ, FFT, RMDQ and FABQ were evaluated and the results were recorded (Table 1).

According to One Sample Kolmogorov-Smirnov test result, the scores were showing normal distribution ($p \geq 0,05$). We had detected statistically significant difference between before and after assesment scores ($p < 0,05$).

Discussion

Pain has been recognized as pain that persists past normal healing time⁵ and hence lacks the acute warning function of physiological nociception.³⁵ Usually pain is regarded as chronic when it lasts or recurs for more than 3 to 6 months [22].

Pain is the most prevalent of musculoskeletal conditions, and sufferers have been identified as high users of complementary and alternative medicine (CAM). Despite lacking evidence, CAM treatments (eg, acupuncture, chiropractic, and massage) and CAM products (eg, vitamins, supplements, and aromatherapy oils) for pain care have become widely available internationally, and CAM use by pain sufferers has become a significant health service issue. However, to date, there has been no integrative review on CAM use for pain [23].

In the studies, especially vitamins D, C, E and zinc which may be effective in the treatment of chronic pain are seen.

Vitamin-D plays a key role in the etiology and progression of various chronic pain conditions and induces muscle weakness and pain in adults [24]. Also, vitamin D status, as measured by 25-hydroxyvitamin D (25(OH)D), could potentially be involved in the pathophysiology of chronic pain. Although the optimal level of serum 25(OH)D is a topic of ongoing research, vitamin D deficiency is typically defined as 25(OH)D < 50.0 nmol/L [25].

The vitamin C deficiency disease scurvy is characterised by musculoskeletal pain and recent epidemiological evidence has indicated an association between suboptimal vitamin C status and spinal pain. Furthermore, accumulating evidence indicates that vitamin C administration can exhibit analgesic properties in some clinical conditions [26].

One of the antioxidants on painful nociception and the reduction of damage caused by free radicalss in patients with chronic muskuloskeletal pain is zinc(Zn) which is associated with the presence of pain [27].

The analgesic efficacy of vitamin E on persistent pain is behavioral, electrophysiological, and molecular techniques. vitamin E would produce this analgesia through spinal mechanisms [11].

In accordance with of these studies, vitamin C, D, E and Zinc supplements are found in the treatment protocol of our study. For assessment; MPQ, FFT, RMDQ and FABQ were used and the results were found to be significant. As a result, vitamin d, c, e and zinc supplementation appear to be effective in the treatment of chronic pain.

Conclusion

Holistic approaches are used in the treatment of chronic pain. In the holistic therapies, detailed evaluation is considered as the most important component. In particular, the effects of vitamin D, C, E and zinc on chronic pain should not be forgotten and should be questioned in the evaluation. It should also be integrated into the treatment in pain control.

References

1. IASP (1994) Terminology The following pain terminology is updated from "Part III: Pain Terms, A Current List with Definitions and Notes on Usage" Classification of Chronic Pain, Second Edition, IASP Task Force on Taxonomy, edited by H. Merskey and N. Bogduk, IASP Press, Seattle 209-214. [Link: https://bit.ly/2Rddcpq](https://bit.ly/2Rddcpq)
2. McBeth J, Pye SR, O'Neill TW, Macfarlane GJ, Tajar A, et al. (2010) Musculoskeletal pain is associated with very low levels of vitamin D in men: Results from the European Male Ageing Study. *Ann Rheum Dis* 69: 1448-1452. [Link: https://bit.ly/3nL58c1](https://bit.ly/3nL58c1)
3. Plotnikoff GA, Quigley JM (2003) Prevalence of severe hypovitaminosis D in patients with persistent, nonspecific musculoskeletal pain. *Mayo Clin Proc* 78: 1463-1470. [Link: https://bit.ly/3gQYtLG](https://bit.ly/3gQYtLG)
4. Al Faraj S, Al Mutairi K (2003) Vitamin D deficiency and chronic low back pain in Saudi Arabia. *Spine (Phila Pa 1976)* 28: 177-179. [Link: https://bit.ly/3gRIF5i](https://bit.ly/3gRIF5i)
5. Siddque SA, Malik YM (2011) Frequency of vitamin D deficiency in patients of low backache. *Ann Pak Inst Med Sci* 7: 208-212. [Link: https://bit.ly/3vzITcv](https://bit.ly/3vzITcv)

Table 1: Before and after treatment, MPQ, FFT, RMDQ and FABQ were evaluated and the results were recorded.

Scale	Before treatment	After treatment
MPQ	50,55±6,03	23,45±5,35
FFT	5,5±2,35 cm	2,45±0,89 cm
RMDQ	14,9±2,38	6,95±1,70
FABQ	2,45±0,89	22,5±5,73



6. Rkain H, Bouaddi I, Ibrahim A, Lakhdar T, Abouqal R, et al. (2013) Relationship between vitamin D deficiency and chronic low back pain in postmenopausal women. *Curr Rheumatol Rev* 9: 63-67. [Link: https://bit.ly/3aOeoH2](https://bit.ly/3aOeoH2)
7. Lewis PJ (2005) Vitamin D deficiency may have role in chronic low back pain. *BMJ* 331: 109. [Link: https://bit.ly/3xBkm7W](https://bit.ly/3xBkm7W)
8. Johansen JV, Manniche C, Kjaer P (2013) Vitamin D levels appear to be normal in Danish patients attending secondary care for low back pain and a weak positive correlation between serum level Vitamin D and Modic changes was demonstrated: a cross-sectional cohort study of consecutive patients with non-specific low back pain. *BMC Musculoskelet Disord* 14: 78. [Link: https://bit.ly/3e55t5M](https://bit.ly/3e55t5M)
9. Kamal-Eldin A, Appelqvist LA (1996) The chemistry and antioxidant properties of tocopherols and tocotrienols. *Lipids* 31: 671-701. [Link: https://bit.ly/3vwLzXn](https://bit.ly/3vwLzXn)
10. Van Dam PS, Bravenboer B, van Asbeck BS, Marx JJ, Gispen WH (1999) High rat food vitamin E content improves nerve function in streptozotocin-diabetic rats. *Eur J Pharmacol* 376: 217-22. [Link: https://bit.ly/3t2PE3T](https://bit.ly/3t2PE3T)
11. Kim HK, Kim JH, Gao X, Zhou JL, Lee I, et al. (2006) Analgesic effect of vitamin E is mediated by reducing central sensitization in neuropathic pain. *Pain* 122: 53-62. [Link: https://bit.ly/3aMabn9](https://bit.ly/3aMabn9)
12. Birlouez-Aragon I, Tessier FJ (2003) Antioxidant vitamins and degenerative pathologies. A review of vitamin C. *J Nutr Health Aging* 7: 103-109. [Link: https://bit.ly/3aSxU07](https://bit.ly/3aSxU07)
13. Bhandari B (1999) Trace elements. In: *Textbook of pediatrics*. Parthasarthy A. 2nd ed New Dehli: Jaypee Brothers Medical Publisher LTD 141-145.
14. Magalová T, Bella V, Brtková A, Beno I, Kudláčková M, et al. (1999) Copper, zinc and superoxide dismutase in precancerous, benign diseases and gastric, colorectal and breast cancer. *Neoplasma* 46: 100-104. [Link: https://bit.ly/2SbF9OZ](https://bit.ly/2SbF9OZ)
15. Keen CL, Gershwin ME (1990) Zinc deficiency and immune function. *Annu Rev Nutr* 10: 415-431. [Link: https://bit.ly/3e4qH3S](https://bit.ly/3e4qH3S)
16. Wu T, Sempos CT, Freudenheim JL, Muti P, Smit E (2004) Serum iron, copper and zinc concentrations and risk of cancer mortality in US adults. *Ann Epidemiol* 14: 195-201. [Link: https://bit.ly/3aPHW79](https://bit.ly/3aPHW79)
17. Baqui AH, Black RE, Fischer Walker CL, Arifeen S, Zaman K, et al. (2006) Zinc supplementation and serum zinc during diarrhea. *Indian J Pediatr* 73: 493-497. [Link: https://bit.ly/3u8fcxR](https://bit.ly/3u8fcxR)
18. Kuguoglu S, Eti-Aslan F, Olgun N (2003) McGill Melzack Ağrı Soru Formu (MASF) nun Türkçe'ye uyarlanması [Turkish adaptation of the McGill Melzack Pain Questionnaire (MPQ)]. *Agri* 15: 47-52.
19. Otman AS, Demirel H, ve Sade A (1998) Tedavi Hareketlerinde Temel Değerlendirme Prensipleri. 2. basım, Hacettepe Üniversitesi Fizik Tedavi Ve Rehabilitasyon Yüksek Okulu Yayınları, Ankara 43.
20. Waddell G, Newton M, Henderson I, Somerville D, Main CJ (1993) A FearAvoidance Beliefs Questionnaire (FABQ) and the role of fear-avoidance beliefs in chronic low-back pain and disability. *Pain* 52: 157-168. [Link: https://bit.ly/3aSyzU5](https://bit.ly/3aSyzU5)
21. Roland M, Morris R (1983) A study of the natural history of back pain. Part I: development of a reliable and sensitive measure of disability in low-back pain. *Spine* 8: 141-144. [Link: https://bit.ly/3eXzHXZ](https://bit.ly/3eXzHXZ)
22. Treede RD, Rief W, Barke A, Aziz Q, Bennett MI, et al. (2015) A classification of chronic pain for ICD-11. *Pain* 156: 1003-1007. [Link: https://bit.ly/3gRb1CI](https://bit.ly/3gRb1CI)
23. Murthy V, Sibbritt DW, Adams J (2015) An integrative review of complementary and alternative medicine use for back pain: a focus on prevalence, reasons for use, influential factors, self-perceived effectiveness, and communication. *Spine J* 15: 1870-1883. [Link: https://bit.ly/3e6X06Y](https://bit.ly/3e6X06Y)
24. Ghai B, Bansal D, Kanukula R, Gudala K, Sachdeva N, et al. (2017) Vitamin D supplementation in patients with chronic low back pain: an open label, single arm clinical trial. *Pain physician* 20: E99-E105. [Link: https://bit.ly/3xAFx9U](https://bit.ly/3xAFx9U)
25. Wu Z, Camargo CA, Sluyter JD, Khaw KT, Malihi Z, et al. (2018) Association between serum 25-hydroxyvitamin D levels and self-reported chronic pain in older adults: A cross-sectional analysis from the ViDA study. *J Steroid Biochem Mol Biol* 188: 17-22. [Link: https://bit.ly/3u5hePu](https://bit.ly/3u5hePu)
26. Carr AC, McCall C (2017) The role of vitamin C in the treatment of pain: new insights. *J Transl Med* 15: 77. [Link: https://bit.ly/3aPOLHI](https://bit.ly/3aPOLHI)
27. Barros-Neto JA, Souza-Machado A, Krachete DC, de Jesus RP, Cortes ML, et al. (2016) Selenium and zinc status in chronic myofascial pain: serum and erythrocyte concentrations and food intake. *PLoS One* 11: e0164302. [Link: https://bit.ly/3aNTxbh](https://bit.ly/3aNTxbh)

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