

Improvement in sperm quality and reduction of DNA fragmentation with bee pollen supplementation: a case report

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ABSTRACT

Background: Infertility is a private, social and economic problem. It is defined as the inability to conceive within one year of regular unprotected sexual intercourse. Some natural antioxidants can improve sperm quality and help infertile patients. We report a patient with idiopathic infertility who had been trying to conceive for eight years with no success.

Case Presentation: A 32-year-old non-smoker, overweight man, was referred from an urologist due to oligospermia. His infertility was diagnosed as idiopathic. He had been trying to have a child for eight years, had received antioxidant supplements for the first five years. Bee pollen in powder form was prepared and administered to the patient for two months. After intervention, all semen parameters except motility (grade d) increased. The inflammatory markers decreased due to supplementation. There was also an increase in testosterone level and a decrease in FSH, LH and prolactin levels following the eight-week treatment period. Moreover, sperm DNA fragmentation reduced from 32.4% to 12.7%.

Conclusion: Bee products have been used as medicinal substances since the ancient times. Bee pollen is rich in flavonoids, some of which have anti-inflammatory and antioxidant effects. In this study, we have shown that the spouse of a patient with idiopathic infertility can become pregnant after he received supplementation with bee pollen.

Keywords: Infertility, Bee pollen, Sperm quality

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Introduction

About 45%–50% of infertilities result from male factorial deficiencies, 30%–45% of which are idiopathic [1]. Idiopathic infertility in men is defined as the inability to cause pregnancy in a female in two years or more of regular unprotected sexual intercourse. It is often diagnosed following low sperm count or low sperm quality in men with no identifiable morphological cause [2]. Among patients who receive treatment for infertility, 44% are diagnosed as idiopathic [3]. Normal function of spermatozoa depends on the balance between ROS (reactive oxygen species) and antioxidants. Many clinical trials have shown that antioxidants improve semen parameters [4]. Bee products were used in the ancient world (Egypt, Greece, and China) as medicine. In the recent years, bee products (propolis, honey, royal jelly, bee wax, bee pollen) have been accepted as alternative drugs [5]. Mixture of different species of flower pollen is agglutinated by nectar and honey bee enzymes (e.g. amylase, catalase), which are secreted by the insects' salivary gland, and form pollen loads that are recognized as granules of bee pollen [6]. Bee pollen has therapeutic values for which it is promoted as a valuable apitherapeutic product. A variety of primary and secondary metabolites of bee pollen exhibit a wide range of bioactivities, such as antioxidant and anti-inflammatory properties [6].

Case presentation

Medical History and Examination according to Modern Medicine

The patient is a 32-year-old referred from the urologist for oligospermia. His infertility was diagnosed as idiopathic. He is a nurse at the

hospital and has normal physical activity. He had been trying to have a child for eight years, while receiving antioxidant supplements the first five years. Except for his infertility, he had a normal medical history.

Medical History and Examination according to Iranian Traditional Medicine

The patient was an overweight non-smoker man (body mass index or BMI = 26.9). He complained of depression at times. This study did not consider the patient's temper.

Treatment

Measures to Protect Health and Nutrition:

The patient's food intake was recorded. He consumed all food groups, with high intake of fast food. He was advised to abstain from fast food until the end of the study.

Pharmaceutical Measures:

The patient received powdered bee pollen, filled in 500 mg capsules, every day for three months.

Treatment Results

Results before and after three months of treatment were noted; semen (Table 1), plasma inflammatory markers and sexual hormones (Table 2) analyses were conducted, both times in the same laboratory with the same method and technicians. No adverse effects were reported during treatment. All analyzed semen parameters except motility (grade d), increased. CRP and TNF α , and inflammatory markers decreased following supplementation. Moreover, laboratory findings indicated an increase in testosterone level, and decrease in FSH, LH, and prolactin levels after treatment. Sperm DNA fragmentation (SDF) reduced from 32.4% to 12.7%.

Table 1. Bee pollen Supplementation effects on Semen Parameters

Semen Parameters	Before Treatment	After Treatment	Unit
Ejaculate Volume	3.08	4.61	ml
Total Sperm Count	74.27	84.9	×10 ⁶
Sperm Concentration	21.19	25.07	×10 ⁶ /ml
Motility grade a	3.7	6.84	%
Motility grade b	23.11	26.06	%
Motility grade c	6.11	9.46	%
Motility grade d	60.8	53.03	%
Motility grade a + b	26.18	32.11	%
Motility grade a + b + c	33.1	39.01	%
Normal morphology	14.16	16.85	%
Live sperm	67.15	74.82	%

Table 2. Bee pollen Supplementation effects on Plasma Inflammatory Markers and Sex Hormones

Markers	Before Treatment	After Treatment	Unit
CRP	6.01	4	μM
TNF α	12.25	9.08	μM
Testosterone	13.07	15.95	ng/ml
FSH	6.08	5	ng/ml
LH	5.95	4.82	ng/ml
Prolactin	345.52	340.21	ng/ml

Discussion

Oxidative stress and ROS, as known etiologies of male infertility, have a significant role in reproductive health and spermatogenesis as well as inflammatory conditions [4]. Inflammation can cause spermatogenic arrest and impede the sperm maturation process [7]. Infertile men demonstrate high ROS in semen, and also high levels of pro-inflammatory cytokines [8]. There are many empiric medical therapies for idiopathic male infertility such as hormone therapy [9] and antioxidant therapy [10]. Bee products have recently been accepted as an alternative therapy in a wide range of diseases [5]. In a recent study, investigators added honey to semen samples of infertile men and then froze them for about 6 months. Results indicated that

honey supplementation could improve the sperm parameters e.g. sperm motility, after thawing [11]. Studies have suggested that bee pollen compounds (e.g. polyphenols and flavonoid) have the potential to enhance the host's defense system against pathogens and inflammatory situations. Anethole, the flavoring substance of bee pollen, is recognized as a potent tumor necrosis factor (TNF) inhibitor [5]. To date, no research has been carried out to prove the relationship between bee pollen and infertility, especially in male idiopathic infertility. We report an infertile man to whom bee pollen was prescribed. In this case, inflammatory markers (CRP, TNF α) declined after bee pollen supplementation. According to previous investigations, inflammatory situations inhibit

sperm maturation [7]. Enhancement of sperm motility is known as the maturation process; all motility grades increased after supplementation. One of the main components of bee pollen is vitamin C. Daily supplementation of vitamin C in 30 healthy, infertile men increased sperm count by 112%-140% percent varied by dosage [12]. Semen vitamin C concentration is higher than the serum; high semen ROS level in infertile men is correlated with low vitamin C in semen [13]. Propolis, a bee product, as well as bee pollen, contain flavonoids, phenolic and aromatic components [14]. Administration of hydroethanolic extract of Indian propolis to male mice reduced oxidative stress and restored testicular testosterone [15].

Conclusion

As demonstrated in this case report, bee pollen has antioxidant and anti-inflammatory properties. Bee pollen supplementation in the presented patient lead to improvement in semen quality and testosterone and he was able to cause conception in his spouse.

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