

Diagnostic Significance of Anti-Sperm Antibodies in the Clinical Practice of Reproductive Immunology in Men and Women

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Abstract Immunological infertility is a significant cause of reduced reproductive function in both men and women. This study evaluated the effects of anti-sperm antibodies (ASA) and cytokines on sperm function in men and reproductive structures in women in 180 patients. Participants were divided into three groups: main (elevated ASA), comparison (increased cytokines), and control (healthy individuals). High ASA levels in men were associated with reduced sperm motility, viability, and normal morphology, with increased DNA fragmentation. In women, ASA and cytokine imbalances negatively affected endometrial function, implantation, and pregnancy outcomes. Correlation analysis showed an inverse relationship between immunological factors and reproductive function. Comprehensive assessment of ASA and cytokine profiles allows individualized prediction and management of infertility and has practical significance for personalized immunological diagnostics, immunomodulatory therapy, antioxidants, and ART.

Keywords Immunological infertility, Anti-sperm antibodies, Cytokines, Male fertility, Female fertility, MAR test, Reproductive immunology

1. Introduction

Immunological infertility is one of the significant causes of reduced reproductive function in both men and women [1,2,3]. In men, anti-sperm antibodies (ASA) and pro-inflammatory cytokines negatively affect sperm motility, viability, morphology, and DNA integrity [4,5,6]. In women, immunological factors include ASA, anti-phospholipid antibodies, autoantibodies to the ovaries and endometrium, and cytokine imbalances that influence implantation and pregnancy outcomes. Identifying immunological factors in infertility allows for accurate diagnosis, prognosis of assisted reproductive technology (ART) outcomes, and personalized treatment strategies [7,8,9,10,11,12,13].

Am of the Study. The aim of this study was to investigate the mechanisms by which anti-sperm antibodies and cytokines affect sperm function in men and reproductive structures in women, as well as to develop effective diagnostic and therapeutic approaches for immunological infertility.

2. Materials and Methods

The study included 180 patients with immunological infertility:

- 90 men aged 22–37 years

- 90 women aged 23–38 years

Patients were divided into three groups:

1. **Main group** — patients with high levels of ASA (men and women)
2. **Comparison group** — patients with elevated levels of specific cytokines (IL-1 β , IL-6, TNF- α , IFN- γ , IL-10)
3. **Control group** — healthy men and women without immunological infertility factors

Methods:

- ASA detection in blood serum and seminal plasma (men) and cervical mucus (women) using the MAR test
- Cytokine profiling using ELISA
- Assessment of sperm parameters according to WHO 2021 guidelines
- Evaluation of female reproductive potential: endometrial quality, hormone levels, presence of autoantibodies, and implantation outcomes during ART

3. Results

Table 1. ASA levels in men and women

Parameter	Men, Main Group	Women, Main Group	Control	p
ASA, U/ml	58.4 \pm 7.2	45.7 \pm 6.1	12.6 \pm 3.4	<0.001
Positive MAR-test, %	72	65	0	<0.001

Table 2. Cytokine profile in men and women (pg/ml)

Cytokine	Men	Women	Control	p
IL-1 β	14.3 \pm 2.6	16.8 \pm 3.0	5.4 \pm 1.3	<0.05
IL-6	22.8 \pm 4.1	25.1 \pm 4.3	9.7 \pm 2.1	<0.05
TNF- α	19.5 \pm 3.7	21.7 \pm 3.9	7.8 \pm 1.9	<0.05
IFN- γ	17.1 \pm 3.2	18.9 \pm 3.4	6.9 \pm 1.6	<0.05
IL-10	5.8 \pm 1.4	6.2 \pm 1.3	9.3 \pm 1.8	<0.05

Key Findings:

- Men with high ASA levels showed decreased sperm motility, viability, and normal morphology, and increased DNA fragmentation.
- Women with high ASA and cytokine imbalance had impaired endometrial function, reduced implantation rates, and higher risk of pregnancy loss.
- Correlation analysis revealed an inverse relationship between immunological factors and reproductive outcomes in both sexes.

4. Discussion

High ASA levels and cytokine imbalances in women contribute to implantation failure and increased risk of miscarriage. In men, ASA and pro-inflammatory cytokines negatively impact sperm quality. Comprehensive evaluation of immunological factors in both partners allows for individualized diagnostics and therapy, including immunomodulators, antioxidants, and ART.

5. Conclusions

1. Immunological factors significantly influence fertility in both men and women.
2. Combined assessment of ASA and cytokine profiles ensures high diagnostic accuracy.
3. In women, immunological abnormalities are associated with reduced fertility and increased risk of miscarriage.
4. Promising therapeutic approaches include immunomodulators, antioxidants, and assisted reproductive technologies.

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