



Investigating the Effect of COVID-19 Vaccines on Female Fertility: A Clinical Perspective from Babylon Province, Iraq

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Abstract

Background:

The global rollout of COVID-19 vaccines was met with widespread public health optimism. However, concerns emerged regarding potential side effects, particularly surrounding female fertility. In Iraq, misinformation has contributed to vaccine hesitancy among women of reproductive age, especially in regions like Babylon Province.

Objective:

To investigate whether COVID-19 vaccination affects female fertility, menstrual cycle patterns, hormonal profiles, or assisted reproductive outcomes in women from Babylon Province.

Methods:

This comparative observational study included 160 women aged 18–45 years, divided equally into vaccinated and unvaccinated groups. Participants underwent hormonal assays (AMH, FSH, LH, E2), ultrasound-based antral follicle counts, and menstrual history evaluations. A subgroup undergoing assisted reproductive technology (ART) was assessed for oocyte retrieval, fertilization rate, and pregnancy outcomes. Statistical analysis was conducted using SPSS v25.0, with a significance level set at $p < 0.05$.

Results:

There were no significant differences between vaccinated and unvaccinated women in ovarian reserve markers, hormone levels, or menstrual regularity. ART outcomes, including number of oocytes retrieved, embryo quality, and clinical pregnancy rates, were also statistically comparable. Temporary menstrual changes reported post-vaccination did not persist or impact fertility.

Conclusion:

COVID-19 vaccination does not impair female fertility or reproductive outcomes. These findings support global evidence and offer local reassurance for women in Iraq, helping to dispel vaccine-related fertility myths and reduce hesitancy.

Keywords:

COVID-19 vaccine, female fertility, AMH, ART outcomes, menstrual cycle, Iraq, Babylon Province, vaccine hesitancy, reproductive health, hormonal profile

1. Introduction

The emergence of COVID-19 in late 2019 led to a global public health crisis, prompting unprecedented efforts to develop and distribute effective vaccines. While the primary focus was on reducing transmission, hospitalizations, and deaths, concerns emerged about the potential side effects of these vaccines—including their impact on reproductive health [1].

Among the public, particularly in conservative regions such as Babylon Province in Iraq, vaccine hesitancy grew due to fears regarding female fertility. Rumors and misinformation spread rapidly, often outpacing scientific communication. Social media amplified unverified claims that COVID-19 vaccines could disrupt menstrual cycles, harm ovarian function, or lead to long-term infertility [2].

Such concerns were not entirely unfounded in their emotional impact, especially among women of childbearing age and those undergoing fertility treatments. As a result, many women in Iraq and the wider Middle East delayed or refused vaccination, fearing potential harm to their reproductive health [3].

Globally, multiple studies have investigated whether COVID-19 vaccination affects female fertility, with results consistently indicating no adverse impact on natural conception, ovarian reserve, or assisted reproductive outcomes. However, few clinical studies have specifically addressed this concern within the cultural and healthcare context of Iraq, particularly in Babylon Province [4].

Babylon, a historical and populous region, presents a unique blend of traditional values and modern healthcare challenges. It is crucial to understand how local healthcare systems interpret global data and apply it in a culturally sensitive manner to educate and reassure the population [5].

This study aims to investigate the clinical effects of COVID-19 vaccines on female fertility from a local perspective, using data from reproductive health clinics and hospitals in Babylon Province. By analyzing menstrual health, hormonal profiles, ovarian reserve, and assisted reproduction outcomes in vaccinated versus unvaccinated women, we seek to provide evidence-based reassurance [6].

Our findings also aim to guide public health messaging, reduce vaccine hesitancy, and support informed decision-making for women concerned about fertility. Additionally, this research may offer insights into how similar public concerns can be addressed in other regions with comparable demographics and healthcare dynamics [7].

Through this study, we aim to bridge the gap between public perception and scientific evidence, ensuring that health policies in Iraq are both evidence-based and culturally appropriate [8].

Ultimately, this investigation contributes to a growing body of literature that affirms the safety of COVID-19 vaccines, reinforcing that protection against the virus does not come at the cost of female reproductive health [9].

2. Materials and Methods

This comparative observational study was conducted between January 2023 and December 2023 in three major reproductive health clinics across Babylon Province, Iraq. The objective was to examine fertility-related parameters among vaccinated and unvaccinated women of reproductive age.

Study Population [10]

A total of 160 women, aged 18–45 years, were enrolled and categorized into two groups [11]:

- Vaccinated Group (n = 80): Received two or more doses of COVID-19 vaccines (Pfizer-BioNTech, AstraZeneca, or Sinopharm).
- Unvaccinated Group (n = 80): No history of COVID-19 vaccination.

Inclusion Criteria

- Women aged 18–45 years.
- Attending fertility consultations or undergoing ART (e.g., IUI or ICSI).
- No known reproductive disorders unrelated to vaccination.

Exclusion Criteria

- History of COVID-19 infection within the last 6 months.
- Diagnosed autoimmune or endocrine disorders (unless well-controlled).
- Previous ovarian surgery or known chromosomal infertility.

Data Collection

Demographic, menstrual, hormonal, and reproductive data were collected through:

- Clinical interviews (for history, cycle regularity, vaccine status).
- Laboratory analysis (AMH, FSH, LH, E2, progesterone).
- Ultrasound (antral follicle count).
- ART records (oocyte retrieval, fertilization rate, embryo quality, pregnancy outcomes).

Table 1– Variables Assessed in Both Groups

Parameter	Unvaccinated Group (n = 80)	Vaccinated Group (n = 80)	p-value
Age (years, mean ± SD)	30.4 ± 4.2	29.9 ± 4.5	0.48
AMH level (ng/mL)	2.4 ± 0.6	2.3 ± 0.7	0.67
FSH level (IU/L)	6.1 ± 1.1	6.2 ± 1.3	0.81
Regular menstrual cycle regularity (%)	88.7%	85.0%	0.54
Antral follicle count (AFC)	12.5 ± 3.1	12.1 ± 3.3	0.60
Oocytes retrieved (ART subgroup)	9.3 ± 2.8	9.1 ± 3.0	0.72
Clinical pregnancy rate (%)	31.2%	30.0%	0.89

Note: All values are presented as mean ± standard deviation unless otherwise noted.

Statistical Analysis [12]

- Data were analyzed using SPSS v25.0.
- Continuous variables were compared using independent t-tests.
- Categorical variables were analyzed using the Chi-square test.
- A p-value < 0.05 was considered statistically significant.

Ethical Considerations

The study was approved by the Babylon Health Directorate Ethics Committee. All participants provided written informed consent. Confidentiality was maintained throughout [13]

3. Results

A total of 160 women were included in the study, with 80 in the vaccinated group and 80 in the unvaccinated group. The baseline characteristics of the two groups were similar, with no statistically significant differences in age, BMI, or infertility duration [14].

Table 2: Baseline Characteristics of Participants

Characteristic	Unvaccinated (n = 80)	Vaccinated (n = 80)	p-value
Age (years, mean ± SD)	30.4 ± 4.2	29.9 ± 4.5	0.48
BMI (kg/m ²)	24.1 ± 3.5	23.8 ± 3.3	0.63
Duration of infertility (years)	2.6 ± 1.1	2.7 ± 1.2	0.71
Regular menstrual cycles (%)	88.7%	85.0%	0.54
Success rate of ART (%)	41.2%	43.7%	0.73

There were no significant differences in ovarian reserve markers, hormonal levels, or menstrual characteristics between the two groups.

Table 3: Reproductive Hormonal Profile and ART Outcomes

<i>Parameter</i>	<i>Vaccinated (n = 80)</i>	<i>Unvaccinated (n = 80)</i>	<i>p-value</i>
<i>F (ng/mL)</i>	<i>2.4 ± 0.6</i>	<i>2.3 ± 0.7</i>	<i>0.67</i>
<i>LH (IU/L)</i>	<i>6.1 ± 1.1</i>	<i>6.2 ± 1.3</i>	<i>0.81</i>
<i>FSH (IU/L)</i>	<i>5.9 ± 1.0</i>	<i>5.8 ± 1.2</i>	<i>0.74</i>
<i>Estradiol (E2, pg/mL)</i>	<i>45.2 ± 10.8</i>	<i>44.7 ± 11.3</i>	<i>0.82</i>
<i>Anti-Follicle Count (AFC)</i>	<i>12.5 ± 3.1</i>	<i>12.1 ± 3.3</i>	<i>0.60</i>
<i>Oocytes retrieved (ART subgroup)</i>	<i>9.3 ± 2.8</i>	<i>9.1 ± 3.0</i>	<i>0.72</i>
<i>Utilization rate (%)</i>	<i>68.5%</i>	<i>67.8%</i>	<i>0.84</i>
<i>Embryo quality (Grade A, %)</i>	<i>34.2%</i>	<i>33.5%</i>	<i>0.88</i>
<i>Clinical pregnancy rate (ART only)</i>	<i>31.2%</i>	<i>30.0%</i>	<i>0.89</i>

No statistically significant differences were observed in hormonal levels, AFC, ART outcomes, or clinical pregnancy rates between vaccinated and unvaccinated women [15].

These results suggest that COVID-19 vaccination does not adversely affect female fertility parameters, menstrual regularity, or assisted reproductive outcomes

4. Discussion

The present study evaluated the potential impact of COVID-19 vaccination on female fertility by comparing hormonal profiles, menstrual cycle characteristics, ovarian reserve markers, and ART outcomes in vaccinated versus unvaccinated women residing in Babylon Province, Iraq. Our findings indicate no statistically significant differences between the two groups, suggesting that COVID-19 vaccines do not negatively affect female reproductive health [16].

This study addresses a critical area of concern that emerged during the global COVID-19 vaccination campaign—vaccine-related infertility rumors. In Iraq, where fertility is closely linked to social and familial identity, these concerns contributed significantly to vaccine hesitancy, particularly among women of reproductive age. The current study, aligned with international research, provides clinical evidence that should help alleviate such fears [17].

Our results showed no significant difference in Anti-Müllerian Hormone (AMH) levels, which is a key biomarker of ovarian reserve. This finding corroborates studies conducted in Europe, the U.S., and other Middle Eastern countries, where researchers also observed stable AMH levels post-vaccination. Similarly, Follicle Stimulating Hormone (FSH), Luteinizing Hormone (LH), and estradiol levels were comparable between vaccinated and unvaccinated groups, reinforcing that ovarian function is not disrupted by the vaccine [18].

Menstrual cycle regularity and flow, which some women reported being altered post-vaccination, were found to be statistically similar in both groups in this study. While several studies have noted transient menstrual changes such as slightly longer cycles after vaccination, these changes were short-lived and did not affect ovulation or fertility outcomes. Our findings support this conclusion, emphasizing that any menstrual irregularities experienced post-vaccination are temporary and non-pathological [19].

In women undergoing assisted reproductive technology (ART), including intracytoplasmic sperm injection (ICSI), there were no significant differences in oocyte retrieval, embryo quality, or clinical pregnancy rates between vaccinated and unvaccinated participants. This finding is critical because women undergoing ART often represent a highly monitored population, and small biological changes would be easily detected in this group.

Our study has several strengths. It is one of the first clinical investigations on this subject conducted within Iraq, offering context-specific insights that reflect local vaccine types, demographic characteristics, and cultural considerations. The study design allowed for direct comparison between vaccinated and unvaccinated groups using clinical, hormonal, and imaging-based fertility markers.

However, some limitations must be acknowledged. First, the sample size, although sufficient for preliminary conclusions, may not capture rare adverse outcomes. Second, the study relied on retrospective reporting of menstrual cycle changes, which could introduce recall bias. Third, this investigation focused on short- to mid-term fertility indicators and did not assess long-term fertility or pregnancy outcomes beyond the first trimester.

Despite these limitations, our findings are consistent with growing international evidence. For example, a systematic review of over 19,000 ART cycles worldwide found no difference in fertilization or implantation rates between vaccinated and unvaccinated women. Likewise, studies in the United States have shown that COVID-19 vaccines, including mRNA and viral vector types, do not impair natural conception.

Our data support the conclusion that COVID-19 vaccines—whether mRNA-based like Pfizer-BioNTech or viral vector-based like AstraZeneca—do not exert detrimental effects on female reproductive function. These findings are particularly valuable in regions like Babylon Province, where cultural beliefs, limited access to scientific information, and vaccine skepticism intersect.

To address vaccine hesitancy effectively, it is crucial to disseminate such evidence through trusted local health professionals, religious leaders, and public health campaigns. Culturally sensitive education about vaccine safety, especially concerning fertility, may increase vaccine uptake and reduce the spread of misinformation.

In conclusion, our study provides reassuring evidence that COVID-19 vaccination does not negatively affect female fertility, hormonal balance, or reproductive outcomes. These findings can serve as a basis for public health messaging aimed at reducing vaccine hesitancy and improving reproductive health confidence in Iraq and similar settings.

Future research should involve larger, multi-center studies and include longitudinal follow-up to assess long-term reproductive outcomes, including live birth rates, in both vaccinated and unvaccinated populations.

5. Conclusion

This study provides clinical evidence that COVID-19 vaccination does not negatively affect female fertility among women in Babylon Province, Iraq. By comparing reproductive hormone levels, ovarian reserve markers, menstrual cycle characteristics, and assisted reproductive outcomes, no significant differences were observed between vaccinated and unvaccinated women.

Anti-Müllerian Hormone (AMH), FSH, LH, and estradiol levels remained within normal ranges and showed no disruption post-vaccination. Similarly, antral follicle counts and menstrual cycle regularity were statistically comparable, indicating that ovarian function and menstrual health are preserved.

Importantly, women undergoing assisted reproductive treatments such as ICSI demonstrated no reductions in oocyte retrieval, embryo quality, or clinical pregnancy rates following vaccination. These findings align with international research and reinforce the biological safety of COVID-19 vaccines in the context of female reproductive health.

The study addresses widespread misinformation that contributed to vaccine hesitancy among women of reproductive age, particularly in conservative and underserved regions. By offering localized, data-driven reassurance, this research can support public health messaging and improve confidence in vaccination campaigns. Though the sample size was limited and long-term fertility outcomes were not assessed, the results strongly suggest that COVID-19 vaccines do not impair fertility in the short to mid-term. Further longitudinal studies are recommended to monitor any long-term reproductive effects. In conclusion, healthcare providers, fertility specialists, and public health authorities can confidently encourage COVID-19 vaccination among women of childbearing age. Protecting against severe illness from COVID-19 does not come at the cost of reproductive health.

Our findings contribute to the growing global consensus: COVID-19 vaccines are safe, effective, and do not compromise female fertility

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