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THE ROLE OF CREATINE SUPPLEMENTATION IN POSTMENOPAUSAL WOMEN - A NARRATIVE REVIEW

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ABSTRACT

Introduction and purpose: Menopause is a phase in a woman's life characterized by substantial physiological changes resulting from hormonal fluctuations, which can negatively impact bone health, muscle function, and overall physical and cognitive well-being. Creatine is a major factor in regulation of cellular energy metabolism, affecting numerous physiological processes relevant to human health. Current evidence suggests that creatine supplementation may be associated with beneficial effects across a wide range of health outcomes. Therefore, the purpose of this narrative review is to summarize and evaluate the available evidence on the effects of creatine supplementation in postmenopausal women, with particular emphasis on bone health, skeletal muscle function, physical strength, and mental health outcomes.
Material and methods: This narrative review summarizes evidence from PubMed-indexed clinical trials, systematic reviews, and meta-analyses examining the potential benefits of creatine supplementation in postmenopausal women.
Results: Across the reviewed studies, the findings indicate that creatine may present beneficial effects on various aspects of health in postmenopausal women. In particular, evidence suggests that the composite of creatine supplementation and resistance training may positively determine selected indicators of bone health, skeletal muscle function, and physical strength. Creatine supplementation may be associated with supportive effects on memory and cognitive function. Moreover, emerging evidence indicates a possible supportive role of creatine supplementation in the treatment of depression and sleep-related disorders.
Conclusions: Creatine supplementation may provide a practical strategy to help limit bone and muscle loss and to support mental health in postmenopausal women. Future research should focus on clarifying long-term effects and optimal dosing strategies, including larger and more representative cohorts.

KEYWORDS

Creatine Supplementation; Menopause; Postmenopause; Women; Bone; Muscle; Cognition

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1. Introduction

Creatine is both an endogenous and dietary compound that serves a critical function in the rapid regeneration of cellular energy. This function is particularly vital during periods of increased energy demand, such as physical activity. This role is mediated through the phosphocreatine system, which facilitates the resynthesis of adenosine triphosphate (ATP) from adenosine diphosphate (ADP) via the transfer of a high-energy phosphate group, a reaction catalyzed by creatine kinase[1,2]. Endogenous creatine is synthesized primarily in the liver and kidneys, while exogenous sources include foods such as red meat and seafood[3].

Menopause represents a major physiological transition in a woman's life and is characterized by a decline in circulating estrogen levels. This hormonal change is associated with reductions in bone mass, skeletal muscle mass, and muscular strength[4,5]. Moreover, available evidence suggests that sex hormones may influence the expression and activity of creatine kinase, thereby potentially affecting creatine metabolism[3]. Numerous studies have explored the physiological effects of creatine supplementation. Evidence suggests that creatine supplementation elevates the synthesis of phosphocreatine and adenosine triphosphate (ATP)[6], thereby enhancing energy supply during resistance training in older individuals[7, 8, 9]. This mechanism is thought to facilitate adaptive responses of skeletal muscle and bone tissue over prolonged training periods[3, 7, 10]. Several studies have examined creatine supplementation in menopausal women[1,8,14,15,16,21,22, 27,31,34]. Accordingly, this review synthesizes the available evidence on this topic.

2. Research materials and methods

This narrative review was carried out using literature retrieved from the PubMed database. The literature search employed key terms including “menopause” and “creatine supplementation.” The review focused on clinical trials, systematic reviews, and meta-analyses. The primary objective of this analysis was to provide a comprehensive and up-to-date overview of the potential benefits of creatine supplementation in postmenopausal women.

3. Discussion on results

3.1 Bone Health and Skeletal Muscles

Older women frequently experience age-related loss of bone mass[11,] which increases the probability of fractures, functional impairment, and is associated with increased morbidity and mortality[12,13]

A large-scale study conducted in Brazil investigated the long-term effects of creatine supplementation in postmenopausal women diagnosed with osteopenia[14]. Nearly 200 participants were randomly assigned to receive either creatine or a placebo and were followed for a period of two years. Assessments included measures of body composition, areal and volumetric bone mineral density (aBMD and vBMD), indices of bone microarchitecture, biochemical markers of bone turnover, muscle strength, physical performance, and the incidence of falls and fractures. Participants were evaluated at baseline and after 12 and 24 months. Areal BMD was measured at the lumbar spine, femoral neck, total femur, and across the whole body. While declines in aBMD were observed at site-specific skeletal locations, whole-body aBMD remained stable, and no significant differences were identified between the supplementation and placebo groups. Although increases in lean mass and appendicular skeletal muscle mass were noted, these changes were not specifically credited to creatine supplementation. Similarly, no significant effects of creatine were observed on bone microarchitecture, biochemical bone markers, muscular capacity, physical functioning, or incidence of falls. Overall, the findings suggest that long-term creatine supplementation at the administered dosage did not result in clinically meaningful improvements in skeletal or functional outcomes in postmenopausal women with osteopenia.

Another study examined the effects of creatine supplementation in conjunction with long-term exercise training on bone-related outcomes in postmenopausal women[15]. Participants were assigned to receive either creatine dosed according to body weight or a placebo, while all subjects completed a two-year resistance and walking exercise program. Outcome measures included bone mineral density of the femoral neck, lumbar spine, and total hip, as well as geometric properties of the proximal femur. The results demonstrated no substantial differences between groups in site-specific BMD measures. Although improvements in bench press and squat strength were documented in both groups, these gains were comparable between the creatine and control conditions. Notably, changes in proximal femur geometry suggested structural adaptations that may be relevant to mechanical stability and hip fracture risk reduction. Creatine supplementation was associated with increases in lean body mass.

A separate research team performed a comparable investigation to evaluate the effects of creatine supplementation in combination with supervised resistance training in postmenopausal women over a 12-month intervention[16]. All participants undertook resistance training program and were allocated to either a creatine or placebo group. Assessments included BMD of the femoral neck, lumbar spine, total hip, and whole body, alongside measures of bone geometry, lean body mass, and muscular strength. Results indicated a slower rate of femoral neck BMD loss in the creatine group relative to placebo. Additionally, creatine supplementation was linked to increases in femoral shaft subperiosteal width and relative bench press strength. Other measured outcomes did not differ meaningfully between groups.

Finally, a study conducted in Brazil investigated the short-term effects of creatine supplementation in postmenopausal women with osteoarthritis[1]. Participants engaged in a lower-limb resistance training program while receiving either creatine or a placebo. The women were observed for 12 weeks. Creatine supplementation in combination with exercise was associated with improvements in physical function and lower-limb lean mass. Supplementation also appeared to reduce stiffness and improve quality of life according to WOMAC scores, while both groups reported reductions in pain.

3.2 Glomerular filtration rate (GFR)

Kidney function is commonly assessed using serum creatinine levels or estimated glomerular filtration rate (eGFR). Some studies have raised concerns that creatine supplementation could impair renal function[17,18,19,20].

Since creatine is metabolized to creatinine[3], reliance on creatinine-based calculations can falsely suggest renal impairment[21]. More precise measurement techniques provide a clearer assessment of kidney function[16].

In a separate study specifically examining postmenopausal women, participants received either creatine or a placebo for 12 weeks [22]. In this study, glomerular filtration rate (GFR) was measured using [^51Cr]ethylenediaminetetraacetic acid ([^51Cr]EDTA) clearance, a method considered more appropriate for assessing renal function during creatine supplementation. No differences were observed between the groups in any kidney function parameters, suggesting that short-term creatine supplementation does not adversely affect renal filtration in this population.

3.3 Cognition and Sleep

Brain function, particularly during periods of cognitive stress, relies on phosphocreatine (PCr) to maintain efficient ATP turnover[23]. The menopausal transition is accompanied by various physiological changes that can elevate stress on the body. Supplementation with creatine has been suggested to enhance ATP resynthesis, which may support cognitive performance, including memory and attention[24], and reduce mental fatigue during challenging activities[25]. A recent systematic review also reported that creatine supplementation can improve memory function in older adults[26].

Postmenopausal women are at increased risk of sleep disturbances[27], which can contribute to cognitive impairments. The evidence suggests that creatine supplementation may support certain aspects of cognitive function, including mood and reaction time[28]. Additionally, creatine appears to enhance sleep quality, continuity, and overall sleep duration [29, 30.]

Supplementation with creatine may enhance both cognitive performance and sleep quality in postmenopausal women, especially under conditions of stress or sleep deprivation[26.] Notably, the positive effects on cognition are more evident when creatine intake is combined with a structured resistance training program[31].

3.4 Mental Health

Perimenopause can substantially affect mental health, with hormonal fluctuations frequently contributing to anxiety, depressive symptoms, and memory difficulties[28,32]. Research indicates that women in this stage may face a higher risk of developing depression[33]. Creatine has been suggested as a potential supportive intervention alongside standard pharmacological treatments for mood disorders[32] and may help mitigate the reduced cerebral energy metabolism often observed in depression[34].

4. Conclusions

Creatine supplementation may furnish multiple benefits for menopausal and postmenopausal women. Together with resistance training, short-term supplementation has been shown to particularly enhance muscle mass, strength, and bone geometry. These adaptations may facilitate to a reduced risk of falls, fractures, and related injuries.

Nevertheless, studies suggest that long-term creatine supplementation without concurrent exercise has no positive effects on bone health or muscle function. However, long-term creatine supplementation in conjunction with resistance training appears to positively influence bone geometry. Importantly, creatine appears to be safe, with no adverse impact on kidney function or standard biochemical parameters. Additionally, evidence indicates potential benefits for cognitive function, mood regulation, and memory, as well as improvements in sleep quality.

Further clinical research is necessary to determine whether creatine supplementation exerts a clear and consistent benefit on various aspects of women's health. Many of the existing studies are limited by small sample sizes, and the concurrent use of resistance training makes it difficult to attribute observed benefits solely to creatine.

Despite these limitations, creatine appears to be a safe and promising intervention for postmenopausal women.

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