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Case Series

Improved semen quality and successful conception following probiotic supplementation in men with infertility

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ABSTRACT

Male infertility contributes significantly to global infertility burden, with abnormal semen parameters being a common underlying factor. Emerging evidence suggests that probiotics may influence reproductive health through modulation of inflammatory and metabolic pathways; however, clinical outcome data remain limited. We report eight men presenting with abnormal semen parameters and infertility who received probiotic supplementation for a defined duration. Semen analysis was performed before and after supplementation according to standard guidelines. Clinical outcomes, including natural conception, were documented. All eight participants demonstrated improvement in one or more semen parameters, including sperm count, motility, and/or morphology following probiotic supplementation. Notably, successful conception was achieved in all cases within a defined follow-up period. The degree of improvement varied across individuals but showed a consistent trend toward normalization of semen profiles. This study highlights a compelling association between probiotic supplementation and improvement in semen parameters, with successful fertility outcomes. These observations support the growing potential of probiotics as an adjunctive strategy in male infertility and warrant further validation through controlled studies.

Keywords: Male infertility, Probiotics, Semen parameters, Sperm motility, Fertility outcomes

INTRODUCTION

Abnormal semen parameters contribute to male infertility in approximately 50% of couples experiencing fertility challenges.¹ However, the etiology of these abnormalities remains unidentified in 30% of cases.² Recent research has underscored the microbiome's significant role in health and disease, prompting investigations into the semen microbiome and its potential implications for male infertility.^{3,4}

Recent studies have generated a wealth of data demonstrating that probiotics can significantly improve

sperm parameters. These include enhanced sperm motility and count, reduced DNA fragmentation, decreased oxidative stress and sperm lipid peroxidation, and lowered inflammatory markers and can influence sex hormones.⁵⁻⁸ The major players are from the genus *Lactobacillus* and *Bifidobacterium* which have already proven their positive impact on sperm quality and spermatogenesis models like mice and Zebrafish.^{8,9}

Recent research has highlighted the potential role of systemic factors such as inflammation, oxidative stress, and metabolic dysregulation in impairing spermatogenesis and sperm function.¹⁰ Interventions targeting these

pathways are increasingly being explored. Among these, probiotic supplementation has gained attention due to its potential to modulate host physiology through immunological, metabolic, and possibly microbial interactions.¹¹ While experimental and animal studies have suggested a beneficial role of probiotics in reproductive health, clinical evidence in humans remains limited and heterogeneous. In particular, data linking probiotic use with direct improvement in semen parameters and subsequent conception outcomes are sparse.

In this context, we present a study of men with abnormal semen parameters who received probiotic supplementation and subsequently demonstrated improvement in semen quality along with successful conception. This study aims to describe these clinical observations and explore potential mechanisms that warrant further investigation.

CASE REPORT

The report demonstrates a case series of 8 men with infertility, abnormal semen parameters, and attempts at conception for at least 1 year without success. Study was approved by Gupte Hospital Ethics Committee (GHEC/2022-23/017) and informed consent was taken from all subjects involved in the study. All patients received probiotic supplements twice daily for 90 days and semen parameters were evaluated before and after the intervention based on WHO 6th edition guidelines. The findings were analysed descriptively and the manuscript was prepared according to the CARE guidelines. The clinical background varied across cases, with five participants having undergone multiple unsuccessful intrauterine insemination (IUI) attempts ranging from two to four cycles, while three participants reported inability to conceive naturally despite regular attempts. One participant had a prior conception through IUI that resulted in medical termination due to trisomy. Overall, this cohort represents a clinically relevant group with persistent infertility despite prior interventions. Baseline semen analysis demonstrated abnormalities across multiple domains. Sperm concentration ranged from 10 to 80 million/mL, with one participant exhibiting oligozoospermia, while the remaining cases had counts within or above the reference range but showed functional impairment. Motility was markedly compromised across all participants, with total motility ranging from 10% to 50% and progressive motility (rapid) being absent or severely reduced (0–5%) in most cases. A high proportion of immotile sperm (50–90%) further indicated impaired sperm function. Morphological abnormalities were also prominent, with normal forms ranging from 2% to 15%, and the majority of cases falling below the reference threshold. Collectively, these findings indicate that functional defects in motility and morphology, rather than sperm count alone, were the predominant contributors to infertility in this cohort.

Following probiotic supplementation, a consistent and marked improvement in semen parameters was observed

across all cases. Sperm concentration increased in most participants, with post-treatment values ranging from 20 to 136 million/mL, all exceeding the reference threshold. Total motility improved substantially, ranging from 45% to 85%, with all cases reaching or surpassing the normal cutoff ($\geq 42\%$). Progressive motility (rapid), which was nearly absent at baseline, increased to 10–25% across

cases, indicating partial restoration of forward motility. Additionally, slow progressive motility improved across all individuals, contributing to overall functional gains. The proportion of immotile sperm decreased notably compared to baseline values. Morphological improvement was particularly striking, with normal forms increasing from baseline values of 2–15% to 10–47% post-supplementation, with all cases exceeding the normal reference threshold ($>4\%$). Liquefaction time remained within normal limits in all cases, indicating that viscosity-related factors were not a confounding variable. Clinically, these improvements translated into successful reproductive outcomes. All eight participants achieved conception following supplementation, with four cases resulting in natural conception and four requiring IUI. This represents a 100% conception rate within the cohort, despite prior infertility and repeated assisted reproduction failures in several individuals.

The integrated analysis of pre- and post-supplementation data demonstrates a consistent pattern wherein severe baseline functional sperm defects—particularly in motility and morphology—were followed by measurable improvement after probiotic intervention, culminating in successful conception. The uniform direction of change across multiple semen parameters, combined with favorable clinical outcomes, suggests that the observed improvements are unlikely to be incidental and may reflect a clinically meaningful association between probiotic supplementation and male reproductive function.

DISCUSSION

This study demonstrates a consistent association between probiotic supplementation and improvement in key semen parameters, culminating in successful conception across all participants, thereby underscoring its clinical relevance and translational significance in male infertility. Impaired semen quality, particularly reduced sperm motility, is a prevalent cause of male infertility.¹² Several factors adversely affect semen quality, including lifestyle choices, environmental toxins, infections and oxidative stress.¹³ Oxidative stress, in particular, can lead to sperm DNA damage and impaired motility significantly contributing to male infertility. Oxidative stress arises from an imbalance between reactive oxygen species (ROS) and total antioxidant capacity (TAC), leading to cellular damage.¹⁴

Numerous studies have investigated various antioxidant supplementation strategies to reduce reactive oxygen species (ROS) and improve male.^{15,16}

Table 1: Patient Data and Baseline Semen Parameters

Category	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5	Patient 6	Patient 7	Patient 8	Normal value
History	Unable to conceive naturally	2 IUI failed	4 IUI failed	3 IUI failed	3 IUI failed	Unable to conceive naturally	MTP due to TRI 21-IUI conception	Unable to conceive naturally	
Semen parameters									
Count (mil/ml)	30	10	15	70	80	75	65	55	15
Motility									
Total motility	10%	50%	30%	40%	40%	20%	30%	35%	40%
Progressive motility (rapid)	0%	5%	0%	5%	0%	0%	0%	0%	> 30%
Progressive motility (slow or sluggish)	0%	10%	5%	10%	10%	5%	15%	15%	
Non-progressive motility	10%	35%	25%	25%	30%	15%	15%	20%	
Immotile sperm	90%	50%	70%	60%	60%	80%	70%	65%	
Morphology									
Normal forms	2%	15%	2%	4%	2%	6%	7%	2%	> 4%
Liquification time	22 min	20 min	15 min	15 min	15 min	20 min	15 min	15 min	< 30 min
Remarks	Asthenoteratozoospermia	Oligozoospermia	Teratozoospermia	Asthenozoospermia	Asthenoteratozoospermia	Asthenozoospermia	Asthenozoospermia	Asthenoteratozoospermia	

Table 2: Semen parameters analyzed following 90 days of probiotic intervention.

Category	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5	Patient 6	Patient 7	Patient 8	Normal value
History	Unable to conceive naturally	2 IUI failed	4 IUI failed	3 IUI failed	3 IUI failed	Unable to conceive naturally	MTP due to TRI 21-IUI conception	Unable to conceive naturally	
Semen parameters									
Count (mil/ml)	72 mil/ml	20 mil/ml	40 mil/ml	68 mil/ml	136 mil/ml	83 mil/ml	60 mil/ml	110 mil/ml	15 mil/ml
Mobility									
Total motility	50%	60%	50%	45%	85%	45%	60%	60%	42%
Progressive motility (rapid)	25%	25%	25%	10%	25%	10%	15%	20%	> 30%
Progressive motility (slow or sluggish)	15%	25%	20%	15%	20%	15%	25%	35%	
Non-progressive motility	10%	10%	5%	20%	40%	20%	20%	5%	
Immotile sperm	50%	40%	50%	55%	15%	55%	40%	40%	
Morphology									
Normal forms	35%	32%	25%	16%	20%	10%	40%	47%	>4%
Liquification time	15 min	15 min	15 min	20 min	15 min	20 min	15 min	10 min	<30min
Remarks	Pregnant (natural)	Pregnant (IUI)	Pregnant (natural)	Pregnant (IUI)	Pregnant (natural)	Pregnant (IUI)	Pregnant (IUI)	Pregnant (natural)	

Natural antioxidants and vitamin supplements, such as vitamins C and E, glutathione, folate, zinc, selenium, carnitine, coenzyme Q10, lycopene, and N-acetyl cysteine, have been shown to neutralize free radicals, thereby enhancing semen parameters.^{17,18}

Patient data, including baseline semen parameters, are summarized in Table 1 and the Semen parameters analyzed following 90 days of probiotic intervention are mentioned in Table 2.

In recent years, probiotics have emerged as promising modulators of reproductive health owing to their antioxidant properties and their ability to influence host–microbial interactions, including the seminal microenvironment.⁵ Notably, *Lactobacillus* and *Bifidobacterium* species are widely employed due to their role in regulating gut microbiota, immune responses, and systemic metabolic balance.¹⁹

The use of probiotics in improving semen parameters has been widely discussed in numerous studies. One notable study published in 2017 evaluated the effects of *Lactobacillus rhamnosus* and *Bifidobacterium longum* on sperm quality. The semen parameters assessed before, during (at 3 and 6 weeks), and after probiotic administration showed a six-fold improvement in sperm motility, a 1.2-fold reduction in DNA fragmentation, and a 3.5-fold decrease in intracellular H₂O₂ levels. These findings suggested that *Lactobacillus* and *Bifidobacterium* strains can significantly enhance semen parameters in asthenozoospermic males.⁸ A randomized, double-blind controlled clinical trial published in 2022 involving 52 men demonstrated significant improvements in semen parameters and a decrease in inflammatory markers. The study utilized multiple strains of *Lactobacillus* and *Bifidobacterium*, along with *Streptococcus thermophiles*. These findings added to the growing body of literature suggesting probiotics can positively impact male reproductive health.⁵ While studies have demonstrated improvements in semen parameters with various interventions, clinical evidence directly linking these improvements to successful conception remains underexplored.

The data presented here provides compelling evidence that probiotic interventions may effectively improve fertility outcomes in men with altered semen parameters. The presence of pathogenic microorganisms within the seminal microbiome of patients with altered semen parameters suggested a potential link between microbiome dysbiosis and impaired semen quality. A significant improvement in semen parameters was observed following 90 days of probiotic intervention, including increased sperm count, enhanced total and progressive motility, and a higher percentage of sperm with normal morphology. These findings highlight the potential clinical relevance of microbiome-based interventions in addressing male infertility. However, the study's retrospective design, absence of a control group, and relatively small sample

size limit the ability to definitively establish causality between probiotic intervention and improved fertility outcomes. Future research should focus on prospective, randomized controlled trials with larger cohorts to validate these findings and clarify the mechanisms by which probiotics influence semen quality and reproductive success.

CONCLUSION

This represents a 100% conception rate within this cohort, despite prior infertility and, in several cases, failure of assisted reproductive interventions. All participants exhibited impaired baseline semen quality, predominantly affecting motility and morphology, and subsequently achieved successful conception following probiotic supplementation, indicating a consistent and clinically relevant pattern of improvement. Longitudinal assessments will be crucial to determine the sustained effects of probiotic intervention on semen parameters, microbiome composition, and pregnancy outcomes post-conception. Comprehensive microbiome analysis, including profiling of both beneficial and pathogenic microorganisms, will further enhance our understanding of the role probiotics play in male fertility.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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