

1 **COMPARATIVE EVALUATION OF PATIENT COMFORT AND PROCEDURAL**
2 **EASE IN ULTRASOUND-GUIDED VERSUS CONVENTIONAL IUI**

7 **Abstract**

8 **Background:** The importance of both patient comfort and clinician ease during intrauterine
9 insemination (IUI) has received relatively little attention to date. IUI, through the current
10 conventional "blind" method, can result in pain, cervical trauma, and difficulty for the
11 clinician. Ultrasound-guided IUI (USG-IUI) allows for real-time visualization, possibly
12 resulting in less discomfort, and increasing clinician control. This study's objective, is to
13 assess patient comfort and clinician ease to compare ultrasound-guided intrauterine
14 insemination (USG-IUI) and conventional method intrauterine insemination (CM-IUI).

15 **Materials and Methods:** A prospective cohort study was conducted on 100 infertile women
16 (≤ 35 years) at the Infertility Clinic, Department of Obstetrics and Gynaecology, GIMS,
17 Greater Noida. The women were randomized to two groups - USG-IUI (n=50) and CM-IUI
18 (n=50). Controlled Ovarian Stimulation (COS) was performed using letrozole (2.5–7.5
19 mg/day) and an hCG trigger. Patient pain was assessed immediately following insemination
20 using a Visual Analog Scale (VAS). Procedural parameters were also recorded for difficulty
21 with catheter insertion, use of tenaculum, bleeding and time taken. Data were analyzed in
22 SPSS version 28.

23 **Results:** Of the 96 evaluated cycles, the average pain level for the USG-IUI group was
24 significantly reduced (2.6 ± 1.2) compared to the CM-IUI group (5.4 ± 1.3 , $p < 0.001$). The
25 perceived ease of the procedure was rated as "more than somewhat" easier by 65.3% of the
26 USG-IUI group and 46.8% of the CM-IUI group. The ultrasound-guided group had a lower
27 proportion that required a tenaculum and also performed fewer attempts to complete the IUI
28 compared to the CM-IUI group ($p < 0.05$). The completed length of the procedure was
29 slightly longer for the USG-IUI group (3.3 min compared to 2.3 min, $p < 0.001$), but patient
30 comfort and clinician satisfaction were rated higher.

31 **Conclusion:** Ultrasound-guided IUI significantly improves patient comfort and ease of the
32 procedure while remaining safe. We recommend its routine use in order to spare the patient
33 experience and to improve the clinician experience.

35 **Keywords:**

36 Intrauterine insemination, Ultrasound-guided IUI, Patient comfort, Procedural comfort,
37 Visual Analog Scale, Fertility healthcare.

39 **Introduction:**

40 In the management of fertility, the effectiveness of assisted reproductive modalities depends
41 on not only their clinical usage but also the patient experience and the ease for the clinician to
42 perform the procedure.[1] Given the modalities available in the management of infertility,
43 intrauterine insemination (IUI) still sits in the middle ground between basic fertility
44 management and advanced assisted reproductive technologies such as in vitro fertilization
45 (IVF). Its low cost, low risk, and low invasiveness relates to its appropriate use in low-
46 resource settings and government-funded fertility clinics in India.[2]

47 Usually, IUI is completed as a blind procedure that requires the clinician to use touch alone to
48 advance the catheter through the cervix and into the uterine cavity. While useful, in some
49 circumstances, using touch may cause cervical trauma and uterine contractions or lead to
50 bleeding, causing discomfort and pain for patients.

51 This may prolong the procedure and may be particularly true for women with difficult
52 cervical anatomy or retroverted uterus that could limit the caretaker's ability to effectively
53 complete the clinical procedure without the use of tenaculum instruments, which can
54 contribute to patient discomfort.

55 To address these difficulties, ultrasound guidance entered into the realm of IUI. The clinician
56 has real-time visualization of the cervix and uterine cavity to assist in providing the best
57 placement of the catheter into the uterus, and potentially minimizing unnecessary hand or
58 body movements.[5] This is particularly important when the cervix has anatomical
59 variabilities that might contribute to cumbersome tubing placement and discomfort.
60 Ultrasound-guided IUI (USG-IUI), has been associated with improved pregnancy rates and
61 tolerability of the IUI, and has been demonstrated to improve the ability of the clinician to
62 perform the IUI procedure.[6]

63 Research that is justified has been conducted in many parts of the world that compares
64 ultrasound-guided IUI (USG-IUI) to IUI with conventional methods (CM-IUI) and reports
65 secondary outcomes associated with pain related to the procedures, time to complete, and
66 clinician-related issues. Overall, studies support that patients undergoing insemination
67 ultrasound reported less pain score on the Visual Analog Scale (VAS) and report few if any
68 insertions that were traumatic. Clinicians also comment the procedure is more controlled
69 even it takes longer to perform to allow for coordination with ultrasonography.[7]

70 Despite these findings, the data on the public healthcare use in India are limited when
71 considering the impact of resource limitations, the patient load, and access to trained
72 personnel on the procedure quality. The outcome assessment should critically consider
73 patient-centered outcomes (patient comfort and satisfaction) and clinician-centered outcomes
74 (procedure ease, and procedure duration) to support using ultrasound guidance in routine
75 fertility practices.[8]

76 We document a comparative assessment of patient tolerability and provider experience for
77 either ultrasound guided or conventional IUI procedures based on findings from a prospective
78 cohort study conducted at a tertiary teaching hospital in Greater Noida. By methodically
79 assigning pain scores and documenting procedure duration, and technical difficulty, we
80 substantiate the importance of clinical efficacy in the context of pain and patient comfort in
81 this evolving landscape of reproductive medicine.

82 Material and Methods:

83 **Study Design and Location:** A prospective cohort analysis was conducted in the Infertility
84 Clinic, Department of Obstetrics and Gynaecology, GIMS, Greater Noida over the duration
85 of twelve months. The main aim of the study was to compare comfort for patients and
86 convenience for the provider of ultrasound-guided IUI (USG-IUI) compared with
87 conventional method IUI (CM-IUI). Women with infertility issues \leq 35 years and with one or
88 more patent fallopian tubes were included. Indications for treatment included unexplained
89 infertility, anovulation, mild male factor, or mild endometriosis. Couples were excluded if
90 they were found to have any of the following - bilateral tubal occlusion, uterine anomaly,
91 endometriosis stage \geq 3, low ovarian reserve, chronic illness, or severe
92 oligoasthenozoospermia. 100 couples were engaged through written consent (after
93 randomization) and ethics approval through the Institutional Ethics Committee.

94 Participants were randomized into two equal groups. Group I included women who had
95 ultrasound-guided intrauterine insemination (USG-IUI) and Group II included women who
96 had conventional method intrauterine insemination (CM-IUI). Controlled ovarian stimulation
97 was initiated on cycle day 2 or 3 utilizing Letrozole 2.5-7.5 mg/day for 5 days. Follicular
98 development was monitored via transvaginal sonography and once a leading follicle reached
99 a size of \geq 18 mm with an endometrial thickness \geq 7 mm, the patient was triggered to ovulate

100 with 5,000 IU of hCG intramuscularly. The IUI procedure was then performed 36 hours after
101 the trigger.

102 Semen samples were retrieved through masturbation following a three-day abstinence period.
103 The samples were then subjected to density-gradient centrifugation for the separation of
104 motile spermatozoa, with approximately 1 ml of motile spermatozoa suspension applied for
105 insemination. For the USG-IUI group, insemination was completed utilizing transabdominal
106 ultrasound imaging with a patient having a bladder that was not completely full to visual
107 uterine axis and catheter tip in real-time to ensure accurate intrauterine deposition with
108 reduced trauma and manipulation to the uterus. In the CM-IUI group, insemination was
109 completed without ultrasound; thus, the clinician relied on tactile sensation alone to guide the
110 catheter tip from the cervix into the uterine cavity. Following insemination, all patients were
111 instructed to remain supine for 15 minutes, and luteal phase support was provided with
112 vaginal progesterone 300 mg twice a day.

113 Patient comfort was the primary outcome measure assessed immediately after the procedure
114 using a Visual Analog Scale (VAS) (1 = no pain; 10 = very painful). The second outcome
115 measure assessment for provider difficulty was by recording the number of attempts to
116 cannulate the cervix, with or without a tenaculum or vulsellum, blood on the catheter tip, and
117 the duration of the procedure in minutes. Analysis was performed using SPSS version 28.
118 Continuous data that were time and VAS scores were reported as means \pm standard deviation
119 and compared using the Student's t-test, categorical data, procedural difficulty, bleeding, were
120 reported as a percentage and compared by the Chi-square test. Statistical significance was
121 determined by p-value ≤ 0.05 .

122 Results:

123 One hundred women with infertility were recruited, 50 in each treatment group (USG-IUI
124 and CM-IUI). Four participants were lost to follow-up, resulting in 96 evaluable cycles (49 in
125 the USG group and 47 in the CM group).

126 1. Demographic and Clinical Characteristics at Baseline

127 The two treatment groups were similar in their age, body mass index, duration of and type of
128 infertility ($p > 0.05$), thus assuring valid comparison with respect to procedural comfort and
129 ease (Table 1).

130 Table 1. Baseline Profile of Participants

Parameter	USG-IUI (n=49)	CM-IUI (n=47)	p-value
Mean Age (years)	28.6 ± 3.5	29.0 ± 3.1	0.61
BMI (kg/m^2)	25.5 ± 2.5	26.0 ± 2.9	0.45
Duration of Infertility (years)	3.2 ± 1.4	3.4 ± 1.6	0.48
Primary Infertility (%)	71.4	65.9	0.53
Unexplained Infertility (%)	38.8	42.5	0.68

131 2. Patient Comfort (Pain Perception)

132 Immediately after the procedure, pain was assessed with the Visual Analog Scale (VAS) (1–
133 10). Patients who received USG-guided IUI demonstrated significantly less pain (mean $2.6 \pm$
134 1.2) compared to the patients in the conventional group (5.4 ± 1.3) ($p < 0.001$).

135 Table 2. Pain Intensity and Distribution (VAS Score)

Pain Category	VAS Range	USG-IUI (n=49)	CM-IUI (n=47)

Mild	1–2	21 (42.9%)	3 (6.4%)
Moderate	3–4	26 (53.1%)	12 (25.5%)
Severe	5–6	2 (4.0%)	31 (66.0%)
Very Severe	>6	0	1 (2.1%)

136

137 3. Procedural Difficulty and Clinician Experience

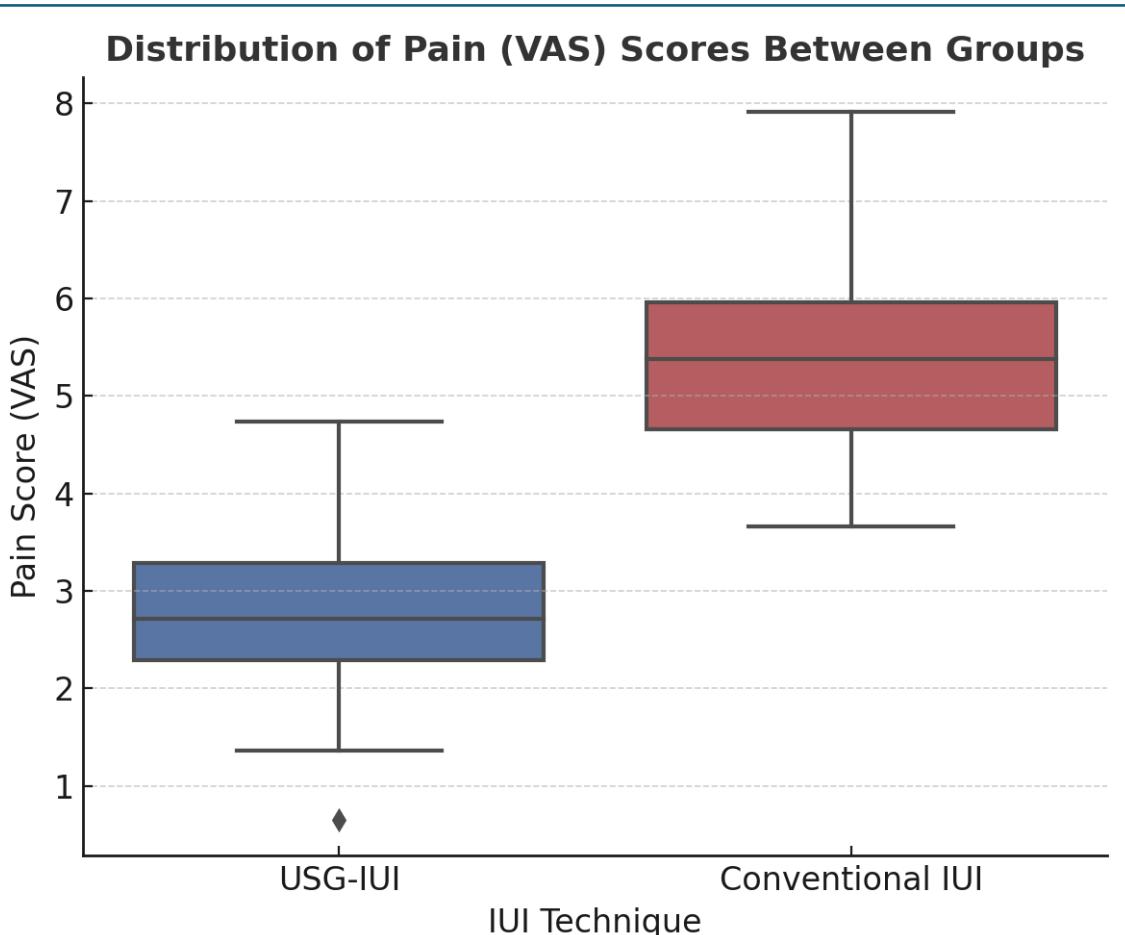
138 The convenience of catheterization, the number of attempts, utilization of tenaculum, and
 139 procedure time were all compared. Although procedure time was slightly longer for USG-IUI
 140 (3.3 ± 0.2 min vs 2.3 ± 0.2 min), clinicians rated it easier to use and smoother in 65.3% of
 141 cases.

142 Table 3. Comparison of Procedural Parameters

Parameter	USG-IUI (n=49)	CM-IUI (n=47)	p-value
Easy Procedure (%)	65.3	46.8	0.067
Tenaculum Use (%)	8.2	21.3	0.04
Bleeding on Catheter (%)	16.3	19.1	0.71
Duration (minutes)	3.27 ± 0.20	2.30 ± 0.23	<0.001
Multiple Attempts Required (%)	10.2	27.7	0.03

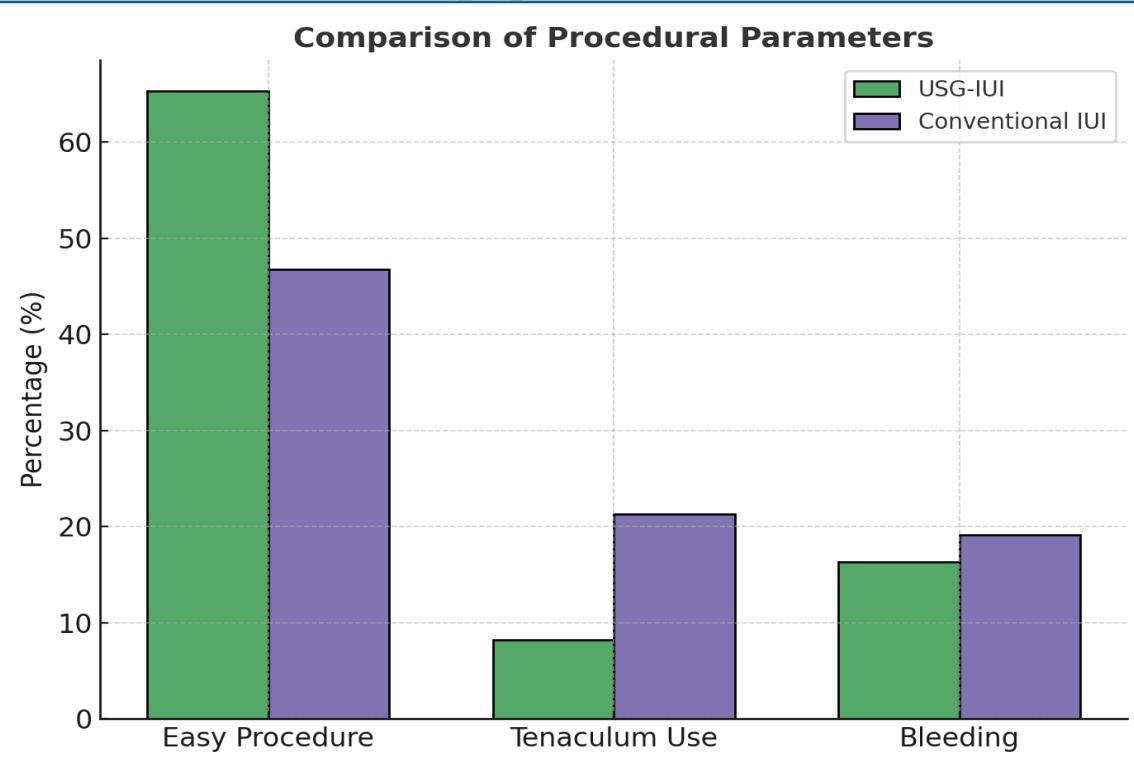
143

144 Graph 1. Boxplot – Distribution of Pain Scores



145
146

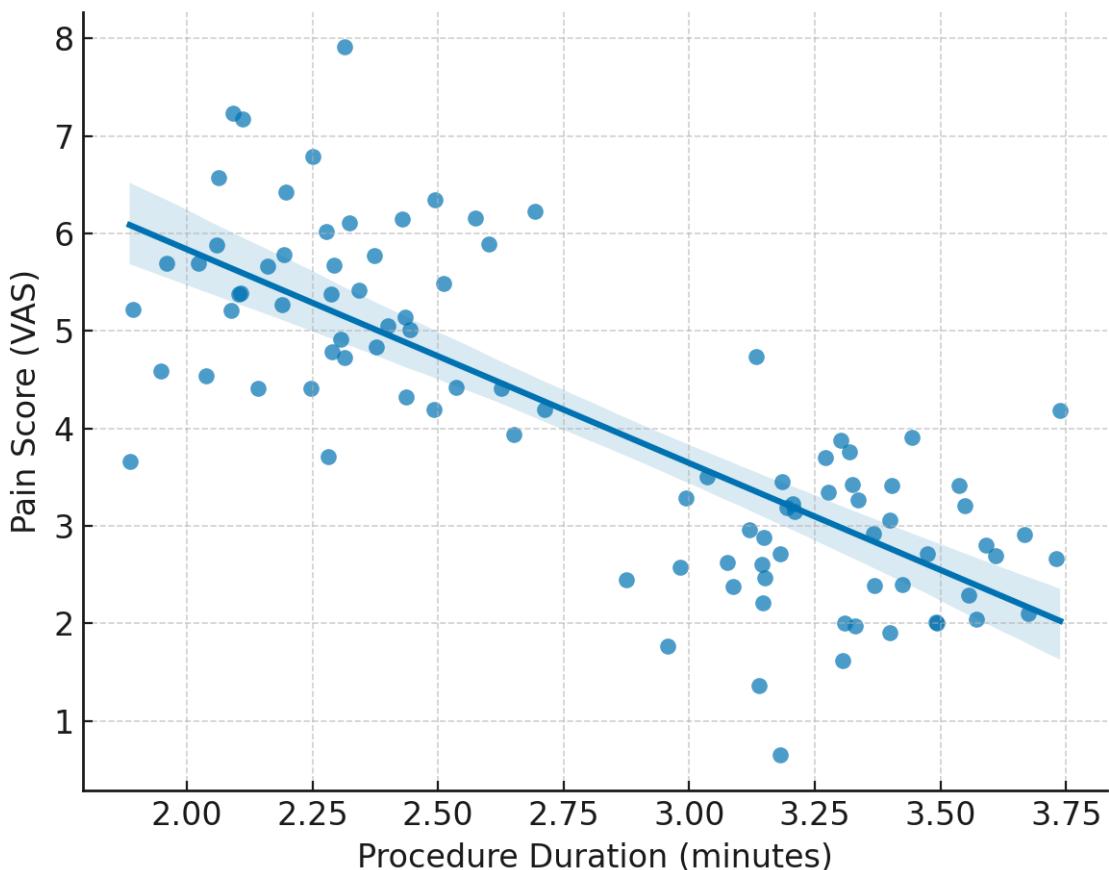
Graph 2. Grouped Bar Chart – Procedural Parameters



147
148

Graph 3. Scatter with Regression – Correlation between Pain Score and Procedure Duration

Correlation between Procedure Duration and Pain Score



149

150

Discussion:

151

152

153

154

155

156

157

158

159

160

161

162

163

164

165

166

167

168

169

170

171

172

173

This prospective study investigated the influence of ultrasound guidance (USG) on the clinicians' ease and patient comfort level experienced with intrauterine insemination (IUI). Pain perception was statistically lower for the USG-IUI group (mean VAS 2.6 ± 1.2) vs the conventional method (5.4 ± 1.3 , $p < 0.001$). Clinician's assessed the procedure easier among the ultrasound guidance (65% USG-IUI patients felt the procedure was easy compared to only 47% for conventional), decreased their use of tenaculum, and made less multiple attempts.

These findings are consistent with Kumar et al. (2018) and Maher et al. (2020) demonstrating transabdominal ultrasound guidance reduces cervical manipulation and results in lower pain scores and a more efficient catheterization.[9,10] Yavangi et al. (2014) showed ultrasound guided insemination significantly improved discomfort during the insemination; patient satisfaction, while also noting no significant difference in pregnancy outcome. [11]

The proposed rationale for why these improvements occurred is an improved alignment of the catheter with the axis of the uterus for the procedure, less probing in a blind fashion, and fewer uterine contractions. Seeing the catheter tip allowed us to insert the catheter more gently, and we did not need to use force, while the elimination of use of instruments such as tenacula, minimized all possible discomfort. In our study, we demonstrated that the percentage of cases requiring this additional instrument decreased from 21 % during the conventional method to 8 % using ultrasound to guide the catheter ($p=0.04$).

Although the mean time of the procedure was slightly longer in the ultrasound group (3.3 minutes vs. 2.3 minutes; $p<0.001$), we presume this increase in time is warranted as both patient comfort and control during the procedure was greatly improved. Moreover the strong

174 correlation between intensity of pain and time of procedure ($r=0.72$; $p<0.001$), underscores
175 our conclusion that the increased complexity of the task is likely increasing discomfort.

176 Our results are in line with those of Abdalla et al. (2012), where the authors indicated that
177 ultrasound guidance provides a situation which is more favorable for patient compliance and
178 relaxation, allowing for a more tranquil atmosphere in which procedures can be
179 performed.[12] Similarly, Al-Inany et al. (2016) noted that ultrasound guidance could
180 decrease anxiety and pain, which may in turn, improve the odds of uterine receptivity.[13]
181 We also noted that procedural bleeding was slightly lower in the USG-IUI group (16%) than
182 in the CM-IUI group (19%), although this was not statistically significant. This correlates
183 with the finding of Rashidi et al. (2013), who reported a higher incidence of traumatic
184 placements of the catheters with the blind technique.[14]

185 Viewing the cervix and uterine cavity in real-time, from the physician's viewpoint, revitalizes
186 confidence, particularly in inexperienced trainees and a distorted uterine anatomy. Viewing
187 the cervix and uterine cavity renders the IUI procedure relevant to "precision-based" versus
188 just "feel-based". The learning curve is small and the benefit the patient and the practitioner
189 receive is substantial.

190 Strengths of this study include a prospective design, a standard assessment tool (VAS), and
191 quantifiable operator feedback. Limitations include a single-center setting, sample size, and
192 subjectivity in pain scoring. However, the fact that these results correlate with previous
193 literature adds to the credibility and strength of the conclusions.

194 Clinical significance: The comfort of patients is now a fundamental measure of quality of
195 care in contemporary reproductive medicine. While the ultrasound-guided IUI may add time
196 to the procedure, it will help mitigate pain and discomfort, all of which promotes patient
197 compliance and satisfaction - qualities which have been found to be associated with
198 psychological health and continuation of care.

199 The ultrasound-guided insemination process has evidenced several advantages in improving
200 the patient's experience, including reduced discomfort, as well as greater control for the
201 clinician. This process will inevitably take slightly longer than a non-ultrasound guided IUI,
202 but the benefit of the patient's ease and overall satisfaction for the clinician is invaluable.
203 Therefore, using ultrasound in care delivery for insemination is warranted for patient-
204 centered and provider-centered outcomes. Moreover, the recommendations which stem from
205 this pilot study involves encouraging randomized controlled studies looking at patient
206 satisfaction, cost-benefit analysis, and long-term reproductive outcomes in order to solidify
207 supporting evidence and implement ultrasound-guided IUI standard practice in gynecologic
208 reproductive medicine.

209 Conclusion:

210 The current study showed that ultrasound-guided intrauterine insemination (USG-IUI)
211 significantly improves patient comfort and makes the procedure easier for the operator
212 compared to the traditional blind technique. The average discomfort score (VAS) was much
213 lower in the ultrasound-guided group (2.6 ± 1.2) than in the conventional group (5.4 ± 1.3 ; p
214 < 0.001). This indicates a clear benefit for patients.

215 Moreover, the ultrasound-guided procedure required fewer attempts, less cervical
216 instrumentation, and less tenaculum use (8.2% vs 21.3%), confirming USG superiority in
217 ease of performance. The mean time for the procedure was slightly longer for USG-IUI, 3.3
218 min versus 2.3 min; however, the improvement in comfort and control for the clinician
219 outweighed the increase in duration for the procedure. Further, the positive correlation
220 between pain score and difficulty score further emphasizes the subtle interplay between
221 precision procedure and patient comfort.

222 Findings of this study are also in concert with results from previous studies from other
223 geographical regions; these findings support the concept of reproducibility as one definite

224 advantage of ultrasound guided interventions over the conventional blind technique.
225 However, aside from potential clinical benefits of using a superior technique for intrauterine
226 insemination, other factors such as patient satisfaction, less anxiety, and compliance with
227 continued fertility treatments, which indirectly impact longer-term outcomes, may be
228 influenced.

229 References:

1. Hauser R, Yoge L, Paz G, Yavetz H. Patient discomfort during intrauterine insemination and its influencing factors. *Reprod Biomed Online*. 2014;29(3):315–20.
2. Chawla R, Ghosh S, Jindal S. Evaluation of pain and procedural ease during ultrasound-guided intrauterine insemination: A comparative analysis. *J Obstet Gynaecol India*. 2019;69(2):157–62.
3. Abdulwahab AS, Sharief M. Ultrasound guidance versus classical method for intrauterine insemination. *Int J Reprod Contracept Obstet Gynecol* [Internet]. 202514(3):703-6.
4. Yildirim G, Ficicioglu C, Bulgan-Kilicdag E. The impact of transabdominal ultrasound guidance on pain and clinical ease during intrauterine insemination. *Arch Gynecol Obstet*. 2015;292(1):171–175.
5. Feti, Mulema Noel MBChBa; Adam, Yasmin MBChB, FCOG(SA)a; Mohamed, Tasneem MBChB, FCOG(SA)b. An evaluation of couples undergoing intrauterine insemination at the BioART Fertility Centre, Johannesburg. *Global Reproductive Health* 9(3):e0096, Autumn 2024. | DOI: 10.1097/GRH.0000000000000096
6. Arlier, S., Kükrer, S., Adıgüzel, F.I. et al. The impact of adenomyosis on intrauterine insemination success in unexplained infertile women: a retrospective cross-sectional study. *BMC Pregnancy Childbirth* 25, 650 (2025). <https://doi.org/10.1186/s12884-025-07769-9>
7. Thanabonyawat I, Charanwetprasert M, Boriboonhirunsarn D, Petyim S, Laokirkkiat P. Ultrasound guidance versus the classical method for intrauterine insemination in oral medication-stimulated cycles: A randomized, single-blind, controlled trial. *European Journal of Obstetrics and Gynecology and Reproductive Biology*. 2021 Mar;258:278-282. doi: 10.1016/j.ejogrb.2021.01.015
8. Baradwan S, Alshahrani MS, Miski NT, Alkhamis WH, Alfaifi SS, Abdelhakim AM, Sunoqrot M, Ahmaro M, Abdelazem O, Mohammed AH, Abbas AM, Bakry MS. Ultrasound guidance versus classical method for intrauterine insemination: A systematic review and meta-analysis of randomized controlled trials. *Eur J Obstet Gynecol Reprod Biol*. 2021 Aug;263:223-230. doi: 10.1016/j.ejogrb.2021.06.039. Epub 2021 Jun 28. PMID: 34242930.
9. Kumar P, Singhal M, Malik S, Bhatia R. Comparative study of ultrasound-guided and blind intrauterine insemination: A randomized prospective trial. *J Hum Reprod Sci*. 2018;11(2):139–144.
10. Maher MA, El-Sherbiny W, Ahmed MS. Ultrasound-guided intrauterine insemination versus blind technique: Effect on patient discomfort and pregnancy rate. *Middle East Fertility Society Journal*. 2020;25(1):8–14.
11. Yavangi M, Amanlou M, Azargoon A, Niroomand N, Baybordi F. Ultrasound-guided versus blind intrauterine insemination: A randomized controlled trial. *Iran J Reprod Med*. 2014;12(9):613–618.
12. Abdalla N, Brooks A, Ahmed A. Patient pain experience and satisfaction during ultrasound-guided intrauterine procedures. *Ultrasound Obstet Gynecol*. 2012;40(6):750–755.

272 13. Al-Inany HG, Wahba AH, Osman A, Aboulghar M. Patient tolerability and clinical
273 performance in ultrasound-guided IUI versus conventional technique. *Fertil*
274 *Steril.* 2016;105(5):1322–1328.

275 14. Rashidi BH, Fakhri S, Tehrani ES, Madani T. Comparison of patient discomfort and
276 pregnancy rates between ultrasound-guided and blind intrauterine insemination. *Int J*
277 *Fertil Steril.* 2013;7(1):34–39.

UNDER PEER REVIEW IN IJAR