The Effects of Preconception Antioxidant Nutrients on Sperm Quality in Patients with Male Factor Infertility: A Prospective Clinical Study

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Background

- **Male factor infertility is estimated to account for 30 to 50% of clinical infertility cases.**[1]
- Vitamins, minerals, and antioxidants are critical for a healthy pregnancy, but less is known about the impact of these nutrients on sperm quality.
- Intervention: Preconception nutrient regimen composed of bioavailable minerals, vitamins, and antioxidants to assess impact on sperm quality (Table 1).
- Individual nutrients were selected based on retrospective data showing a positive impact on sperm quality, but have not been clinically tested in combination.

Hypothesis & Objective

Hypothesis: The evidence-based preconception nutrient combination will improve sperm motility and morphology over a 90-day course.

Objective: To assess repeat semen analysis (SA) results after a 90-day course of preconception antioxidant nutrients in patients with male factor infertility.

Agent	Dose	Proposed Function
CoQ10	600 mg	•Free radical scavenger •Improve cell energy production[2]
L-Carnitine	500 mg	•Free radical scavenger[3] •Anti-oxidant activity[4] •Increases sperm motility via fatty acid metabolism[4]
NAC (N-Acetyl Cysteine)	500 mg	•Antioxidant •Free radical scavenger[5] •Intracellular detoxification[6] •Improves sperm quality and DNA damage[6]
Folate	1 mg	•Spermatogenesis •Free radical scavenger[7]
Zinc	25 mg	•Spermatogenesis •Membrane stabilization •Antioxidant activity[7]
L-Arginine	500 mg	•Amino acid with antioxidant properties •Increases blood flow[8]
Choline (Choline Bitartrate)	100 mg	•Regulates sperm membrane structure and fluidity •Spermatozoa maturation and fertilization potential[9]
Trans-Resveratrol	60 mg	•Decrease cell exposure to carcinogens •Antioxidative activity[10] •Reduces DNA damage[11]

Table 1: Key ingredients in the preconception antioxidant nutrient regimen.

Methods

- **Study Design:** Prospective experimental single-arm study. This was an IRB approved study (*Veritas 3048-13224-1*).
- **Recruitment:** Patients presenting to a fertility clinic that were identified with male factor infertility based on having at least one abnormal SA parameter
  - Concentration < 15 million/ml, progressive motility < 32%, or morphology < 4% based on strict criteria
- **Sample Size:** First 23 patients to complete the intervention and follow-up SA
- **Monitoring:** Patients were contacted monthly via email for the 90-day study duration
  - Self-reported side effects and compliance was recorded
- **Data Collection & Analysis:** Both baseline and follow-up SA were evaluated at the same andrology lab and compared.
  - Statistical significance and effect sizes were assessed using paired samples *t*-tests and Cohen's *d*
  - Average time between SA tests was 157.2±39.6 days
  - Mild side effects included bright yellow urine (26.1%) and nausea (13%) if taken without food

Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
- Male - Ages 18 to 45 - Patients struggling with infertility - A recent abnormal SA parameter	- Males younger than 18 years old, or older than 45 years old - Active cigarette smokers - Diagnosed with a varicocele - Concurrent use of other preconception nutrient regimens

Results

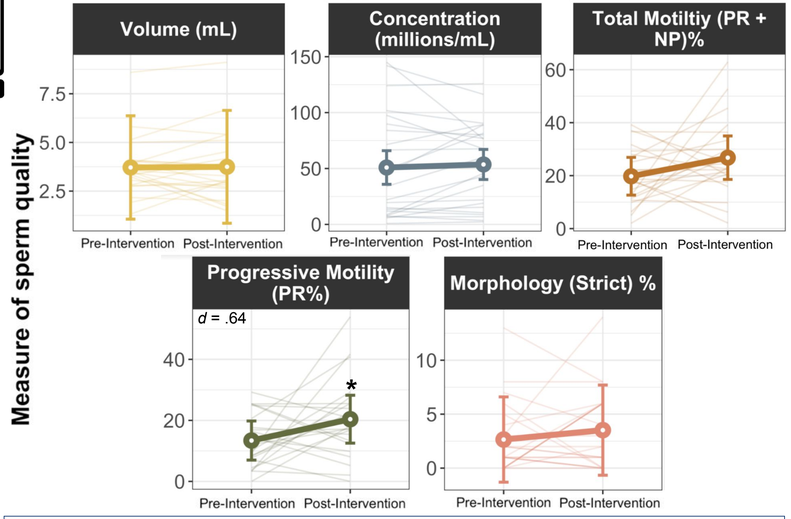

Figure 1: Comparison of mean measures of semen analysis pre- and post-intervention (n=23). *p<0.05.

Semen Analysis Results - Baseline vs Post-Intervention

Semen Analysis Measure	Baseline SA	Post-Intervention SA	% Change	*p*-value
Volume (mL)	3.71+/-1.5	3.75+/-1.8	0.877%	.945
Concentration (millions/mL)	50.9+/-47.2	53.6+/-37.8	5.3%	.598
Total Motility (%)	19.8+/-10.6	26.8+/-14.0	35.4%	.086
Progressive Motility (%)	13.4+/-8.6	20.4+/-12.8	52.2%	.046
Strict Morphology (%)	2.7+/-3.3	3.5+/-3.6	29.6%	.327

Limitations

- Single arm study - Lack of control group
- Self-reported compliance
- Sample size limited
- Selection bias
- Unable to control for confounding factors

Conclusion & Future Directions

- **An interim analysis of a 90-day course of preconception antioxidant nutrients showed a significant improvement in progressive motility and a positive trend in total motility in patients with male factor infertility.**
- A statistically significant increase in progressive motility by 52.2% (p = .046), and a marginally significant increase in total motility by 35.4% (p = .086).
- No significant changes noted in volume, concentration, or morphology.
- Taking additional supplements to improve sperm quality may represent a low-level intervention to support patients with male factor infertility.
- The study will be extended to include 50 participants; further sperm quality parameters such as DNA fragmentation will be investigated in future participants.

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Funding & Conflicts of Interest

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