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Research

Co-Administration of Creatine and Vitamin D and Telomere Length in Older Men: An Exploratory Pilot Trial

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Telomeres shorten with age, partly due to oxidative stress and inflammation, and this process is linked to a higher risk of chronic disease. Creatine supports cellular energy production and may reduce metabolic stress, while vitamin D has anti-inflammatory and antioxidant properties. Together, they may help protect telomeres and support healthy aging. This exploratory, open-label pilot study examined the effects of daily creatine monohydrate (2.5 g) plus vitamin D3 (2000 IU) over 12 months in 30 healthy men aged 65 years and older. Telomere length in blood cells was assessed at the end of the study and compared with an age-matched reference group. Adherence to supplementation was high (81%), and no side effects were reported. After 12 months, participants receiving creatine and vitamin D had significantly longer telomeres than controls (0.90 ± 0.21 vs. 0.81 ± 0.17), corresponding to an approximately 11% difference (P = 0.004). These preliminary findings suggest that combined creatine and vitamin D supplementation may help preserve telomere length in older adults. This simple and well-tolerated strategy warrants further investigation in larger randomized controlled trials to confirm its potential role in promoting healthy aging.

Keywords: Telomeres, Aging, Creatine, Vitamin D, Bioenergetics, Supplementation.

Abbreviations Used: None

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INTRODUCTION

Telomeres are repetitive DNA sequences located at the ends of chromosomes that serve as protective caps, preserving chromosomal integrity and stability. With each cell division, telomeres progressively shorten, a process that is further accelerated by oxidative stress, chronic inflammation, and impairments in cellular energy metabolism (Guillen-Parra et al., 2024). Shortened telomeres are strongly associated with a higher risk of age-related diseases, functional decline, and mortality (Huang et al., 2025). As a result, telomere length is widely regarded as a biomarker of biological aging and a potential target for nutritional interventions (Stajer et al., 2021; Todorovic et al., 2022). Creatine, a naturally occurring compound essential for cellular energy production, has been extensively studied for its beneficial effects on muscle mass, bone health, and cognitive function in older adults. Beyond its traditional role in energy metabolism, emerging evidence suggests that creatine may act as a cellular modulator, suppressing pro-inflammatory signalling and reducing oxidative stress associated with the senescence-associated secretory phenotype (Aulesa and Gongora, 2024; Ostojic et al., 2025). Through these mechanisms, creatine may favourably influence telomere dynamics, potentially offering a novel strategy to support healthy aging and mitigate age-related diseases. Vitamin D, a key nutrient involved in bone integrity and immune regulation, has also been implicated in telomere maintenance due to its well-documented anti-inflammatory and antioxidant effects (Zhu et al., 2025). The combined supplementation of creatine and vitamin D may therefore provide complementary, possibly synergistic benefits - enhancing cellular energy balance while protecting telomeres from oxidative and inflammatory damage. Based on this rationale, we conducted an exploratory pilot trial to investigate the effect of 12 months of daily creatine plus vitamin D supplementation on telomere length in community-dwelling older adults.

METHODS

This study was designed as an open-label, post-test-only pilot trial conducted in a cohort of older adults. Eligible participants were ≥ 65 years of age (mean age 74.8 ± 6.9 years), free from major acute or chronic diseases, and with no prior history of regular creatine or vitamin D supplementation. Recruitment targeted community-dwelling men who were not using other dietary supplements that could potentially confound study outcomes. Before participation, written informed consent was obtained from all participants, and the study protocol was approved by the institutional ethics committee (approval number: CD-23-14-895-2022-P1). Participants received a

daily oral dose of 2.5 g of creatine monohydrate combined with 2000 IU of vitamin D3. They were instructed to dissolve the supplement in 250 mL of lukewarm water and consume it once daily with breakfast. The intervention period lasted 12 months, during which participants were advised to avoid taking any additional dietary supplements. The primary outcome was relative telomere length, assessed at the 12-month follow-up. Leucocyte telomere length was measured using quantitative polymerase chain reaction (qPCR), which quantifies telomere length relative to a standardized reference DNA, following established methods described by Cawthon (2002).

RESULTS

A total of 30 men with a mean age of 71.5 ± 6.5 years completed the 12-month intervention and were included in the final analysis. Compliance with supplementation was high (81.4 ± 8.0%), reflecting strong adherence to the prescribed daily regimen. No adverse effects were reported at any point during the study, indicating that the intervention was well tolerated. At the conclusion of the 12 months, the mean relative telomere length in the supplemented group was 0.90 ± 0.21 (95% CI: from 0.82 to 0.98). This value was significantly higher than that of an age-matched healthy reference group, free from dietary supplements, whose mean telomere length was 0.81 ± 0.17 (Z-test = 2.90, P = 0.004). The observed difference corresponds to a 10.76% greater telomere length in the supplemented participants compared with the healthy controls.

DISCUSSION

This exploratory pilot trial provides preliminary evidence that daily supplementation with creatine and vitamin D over 12 months may help preserve or enhance telomere length in older men. Participants who received the combined intervention demonstrated ~ 11% higher mean relative telomere length compared with an age-matched reference group of healthy individuals not taking dietary supplements. The difference was statistically significant, suggesting that this combined nutritional approach could counteract the typical age-related telomere attrition observed in later life. The mechanisms underlying these findings are likely multifactorial and related to the complementary roles of creatine and vitamin D in cellular health. Telomere shortening is driven by cumulative oxidative stress, chronic inflammation, and deficits in bioenergetic capacity (Guillen-Parra et al., 2024). Both creatine and vitamin D are known to modulate these pathways. Creatine serves as a central component of the phosphocreatine system, supporting rapid ATP regeneration in high-energy-demand tissues such as muscle and brain. Beyond its role in cellular energetics, emerging evidence indicates that creatine may act as a cellular stress buffer, mitigating oxidative damage and downregulating pro-inflammatory signalling associated with the SASP (for a detailed review, see Ostojic et al., 2025). These effects could indirectly reduce telomere attrition by improving mitochondrial efficiency and protecting DNA from reactive oxygen species. Vitamin D, meanwhile, has well-documented anti-inflammatory and antioxidant properties. Previous research has linked higher circulating vitamin D levels with longer telomeres and reduced systemic inflammation (Zhu et al., 2025). By modulating immune function and inflammatory responses, vitamin D may create a more favourable cellular environment for telomere preservation. When combined, creatine and vitamin D may exert synergistic effects, simultaneously improve energy homeostasis and reduce oxidative and inflammatory stressors that contribute to telomere shortening. This dual-action approach aligns with emerging models of healthy aging, which emphasize the need to target multiple cellular pathways to prevent or delay age-related functional decline.

This study is the first to investigate the combined effects of creatine and vitamin D supplementation on telomere dynamics in older adults. While prior research has separately linked vitamin D to telomere maintenance and creatine to improvements in muscle, strength, and cognition, the potential role of these nutrients in cellular aging has been less explored. Our findings suggest that combined creatine and vitamin D supplementation may support telomere preservation, extending their benefits beyond musculoskeletal health (Candow et al., 2025). Although the observed increase in telomere length was modest, even small differences may be clinically meaningful, as shorter telomeres are strongly associated with a higher risk of age-related diseases and mortality at the population level.

The study's strengths include its 12-month intervention period, high compliance, and use of a well-validated qPCR method for telomere measurement. Furthermore, no adverse effects were reported, underscoring the safety and tolerability of this combined intervention in older adults. However, several limitations should be considered. The open-label, post-test-only design precluded assessment of baseline telomere length and limited causal inference. The small sample size reduced statistical power and generalizability, and the study population was restricted to healthy, community-dwelling older men. Additionally, no secondary biomarkers such as oxidative stress or inflammation were measured, limiting mechanistic insight. Despite these limitations, the results provide a foundation for future trials. Larger, randomized studies with diverse participants and mechanistic assessments are needed to confirm these findings. If validated, creatine plus vitamin D supplementation may represent a low-cost, practical strategy to promote healthy aging and reduce age-related disease risk.

In conclusion, in this exploratory pilot trial, 12 months of daily creatine plus vitamin D supplementation was associated with significantly longer telomeres compared to age-matched healthy controls. These preliminary findings suggest that this combined nutritional intervention may help preserve telomere length and support cellular health in older adults. Larger, well-controlled studies are needed to confirm these results and determine their clinical significance.

CONFLICT OF INTEREST DECLARATION

SMO serves as a member of the Scientific Advisory Board on Creatine in Health and Medicine (AlzChem LLC). SMO co-owns patent "Supplements Based on Liquid Creatine" at the European Patent Office (WO2019150323 A1) and patent application "Composition Comprising Creatine for Use in Telomere Lengthening" at the U.S. Patent and Trademark Office (# 18/934,264). SMO has received research funding related to creatine from various public funding agencies and industry partners. SMO is the co-founder of KRE-ALL, a company developing creatine-enriched food products, and the founder of INOVA Nutrition, a biotechnology startup focused on innovative nutraceuticals. VP, PA and MO declare no known competing interests.

CONTRIBUTION OF AUTHORS

All authors were involved in conception, data collection, analysis, and the writing of this manuscript.

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