

Fertility Preservation Strategy for Women with POSEIDON Groups 3 and 4: A Retrospective Cohort Study

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INTRODUCTION

Fertility preservation has become increasingly relevant as improvements in assisted reproductive technologies have provided options for individuals facing potential fertility loss. For women diagnosed with poor ovarian reserve (POR), categorized as POSEIDON Groups 3 and 4, effective fertility preservation is a significant clinical challenge. These groups typically experience reduced efficacy compared to standard-assisted reproductive techniques due to diminished ovarian reserve. The POSEIDON classification, introduced in 2016, stratifies POR patients by age and ovarian reserve, recognizing age as a key factor in oocyte quality. Women in these groups frequently undergo multiple stimulation cycles, adding physical, emotional, and financial strain. However, few studies have compared stimulation protocols for these groups in fertility preservation.

This study compares ovarian response and reproductive outcomes between POSEIDON Groups 3 and 4, aiming to identify optimal protocols, build predictive models, and evaluate age-specific effectiveness and cost efficiency.

METHODS

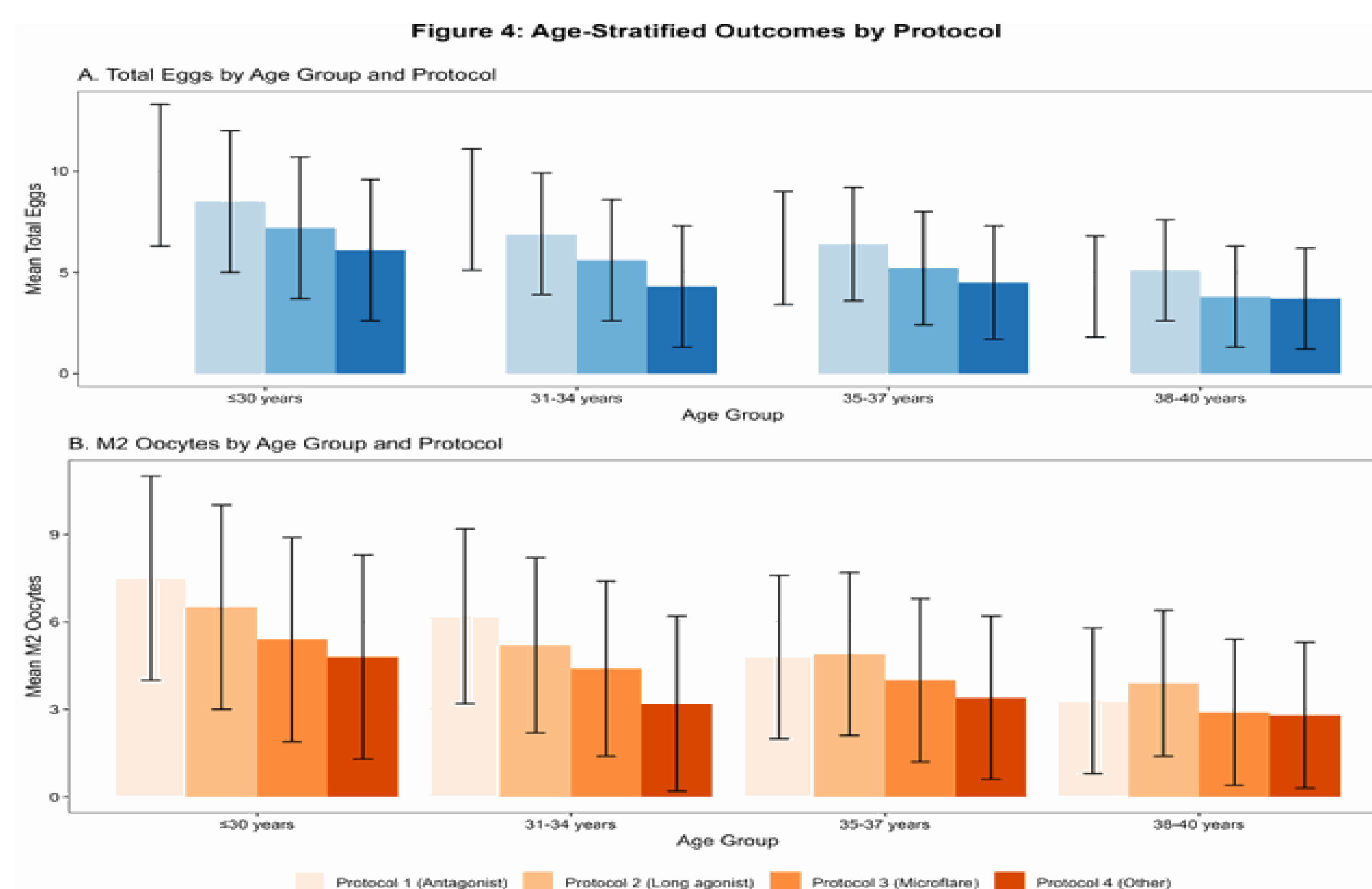
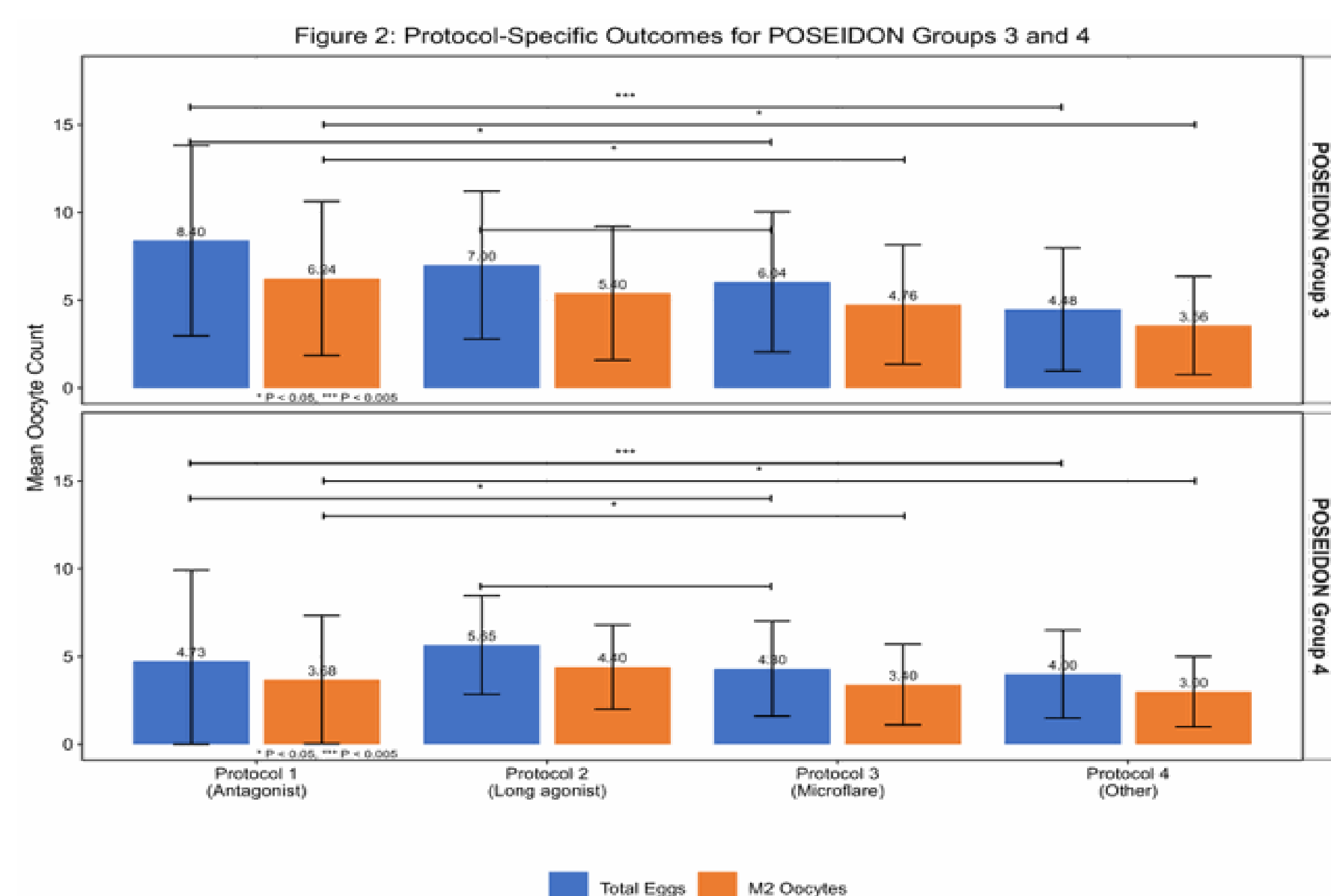
This retrospective cohort study included 61 women who underwent 193 ovarian stimulation cycles for fertility preservation between the years 2019 to 2024.

Patients were divided into POSEIDON Group 3 (<35 years) and POSEIDON Group 4 (≥35 years) based on age and diagnosis of poor ovarian reserve.

The main outcome measures included the total oocyte yield, mature (M2) oocytes retrieved, and protocol-specific responses. Logistic regression models were developed to identify the predictors of higher M2 oocyte retrieval in each group.

RESULTS

Significant differences were observed between the groups in terms of FSH levels, AMH levels, and AFC. No significant differences were observed in BMI or stimulation parameters. FSH levels were significantly lower in the younger group (11.10 vs 14.49, $P<.001$). In POSEIDON Group 3, antagonist protocol yielded the highest mean for total eggs (8.40 ± 5.43) and M2 oocytes (6.24 ± 4.39), with significant differences between protocols ($P=.036$). In the POSEIDON Group 4, no significant differences were observed between protocols, although Protocol 2 (long agonist) showed slightly better results as shown in figure 2. No significant differences in M2 oocytes or total egg yield across different trigger types in either POSEIDON Group 3 or Group 4 (all $P>.05$). Younger women (POSEIDON Group 3) showed significantly higher total egg counts (7.26 vs 4.56, $P<.001$) and mature M2 oocytes (5.55 vs 3.56, $P<.001$) compared with older women (POSEIDON Group 4) as shown in figure 4A and 4B. For younger women, baseline characteristics including AMH, FSH, and AFC demonstrated significant predictive value, suggesting that traditional ovarian reserve markers retain their relevance in this population. In contrast, for older women, the Last E2 level emerged as the strongest predictor, indicating that the response to stimulation itself may be more informative than the baseline characteristics in this age group. Age-stratified analysis revealed protocol efficacy varies across age subgroups, with cost-effectiveness favoring antagonist protocol in younger patients and long agonist protocol in older patients. The superior response observed in the younger POSEIDON Group 3 aligns with previous researches indicating that age remains a critical determinant of ovarian response, beyond quantitative markers of reserve. This reinforces the value of the POSEIDON classification for differentiating these patient populations for more personalized treatment approaches.



Conclusion

This study demonstrates the need for age-specific ovarian stimulation protocols for women with poor ovarian reserve. Antagonist protocols enhance egg retrieval outcomes in younger women, while long agonist protocols may offer advantages for women approaching the age 40. Different baseline characteristics predict outcomes in each age group, highlighting the importance of individualized approaches to fertility preservation in these challenging patient populations. Economic analysis provides practical guidance for protocol selection, with antagonist protocols offering the best value in younger patients and long agonist protocols being more cost-effective in older patients. Future prospective studies with larger sample sizes are needed to validate these findings and further refine the protocol selection for women with poor ovarian reserve seeking fertility preservation.

References

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