



Effect of Sesame on Sperm Parameters in Infertile Men: A Retrospective Cohort Study

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Abstract

Background: Male idiopathic infertility is characterized by abnormal semen parameters, including sperm concentration, motility, and morphology. Various hormonal and experimental therapies are employed to address this condition.

Objectives: This study investigates the effect of sesame on sperm concentration, morphology, and motility in infertile men compared to combination drug therapy.

Materials and Methods: In this retrospective cohort study, 80 infertile men with abnormal semen parameters, referred to the infertility clinics of Fatemeh Hospital and Shahid Beheshti Hospital in Hamadan, Iran, were included. Participants were divided into two groups: One receiving combination drug therapy (e.g., FertilAid, n = 40) and the other receiving black sesame seeds (30 g/day, n = 40). Semen parameters were evaluated before and three months after treatment using Computer-assisted Sperm Analysis (CASA). Statistical analysis was performed using paired t-tests and independent t-tests, with a significance level of $P < 0.05$.

Results: Post-intervention, sperm motility was $42.6 \pm 9.23\%$ in the sesame group vs. $44.02 \pm 6.61\%$ in the combination drug group ($P = 0.43$), concentration was 33.82 ± 10.8 million/mL vs. 46.57 ± 9.62 million/mL ($P < 0.001$), and morphology was $27.22 \pm 10.23\%$ vs. $28 \pm 7.59\%$ ($P = 0.58$). Within-group analysis showed significant improvements in all parameters for both groups ($P < 0.001$).

Conclusions: Both sesame and combination drug therapy improved sperm parameters, with combination drugs showing greater efficacy in enhancing sperm count and motility, while sesame significantly improved morphology.

Keywords: Sesamum, Sesame Oil, Male Infertility, Herbal Medicine

1. Background

Infertility is defined as the inability to conceive after 12 months of regular, unprotected sexual intercourse (1). Approximately 15% of couples experience infertility, with male factors contributing to 20 - 30% of cases, female factors to 50%, and combined factors to 20 - 30% (2, 3). Male infertility can result from genetic conditions, lifestyle factors, medical comorbidities, or medications (4). Common causes include idiopathic infertility, varicocele, and genital tract infections (5). The World Health Organization (WHO) recommends semen analysis as the initial step to assess male fertility

potential, with normal parameters defined as semen volume ≥ 1.5 mL, total sperm count ≥ 39 million per ejaculation, sperm concentration ≥ 15 million/mL, total motility $\geq 40\%$, and normal morphology $\geq 4\%$ (6, 7).

Treatment for male infertility is categorized as specific (targeting known etiologies) or non-specific (for idiopathic cases), including hormonal and non-hormonal therapies (8). Interest in herbal medicine has prompted research into medicinal plants' effects on male fertility, with sesame (*Sesamum indicum* L.) showing promise due to its reported benefits on sperm count and motility (9, 10). Known as the "queen of oilseeds," sesame, a member of the Pedaliaceae family,

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has been cultivated for over 3,000 years in the Middle East and Africa (11, 12). Its antioxidant and anti-inflammatory properties, along with potential effects on blood glucose and cancer cell growth, make it a candidate for therapeutic use (13).

2. Objectives

This study evaluates the effect of sesame on sperm concentration, morphology, and motility in infertile men compared to combination drug therapy.

3. Materials and Methods

3.1. Study Design and Participants

This retrospective cohort study was conducted at the infertility clinics of Fatemeh Hospital and Shahid Beheshti Hospital in Hamadan, Iran, from 2020 to 2022. The study analyzed existing medical records of 80 infertile men with abnormal semen parameters (sperm concentration < 15 million/mL, motility < 40%, or normal morphology < 4%), selected via convenience sampling. Participants were divided into two groups based on treatments prescribed by their attending physician as part of routine clinical care: The combination drug group (n = 40) received oral medications such as FertilAid (one capsule daily, containing L-carnitine, zinc, and antioxidants), while the sesame group (n = 40) consumed 30 g of black sesame seeds daily (approximately 0.5 mg/kg body weight, taken orally once daily with meals). Group assignment was non-randomized, determined by physician discretion based on patient preference, clinical suitability, and treatment availability during the study period. No prospective intervention or randomization was implemented, as the study relied on retrospective data from standard clinical practice.

Exclusion criteria included azoospermia, sesame allergy, unwillingness to participate, significant sesame consumption in the preceding three months, use of oral

infertility medications in the preceding three months, or surgical infertility treatment within the past year. Ethical approval was obtained from the Institutional Review Board of Hamadan University of Medical Sciences, which waived the requirement for patient consent due to the retrospective nature of the study and the use of de-identified data.

3.2. Data Collection

A researcher-designed checklist collected data on age, treatment group, and semen parameters (motility, concentration, morphology). Semen samples were collected after 48 - 72 hours of sexual abstinence via masturbation in a laboratory-provided sterile container. Samples were incubated at 37°C and analyzed within one hour using Computer-assisted Sperm Analysis (CASA). Semen parameters were assessed at baseline and after three months of treatment. Follow-up challenges, such as irregular attendance, were mitigated through reminder phone calls. Some participants withdrew due to the study duration, and medication supply issues were resolved by sourcing from alternative pharmacies.

3.3. Data Analysis

Data were analyzed using SPSS version 16. Quantitative variables were expressed as mean \pm standard deviation (SD). Paired *t*-tests compared pre- and post-treatment semen parameters within each group. Independent *t*-tests compared post-treatment parameters between groups. One-way ANOVA assessed age-related differences within groups. The significance level was set at $P < 0.05$.

4. Results

Eighty infertile men were included, with 40 in each group. The mean age was 28.87 ± 3.56 years in the sesame group and 29.35 ± 3.37 years in the combination drug group ($P = 0.56$).

Table 1. Mean Sperm Motility, Morphology, and Concentration Before and After Treatment with Sesame Seeds Based on Age Groups

Age Groups/Semen Parameters	Number	Mean ± SD	P-Value
< 30			
Motility			< 0.001
Before	23	41.26 ± 8.82	
After	23	43 ± 8.25	
Concentration			< 0.001
Before	23	34.86 ± 13.67	
After	23	38.13 ± 11.36	
Morphology			< 0.001
Before	23	23.17 ± 11.18	
After	23	27.69 ± 10.45	
≥ 30			
Motility			< 0.001
Before	17	39.7 ± 13.85	
After	17	42.05 ± 10.65	
Concentration			< 0.001
Before	17	27.11 ± 10.55	
After	17	28 ± 6.81	
Morphology			< 0.001
Before	17	22.11 ± 10.36	
After	17	26.58 ± 10.22	

Table 2. Mean Sperm Motility, Morphology, and Concentration Before and After Treatment with Combination Drugs Based on Age Groups

Age Groups/Semen Parameters	Number	Mean ± SD	P-Value
< 30			
Motility			< 0.001
Before	20	37.65 ± 12.05	
After	20	45.05 ± 6.54	
Concentration			< 0.001
Before	20	39.2 ± 12.69	
After	20	45.6 ± 9.28	
Morphology			< 0.001
Before	20	22.55 ± 11.15	
After	20	26.9 ± 9.22	
≥ 30			
Motility			< 0.001
Before	20	37.15 ± 10.78	
After	20	43 ± 6.68	
Concentration			< 0.001
Before	20	41.6 ± 14.11	
After	20	47.55 ± 10.09	
Morphology			< 0.001
Before	20	23.6 ± 8.65	
After	20	29.1 ± 6.02	

4.1. Within-Group Analysis

Sesame Group: Significant improvements were observed in all semen parameters post-treatment (Table 1). For participants < 30 years (n = 23), motility increased

from 41.26 ± 8.82% to 43 ± 8.25% (P < 0.001), concentration from 34.86 ± 13.67 million/mL to 38.13 ± 11.36 million/mL (P < 0.001), and morphology from 23.17 ± 11.18% to 27.69 ± 10.45% (P < 0.001). For those ≥ 30 years (n = 17), motility increased from 39.7 ± 13.85% to 42.05 ± 10.65% (P < 0.001), concentration from 27.11 ± 10.55

Table 3. Comparison of Mean Sperm Motility, Concentration, and Morphology Before and After Treatment with Sesame Seeds and Combination Drugs

Semen Parameters/Groups	Mean ± SD	P-Value
Motility before		
Sesame	40.6 ± 11.1	0.2
Combination drugs	37.4 ± 11.29	
Motility after		
Sesame	42.6 ± 9.23	0.43
Combination drugs	44.02 ± 6.61	
Concentration before		
Sesame	31.57 ± 12.89	0.003
Combination drugs	40.4 ± 13.3	
Concentration after		
Sesame	33.82 ± 10.8	< 0.001
Combination drugs	46.57 ± 9.62	
Morphology before		
Sesame	22.72 ± 10.72	0.88
Combination drugs	23.07 ± 9.87	
Morphology after		
Sesame	27.22 ± 10.23	0.58
Combination drugs	28 ± 7.59	

million/mL to 28 ± 6.81 million/mL ($P < 0.001$), and morphology from $22.11 \pm 10.36\%$ to $26.58 \pm 10.22\%$ ($P < 0.001$).

Combination Drug Group: All parameters improved significantly (Table 2). For participants < 30 years ($n = 20$), motility increased from $37.65 \pm 12.05\%$ to $45.05 \pm 6.54\%$ ($P < 0.001$), concentration from 39.2 ± 12.69 million/mL to 45.6 ± 9.28 million/mL ($P < 0.001$), and morphology from $22.55 \pm 11.15\%$ to $26.9 \pm 9.22\%$ ($P < 0.001$). For those ≥ 30 years ($n = 20$), motility increased from $37.15 \pm 10.78\%$ to $43 \pm 6.68\%$ ($P < 0.001$), concentration from 41.6 ± 14.11 million/mL to 47.55 ± 10.09 million/mL ($P < 0.001$), and morphology from $23.6 \pm 8.65\%$ to $29.1 \pm 6.02\%$ ($P < 0.001$).

4.2. Between-Group Analysis

Post-treatment, the combination drug group showed higher sperm concentration (46.57 ± 9.62 million/mL vs. 33.82 ± 10.8 million/mL, $P < 0.001$) and motility ($44.02 \pm 6.61\%$ vs. $42.6 \pm 9.23\%$, $P = 0.43$) compared to the sesame group, though motility differences were not significant. Morphology was similar between groups ($28 \pm 7.59\%$ vs. $27.22 \pm 10.23\%$, $P = 0.58$) (Table 3).

4.3. Correlation Analysis

Combination drugs showed a stronger positive correlation with improvements in motility (Beta = 0.009, $P = 0.04$) and concentration (Beta = 0.008, $P < 0.001$) compared to sesame. Sesame had a notable effect

on morphology (Beta = 0.008, $P = 0.09$), though not statistically significant (Table 4).

5. Discussion

Sesame (*Sesamum indicum* L.) has garnered attention for its potential therapeutic role in male infertility due to its antioxidant and anti-inflammatory properties (14). This retrospective cohort study demonstrates that both sesame and combination drug therapy (e.g., FertilAid) significantly improve sperm parameters in infertile men, with combination drugs showing greater efficacy in enhancing sperm concentration and motility, while sesame notably improves morphology. These findings align with the growing interest in herbal medicine as an adjunct or alternative to conventional treatments for idiopathic male infertility.

The significant improvements in sperm motility, concentration, and morphology observed in the sesame group may be attributed to its bioactive compounds, including lignans (e.g., sesamin and sesamol), which possess antioxidant properties that mitigate oxidative stress in the testicular microenvironment (14, 15). Oxidative stress is a known contributor to sperm dysfunction, impairing motility and morphology through lipid peroxidation and DNA damage (5, 6). Sesame's antioxidant effects likely protect spermatozoa from reactive oxygen species (ROS), enhancing their functional parameters. Additionally, sesame may

Table 4. Comparison of Effects of Combination Drugs and Sesame on Semen Parameters

Models	B	Beta	t	P-Value
Constant	0.277		0.766	0.44
Motility before	-0.013	0.006	-2.09	0.04
Motility after	0.018	0.009	2.02	0.04
Concentration before	-0.019	0.007	-2.88	0.005
Concentration after	0.041	0.008	5.399	0.000
Morphology before	0.01	0.007	1.73	0.08
Morphology after	-0.01	0.008	-1.7	0.09

modulate the hypothalamic-pituitary-testicular axis, as suggested by animal studies showing increased testosterone levels and improved epididymal sperm reserves (15, 16). For instance, Abbasi et al. reported enhanced testosterone concentrations and germ cell to Sertoli cell ratios in diabetic rats supplemented with sesame oil, suggesting a hormonal mechanism that may translate to humans (16). Similarly, Mohammadzadeh et al. found that sesame oil, combined with low-dose estradiol, improved testicular function in aged mice, supporting its role in reproductive health (17).

In contrast, the combination drug group, treated with FertilAid, exhibited superior improvements in sperm concentration (46.57 ± 9.62 million/mL vs. 33.82 ± 10.8 million/mL, $P < 0.001$) and motility ($44.02 \pm 6.61\%$ vs. $42.6 \pm 9.23\%$, $P = 0.43$). FertilAid contains a blend of antioxidants (e.g., vitamin C, vitamin E, and coenzyme Q10), L-carnitine, and zinc, which are known to enhance spermatogenesis and sperm function (8). L-carnitine improves sperm motility by supporting mitochondrial energy metabolism, while zinc contributes to DNA synthesis and sperm membrane stability (4, 8). The synergistic action of these compounds likely explains the greater efficacy of combination drugs compared to sesame alone. However, the non-significant difference in post-treatment motility ($P = 0.43$) suggests that sesame may have comparable effects on motility in certain contexts, potentially due to its antioxidant properties overlapping with those of FertilAid.

Our findings partially align with previous human studies. Khani et al. reported significant improvements in sperm count and motility but not morphology in 25 infertile men treated with sesame for three months (10). In contrast, our study found significant morphology improvements ($27.22 \pm 10.23\%$ vs. $22.72 \pm 10.72\%$, $P < 0.001$), possibly due to differences in sesame dosage (30 g/day in our study vs. unspecified in Khani et al.), study population, or analytical methods (CASA vs. manual analysis). Animal studies further corroborate sesame's benefits. Amini Mahabadi et al. demonstrated improved

sperm number, motility, and luteinizing hormone levels in Wistar rats fed sesame seeds (18), while Shittu et al. reported dose-dependent improvements in sperm count, motility, and morphology in rats treated with sesame radiatum phytoestrogens (19). These studies suggest that sesame's effects may be dose-dependent and species-specific, warranting further investigation in humans.

The clinical implications of these findings are noteworthy. Sesame, as a non-pharmacological intervention, offers a cost-effective and accessible option for men with idiopathic infertility, particularly in regions where combination drugs are expensive or unavailable. Its significant effect on sperm morphology suggests a role in addressing teratozoospermia, a common cause of male infertility (6). However, the superior efficacy of combination drugs in improving sperm count and motility indicates that they may be preferred in cases where rapid improvement is desired, such as in assisted reproductive technologies (ART). The choice between sesame and combination drugs may also depend on patient preferences, tolerance, and cultural acceptability of herbal remedies.

This study has several limitations. The single-center, retrospective design and non-randomized group assignment introduce potential selection bias, as treatment allocation was based on physician discretion and patient preference. The small sample size ($n = 80$) limits generalizability, and the lack of a placebo group precludes assessment of spontaneous improvements. Additionally, the study did not measure hormonal levels (e.g., testosterone, luteinizing hormone) or oxidative stress markers, which could elucidate sesame's mechanisms of action. The short follow-up period (three months) may not capture long-term effects on fertility outcomes, such as pregnancy rates. Future research should include randomized controlled trials (RCTs) with larger, multicenter cohorts to confirm these findings. Incorporating hormonal and oxidative stress assays, dose-response studies, and longer follow-up periods

could further clarify sesame's therapeutic potential and optimal administration protocols. Additionally, exploring the combined use of sesame and pharmacological agents may reveal synergistic effects, enhancing treatment outcomes.

In conclusion, both sesame and combination drugs improve sperm parameters in infertile men, with combination drugs being more effective for sperm count and motility, and sesame showing a significant impact on morphology. These findings highlight sesame as a promising adjunct therapy, particularly for morphology-related infertility, while combination drugs remain the preferred choice for comprehensive semen parameter improvement. Further RCTs are needed to establish sesame's role in clinical practice and to optimize its use in male infertility treatment.

5.1. Limitations

This study is limited by its single-center design and non-randomized group assignment, which may introduce selection bias. The small sample size and retrospective nature further limit generalizability. Future randomized controlled trials with larger, multicenter cohorts are needed to validate these findings.

Footnotes

AI Use Disclosure: The authors declare that no generative AI tools were used in the creation of this article.

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Data Availability: The dataset presented in the study is available on request from the corresponding author during submission or after publication.

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