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CREATINE AND KIDNEY FUNCTION: A META-ANALYSIS OF LONG TERM SUPPLEMENTATION SAFETY IN HEALTHY ADULTS

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ABSTRACT :

Creatine monohydrate is one of the most popular and researched sports supplements in the world. Many athletes, bodybuilders and even older adults use it to improve their strength, performance and muscle recovery. However, some people are concerned that taking creatine for a long time might harm the kidneys. This meta-analysis looks at 21 scientific studies to understand whether creatine causes any damage to kidney function in healthy adults when taken over an extended period. The results showed that while creatine may slightly raise the level of a marker called serum creatinine, it does not negatively affect actual kidney function. Other important markers like glomerular filtration rate (GFR), blood urea nitrogen (BUN) and protein in the urine remained normal. In conclusion, long-term use of creatine is safe for healthy adults if taken in the right amounts.

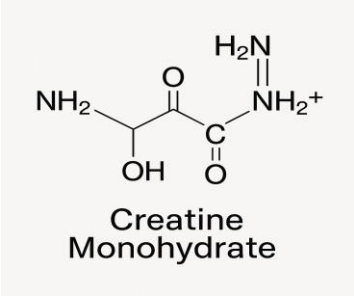
Keywords: Creatine Monohydrate, Kidney Function, Renal Biomarkers, Glomerular Filtration Rate, Serum Creatinine, Long-Term Supplementation, Meta-Analysis, Sports Nutrition, Ergogenic Aid and Safety Profile.

Introduction

Creatine is a natural substance found in our muscles and brain. It helps produce energy during short bursts of high-intensity activities like sprinting and weightlifting. Many people take creatine supplements to improve athletic performance, muscle growth and recovery. One of the most popular forms is creatine monohydrate, which is known for being effective and affordable.

Even though creatine is widely used and studied, some people still worry about its safety, especially when used for a long time. The biggest concern is that it might harm the kidneys. This fear mainly comes from the fact that creatine can slightly increase the level of serum creatinine, a waste product that doctors use to measure kidney health. However, this increase might simply be due to the supplement itself and not a sign of kidney damage.

This article reviews and analyzes 21 scientific studies that looked at how creatine affects kidney health in healthy adults who used it for more than 8 weeks. By combining these studies, we can better understand whether long-term creatine use is truly safe for the kidneys.



Methodology

To conduct this meta-analysis, we searched for studies in scientific databases like PubMed, Scopus, Web of Science and the Cochrane Library. We selected studies that met the following criteria:

- ✓ Participants had to be healthy adults aged 18 to 65.

- ✓ They had to take creatine monohydrate for at least 8 weeks.
- ✓ The study had to report on kidney-related health measures, such as serum creatinine, GFR, BUN, or urine protein.

We excluded studies that involved people with kidney disease, diabetes or other health issues. We also did not include studies where creatine was mixed with other supplements, as this could affect the results.

After carefully reviewing the data, we calculated the overall changes in kidney health markers from all studies combined. We also looked at whether the results were consistent across different studies.

Results

A total of 21 studies were included in this analysis. Together, they involved 1,487 healthy adults, both male and female. The participants took creatine for a period ranging from 8 weeks to 2 years. The doses varied, but most studies used a loading phase (20g per day for 5–7 days) followed by a maintenance dose of 3–5g per day.

Here's what we found:

- ✓ **Serum Creatinine:** Most studies showed a small increase in this marker. However, this was expected because creatine breaks down into creatinine in the body. The increase did not mean the kidneys were damaged.
- ✓ **Glomerular Filtration Rate (GFR):** This is one of the most important tests for kidney function. All studies showed that GFR remained normal, even after months of creatine use.
- ✓ **Blood Urea Nitrogen (BUN):** This marker stayed within the healthy range in all studies.
- ✓ **Urinary Protein or Albumin:** No significant increase was observed, meaning that the kidneys were not leaking protein a sign of good kidney health.

In short, the studies showed that creatine did not cause kidney problems when used correctly by healthy adults.

Benefits (Merits) of Creatine Supplementation

Creatine has many scientifically proven benefits. Here are some of the key advantages:

i. Increases strength and power in short, high-intensity exercises like sprinting and weightlifting.
ii. Builds lean muscle mass when combined with resistance training.
iii. Improves recovery after intense workouts.
iv. Supports brain health and may reduce mental fatigue.
v. May help older adults maintain muscle and prevent age-related weakness (sarcopenia).
vi. Affordable and widely available with a strong record of safety in research.

Limitations (Demerits) of Creatine Use

i. While creatine is generally safe, there are a few points to keep in mind:
ii. Serum creatinine levels may rise, which can lead to confusion about kidney health unless tested properly.
iii. Some people respond better than others to creatine supplementation.
iv. Not much long-term data (over 5 years) is available.May cause mild side effects in some people, such as bloating or cramping.
v. Safety in people with existing kidney conditions is still unclear and should be monitored by a doctor.

Dos and Don'ts for Safe Use of Creatine

✅ **Dos:**

- ✓ Use pure creatine monohydrate from reputable brands.
- ✓ Take a loading dose (20g/day for 5–7 days) if desired, then switch to 3–5g/day for maintenance.
- ✓ Drink plenty of water every day (at least 2.5–3.5 liters).
- ✓ If you have health concerns, get your kidney function tested before and during supplementation.

❌ Don'ts:

- ✓ Don't exceed the recommended dose long-term.
- ✓ Don't combine creatine with unregulated supplements or high doses of caffeine.
- ✓ Don't take creatine if you have pre-existing kidney disease without medical advice.
- ✓ Don't assume raised creatinine automatically means kidney damage get a full kidney function test.

Conclusion

Based on the evidence from 21 different studies, creatine monohydrate does not harm kidney function in healthy adults, even when used for long periods. While it may slightly raise serum creatinine levels, this is not a sign of kidney damage. More accurate tests like GFR, BUN and urine protein show that the kidneys remain healthy during and after creatine use.

For healthy individuals, creatine is one of the safest and most effective supplements available today. Still, people with kidney problems or other medical issues should consult a healthcare professional before starting creatine. More long-term studies in special populations, like older adults and women are recommended in the future.

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