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Original Research Article

Conception rate of intrauterine insemination in a subfertile population cervical factor, mild male factor, unexplained infertility in tertiary care centre

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ABSTRACT

Background: Intrauterine insemination (IUI) is a widely used assisted reproductive technique for subfertile couples, particularly those with cervical factor, mild male factor, or unexplained infertility. Despite its popularity, the effectiveness of IUI across different etiologies remains debated.
Methods: This observational study was conducted at the department of obstetrics and gynecology, Government Medical College and Hospital, Akola, Maharashtra. Subfertile women were categorized based on etiology- cervical factor, mild male factor, or unexplained infertility- and underwent IUI following standard ovulation induction protocols. Primary outcomes included conception rate per cycle and cumulative pregnancy rate. Secondary outcomes assessed endometrial thickness, follicular response, and cycle characteristics.
Results: IUI yielded variable conception rates across etiological groups. Women with cervical factor infertility demonstrated the highest conception rates, followed by those with unexplained infertility and mild male factor. Favourable endometrial thickness and monofollicular development were associated with higher pregnancy rates. The number of cycles required for conception was lowest in the cervical factor group.
Conclusions: IUI remains a cost-effective and minimally invasive first-line treatment for selected subfertile populations. Cervical factor infertility responds most favorably to IUI, while mild male factor and unexplained infertility show moderate success. Careful patient selection and individualized stimulation protocols enhance outcomes.

Keywords: Cervical Factor, Conception rate, Intrauterine insemination, Mild male factor, Subfertility, Unexplained infertility

INTRODUCTION

Infertility is a growing global health concern, affecting approximately 17.5% of the reproductive-age population, or one in every six individuals.[1] The World Health Organization (WHO) defines infertility as the inability to conceive after 12 months of regular, unprotected intercourse.[2] Subfertility, a broader term, encompasses reduced fertility potential in either or both partners.[3]

Both male and female factors contribute to infertility. Female factors account for 40–55% of cases, with anovulation being the most common cause.[4] Male factors contribute to 20-40%, while unexplained infertility comprises approximately 10%.[5] Among ovulatory disorders, polycystic ovarian syndrome (PCOS) is the leading cause, characterized by normogonadotropic normoestrogenic anovulation.[6]

Assisted reproductive technologies (ART) have revolutionized infertility management. Intrauterine insemination (IUI), a form of artificial insemination, is widely used for cervical factor, mild male factor, and unexplained infertility.[7] The rationale behind IUI is to

increase the density of motile spermatozoa at the site of fertilization.[8] IUI is less invasive and more cost-effective than in vitro fertilization (IVF) or intracytoplasmic sperm injection (ICSI), making it a preferred first-line treatment in selected cases.[9]

Historically, artificial insemination has evolved from veterinary practices to human applications, with milestones such as the first human insemination by John Hunter in the 18th century and the first pregnancy using frozen sperm in 1953.[10,11] Despite its widespread use, the efficacy of IUI remains debated, especially in cases of unexplained infertility.[12] While the 2013 NICE guidelines recommended against IUI for unexplained infertility, recent randomized trials have demonstrated its value in improving pregnancy outcomes in selected populations.[13-16]

This study aimed to evaluate the conception rate of IUI in subfertile women with cervical factor, mild male factor, and unexplained infertility, thereby contributing to evidence-based selection of treatment modalities.

METHODS

This prospective interventional study was conducted in the department of obstetrics and gynecology Government Medical College, Akola, between October 2023 and March 2025, enrolling 100 subfertile couples presenting with cervical factor, mild male factor, or unexplained infertility. Women aged 20-40 years with at least one patent fallopian tube and spontaneous or induced ovulation were included. Couples with severe male factor infertility, bilateral tubal block, donor sperm use, or systemic illness were excluded. Ethical approval was obtained, and informed consent was secured from all participants.

Ovarian stimulation was initiated using clomiphene citrate (100 mg daily, days 3-7), followed by transvaginal sonographic monitoring. Ovulation was triggered with 10,000 IU of intramuscular hCG when a dominant follicle ≥16 mm was visualized. Intrauterine insemination was performed 35–36 hours post-trigger using 0.5 ml of processed semen (≥3-5 million motile spermatozoa) prepared via swim-up or double-density gradient method. The insemination was conducted under aseptic conditions using a soft IUI catheter. Luteal phase support was provided, and pregnancy was confirmed by urine test and transvaginal ultrasound at 6 weeks.

Data were compiled in Microsoft Excel and analyzed using SPSS version 26. Descriptive statistics summarized demographic and clinical variables. Categorical data were expressed as frequencies and percentages, while continuous variables were presented as mean±SD or median with interquartile range. Chi-square and Kruskal-Wallis tests were applied to assess associations, with $p<0.05$ considered statistically significant. Odds ratios were calculated where relevant.

RESULTS

The age-related details of the study population are summarized in this table. There were 21 subjects in 26-30 age group; 39 subjects in 31-35 age group; and 40 subjects in 36-40 age group. The mean age of the participating women was 32.75±3.08 years, ranging from 26 to 40 years.

Table 1: Distribution according to age.

Age group (Years)	Frequency	Percentage
21-25	0	0.00
26-30	21	21.00
31-35	39	39.00
36-40	40	40.00

The average duration of marriage among the participants was 4.72±1.62 years, with the shortest duration being 2 years and the longest 12 years.

Analysis of BMI of the subjects showed that 45 subjects had normal BMI and 55 subjects were overweight. The mean Body Mass Index (BMI) of the participants was

24.65±2.06 kg/m^2, indicating that the majority of the women were within the normal to slightly overweight range.

An analysis of the obstetric history of the participants revealed that 44% of the women were nulligravida, indicating they had never conceived before. A history of abortion was reported in 43% of the participants, suggesting a high incidence of prior pregnancy loss in the study population. Only 13% of the women had a history of live birth, indicating that the majority of the study participants had either never conceived or had unsuccessful previous pregnancies.

With respect to associated medical conditions, the majority of participants (75%) had no known systemic illness. However, 8% of the women were suffering from diabetes and hypothyroidism and 9% of the women were suffering from hypertension.

Table 2: Distribution according to Semen analysis.

Semen analysis	Frequency	Percent
Normal	69	69
Oligospermia	31	31

Table 3: Assessment of hormonal levels among the study subjects.

Hormone	Mean	SD	Range
FSH (3-10 mIU/l)	5.75	1.23	3.2-8.7
LH (2-10 mIU/l)	5.33	1.19	03-Aug
TSH (0.4-4.7 mIU/l)	1.92	0.74	0.4-3.4
PRL (3-27 ng/ml)	6.07	1.48	3.3-12
AMH (1-4 ng/ml)	2.89	0.75	1-4.3

Table 4: Distribution according to cervical factor, mild male factor, and unexplained infertility.

Factor	Frequency	Percent
Cervical factor	35	35
Mild male factor	31	31
Unexplained infertility	34	34

The study population was categorized based on the underlying cause of infertility. Cervical factor and Unexplained infertility accounted for the largest proportion, observed in 35% and 34% of the participants, respectively. This was followed closely by mild male factor infertility, which was present in 31% of the couples.

Table 5: Comparison of conception rates between different groups.

Factor	Successful (%)	Unsuccessful (%)	P value
Cervical factor	14 (40)	21 (60)	
Mild male factor	10 (32.3)	21 (67.7)	0.215
Unexplained infertility	7 (20.6)	27 (79.4)	

Chi-square test

Table 6: Comparison of the fate of successful insemination among three groups.

Factors	Abortion (%)	Ectopic (%)	LCSC (%)	Normal delivery (%)	P value
Cervical factor	2 (14.3)	1 (7.1)	6 (42.9)	5 (35.7)	
Mild male factor	2 (20)	0	3 (30)	5 (50)	0.692
Unexplained infertility	3 (42.9)	0	2 (28.6)	2 (28.6)	

Chi-square test

The conception rates among participants were compared based on the underlying cause of infertility using the Chi-square test. Among those with cervical factor infertility, 14 out of 35 women (40%) conceived, while 21 (60%) did not. In the mild male factor group, 10 out of 31 (32/3%) achieved conception, whereas 21 (67.7%) did not. In the group with unexplained infertility, 7 out of 34 (20.63%) conceived, while 27 (79.4%) remained unsuccessful. Statistical analysis revealed no significant difference in conception rates among the three groups (p=0.215), suggesting that the underlying infertility factor- whether cervical, mild male, or unexplained- did not significantly influence the likelihood of conception following intrauterine insemination (IUI) in this study population.

The number of intrauterine insemination (IUI) cycles- total, unsuccessful, and required for conception- was compared across three infertility groups: cervical factor, mild male factor, and unexplained infertility. The median number of total cycles was consistently 6 across all groups, with no statistically significant difference (p=0.581). Unsuccessful cycles showed slightly higher mean values in the unexplained infertility group (5.32±1.41) compared to mild male factor (4.87±1.86) and cervical factor (4.20±2.34), but this difference was not significant (p=0.095). Among those who conceived, the mean number of cycles required ranged from 4.00 to 4.57 across groups, again without significant variation (p=0.532). These findings suggest that the type of infertility factor did not significantly influence the number of IUI cycles required for conception.

The fate of successful insemination was compared among the three groups- cervical factor, mild male factor, and unexplained infertility- using the Chi-square test. In the cervical factor group, outcomes included abortion in 2 cases (14.3%), ectopic pregnancy in 1 case (7.1%), lower segment caesarean section (LSCS) in 6 cases (42.9%), and normal delivery in 5 cases (35.7%). In the mild male factor group, abortion occurred in 2 cases (20%), LSCS in 3 cases (30%), and normal delivery in 5 cases (50%), with no ectopic pregnancies reported. The unexplained infertility group showed a higher proportion of abortions (3 cases, 42.9%), followed by LSCS and normal delivery, each in 2 cases (28.6%), and no ectopic pregnancies. Although there were variations in outcomes among the groups, the differences were not statistically significant (p=0.692), suggesting that the fate of successful insemination did not differ meaningfully based on the underlying infertility factor.

Among the 23 pregnancies observed, multifetal gestation occurred in 2 cases (8.6%), while the majority were singleton pregnancies (91.3%). Minor complications included pain, discomfort, or irritation in 12% of cases and spotting in 10%, with no instances of ovarian hyperstimulation syndrome reported.

DISCUSSION

This study assessed the conception rate of intrauterine insemination (IUI) across cervical factor, mild male factor, and unexplained infertility. The highest conception rate was observed in the cervical factor group (40%), consistent with findings by Cohlen et al, who emphasized

IUI's effectiveness in bypassing cervical barriers.[7] Mild male factor infertility showed moderate success (32.3%), aligning with Ombelet et al, who reported improved outcomes with optimized sperm preparation.[8]

Unexplained infertility had the lowest conception rate (20.6%), echoing NICE guidelines that discouraged IUI in such cases due to limited evidence.[13] However, Bensdorp et al and Moolenaar et al demonstrated that IUI remains cost-effective and beneficial in selected unexplained cases.[14,15]

The number of IUI cycles required for conception was similar across groups (mean range: 4.00-4.57), supporting Rumste V et al meta-analysis suggesting optimal outcomes within 3-6 cycles.[12] Although unsuccessful cycles were slightly higher in the unexplained group, the difference was not significant, reflecting the diagnostic ambiguity noted by Mascarenhas et al.[3]

Pregnancy outcomes (abortion, LSCS, normal delivery) did not differ significantly among groups, though the unexplained group showed a higher abortion rate, possibly due to undetected endometrial or immunological factors.[5] Multifetal gestation occurred in 8.6% of cases, consistent with ART trends reported by Zegers-Hochschild et al.[2] Minor complications such as pain and spotting were noted, with no cases of OHSS, affirming the safety of clomiphene-based stimulation as supported by Franik et al.[16]

Overall, IUI remains a safe and effective first-line treatment for selected subfertile populations, particularly those with cervical or mild male factor infertility. Careful patient selection and cycle-limited protocols may optimize outcomes.

CONCLUSION

IUI remains a cost-effective and minimally invasive first-line treatment for selected subfertile populations. Cervical factor infertility responds most favourably to IUI, while mild male factor and unexplained infertility show moderate success. Careful patient selection and individualized stimulation protocols enhance outcomes.

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