

## Research Article

# Predicting the Reproductive Outcome in Endometriosis: A Comparison between Revised American Fertility Society Scoring System (r-AFS) and Endometriotic Fertility Index Scoring System (EFI) in an Indian Population

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**Abstract**

**Objective:** Comparison between EFI and r-AFS scores in predicting reproductive outcomes in patients with surgically documented endometriosis attempting conception.

**Design:** Prospective data collection on 166 patients and comprehensive statistical analysis to compare the reproductive outcomes between the two scores.

**Setting:** Tertiary care centre, specialised in infertility, reproductive medicine, endoscopic surgery and gynecology.

**Patient(s):** A total of 166 consecutively diagnosed and treated infertile patients with laparoscopically proven endometriosis.

**Intervention(s):** Surgical diagnosis and treatment followed by fertility management.

**Main Outcome Measure(s):** Reproductive outcomes predicted by EFI and r-AFS scores.

**Result(s):** Co-relation with EFI, was a better prognosticator of the pregnancy rates. A statistically significant variable used to create the EFI was the least function score (i.e. the sum of those scores determined intraoperatively after surgical intervention that describe the function of the tube, fimbria, and ovary on both sides) The least function score, determined post operatively, was a good predictor of the pregnancy outcome. Correlation with EFI, a

**Conclusion(s):** The EFI is a simple, robust, and validated clinical tool that predicts reproductive outcomes after endometriosis surgical staging. It can be used clinically to counsel infertile endometriosis patients receiving reproductive surgery in specialised centres about their post operative conception options.

**INTRODUCTION**

Endometriosis is an enigmatic disease. There is continued frustration in staging it clinically. It also has a huge impact on associated pain and infertility. Despite the multiple staging systems, there is a reduced ability to ameliorate its effect on millions of women suffering from this disease, world wide.

*Why is there a need for another scoring system?*

The commonly used classification was the revised American Fertility Society (r-AFS) classification, used since 1985. This classification mainly depends on the morphological description. It predicts the recurrence potential of endometriosis after surgery. The limitation of this classification is the limited predictive ability for pregnancy after surgery. Studies have shown no association between the endometriosis stage, lesion type, lesion site and cumulative probability of pregnancy.

The objective of the study was to determine the better tool for predicting the reproductive outcome scored by Endometriotic Fertility Index (EFI) and r-AFS, in patients with surgically documented endometriosis, attempting conception.

## MATERIALS AND METHODS

### Study Design

The study was a prospective, with comparative data analysis. The study was conducted over a period of 18 months, at a tertiary level centre for gynecology and assisted reproduction.

Sample size calculated for the study was 148. However, we were able to include 166 patients who fulfilled our inclusion criteria. Level of significance was 95% with power of 80%.

### Statistical Analysis

Analysis was done using SPSS Software version 22.0, data analysed using independent t-test and  $\chi^2$  test. Significance was set at  $p < 0.05$ .

### Inclusion criteria

All the patients undergoing surgery for endometriosis, for fertility enhancement purpose, were included. Those patients who underwent subsequent surgery for endometriosis, uterine myoma, leiomyoma, congenital structural abnormalities of reproductive tract like pelvic tuberculosis, ovarian tumour, polycystic ovarian syndrome, male factor infertility and patients lost to follow up were excluded.

All the patients were scored with AFS intra operatively and immediate post operatively by EFI scores. These patients were followed up for a period of twelve months for determining the reproductive outcome documented by the pregnancy rates.

### Protocol following surgery

- Minimal = Natural cycles followed by COH + IUI for 3-4 cycles
- Moderate = Natural cycles followed by COH + IUI for 3-4 cycles
- Severe = COH + IUI for 2-3 cycles (If AFS scores were  $< 71$ , and bilateral patent tubes)
- Followed by ART (By GnRH suppression)

Bias and confounding factors were eliminated by taking the same samples for both criteria (Figure 1-3)

## RESULTS

Majority of the patients in our study were under 35 years of age. Age related matching of the population could not be achieved in our study. This was a limitation of this study (Figure 4,5).

The pregnancy rates in patients with surgically documented endometriosis attempting conception in our study (non ART and ART) was 31% (Figure 6).

Pregnancy rate was 28% in patients with minimal endometriosis, 50% in mild endometriosis, 24% in moderate endometriosis, and 32% in patients with severe endometriosis.

REVISED AMERICAN SOCIETY FOR REPRODUCTIVE MEDICINE CLASSIFICATION OF ENDOMETRIOSIS 1985

Patient's Name \_\_\_\_\_ Date: \_\_\_\_\_

Stage I (Minimal) 1-5 Laparoscopy \_\_\_\_\_ Laparotomy \_\_\_\_\_ Photography \_\_\_\_\_  
 Stage II (Mild) 6-15 Recommended Treatment \_\_\_\_\_  
 Stage III (Moderate) 16-40 \_\_\_\_\_  
 Stage IV (Severe) >40 \_\_\_\_\_  
 Total \_\_\_\_\_ Prognosis \_\_\_\_\_

Peritoneum	ENDOMETRIOSIS	< 1 cm	1 - 3 cm	> 3 cm	
		Superficial	1	2	4
	Deep	2	4	6	
Ovary	R Superficial	1	2	4	
	Deep	4	16	20	
	L Superficial	1	2	4	
	Deep	4	16	20	
POSTERIOR CULDESAC OBLITERATION		Partial	Complete		
		4	40		
Ovary	ADHESIONS	< 1/3 Enclosure	1/3-2/3 Enclosure	> 2/3 Enclosure	
	R Filmy	1	2	4	
	Dense	4	8	16	
	L Filmy	1	2	4	
	Dense	4	8	16	
	Tube	R Filmy	1	2	4
		Dense	4	8	16
		L Filmy	1	2	4
Dense		4*	8*	16	

Figure 1 r-AFS classification, 1985.

### ENDOMETRIOSIS FERTILITY INDEX (EFI) SURGERY FORM

LEAST FUNCTION (LF) SCORE AT CONCLUSION OF SURGERY

Score	Description	Left	Right
4	Normal	Fallopian Tube <input type="checkbox"/>	<input type="checkbox"/>
3	Mild Dysfunction	Fimbria <input type="checkbox"/>	<input type="checkbox"/>
2	Moderate Dysfunction	Ovary <input type="checkbox"/>	<input type="checkbox"/>
1	Severe Dysfunction		
0	Absent or Nonfunctional		

To calculate the LF score, add together the lowest score for the left side and the lowest score for the right side. If an ovary is absent on one side, the LF score is obtained by doubling the lowest score on the side with the ovary.

Lowest Score  Left +  Right =  LF Score

### ENDOMETRIOSIS FERTILITY INDEX (EFI)

Historical Factors			Surgical Factors		
Factor	Description	Points	Factor	Description	Points
Age	If age is $\leq 35$ years	2	LF Score	If LF Score = 7 to 8 (high score)	3
	If age is 36 to 39 years	1		If LF Score = 4 to 6 (moderate score)	2
	If age is $\geq 40$ years	0		If LF Score = 1 to 3 (low score)	0
Years Infertile	If years infertile is $\leq 3$	2	AFS Endometriosis Score	If AFS Endometriosis Lesion Score is $< 16$	1
	If years infertile is $> 3$	0		If AFS Endometriosis Lesion Score is $\geq 16$	0
Prior Pregnancy	If there is a history of a prior pregnancy	1	AFS Total Score	If AFS total score is $< 71$	1
	If there is no history of prior pregnancy	0		If AFS total score is $> 71$	0
Total Historical Factors			Total Surgical Factors		
EFI = TOTAL HISTORICAL FACTORS + TOTAL SURGICAL FACTORS:			<input type="text"/> Historical + <input type="text"/> Surgical = <input type="text"/> EFI Score		

Figure 2 The newer scoring system, Endometriotic Fertility Index (Adamson and Pasta, FertilSteril 2010).

Descriptions of least function terms.		
Structure	Dysfunction	Description
Tube	Mild	Slight injury to serosa of the fallopian tube
	Moderate	Moderate injury to serosa or muscularis of the fallopian tube; moderate limitation in mobility
	Severe	Fallopian tube fibrosis or mild/moderate salpingitis isthmica nodosa; severe limitation in mobility
Fimbria	Nonfunctional	Complete tubal obstruction, extensive fibrosis or salpingitis isthmica nodosa
	Mild	Slight injury to fimbria with minimal scarring
	Moderate	Moderate injury to fimbria, with moderate scarring, moderate loss of fimbrial architecture and minimal intrafimbrial fibrosis
Ovary	Severe	Severe injury to fimbria, with severe scarring, severe loss of fimbrial architecture and moderate intrafimbrial fibrosis
	Nonfunctional	Severe injury to fimbria, with extensive scarring, complete loss of fimbrial architecture, complete tubal occlusion or hydrosalpinx
	Mild	Normal or almost normal ovarian size; minimal or mild injury to ovarian serosa
	Moderate	Ovarian size reduced by one-third or more; moderate injury to ovarian surface
	Severe	Ovarian size reduced by two-thirds or more; severe injury to ovarian surface
	Nonfunctional	Ovary absent or completely encased in adhesions

*Adamsen. Endometriosis fertility index. Fertil Steril 2010.*

Figure 3 Least Function Score.

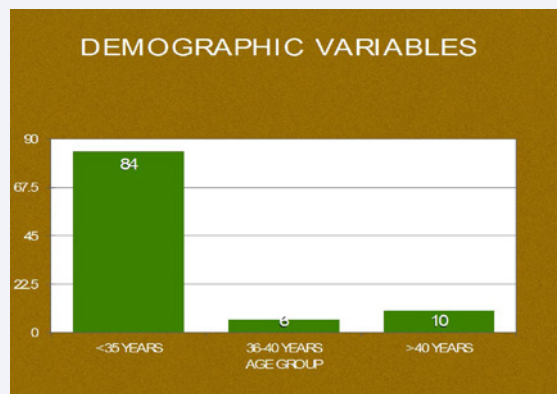


Figure 4 Demographic distribution.

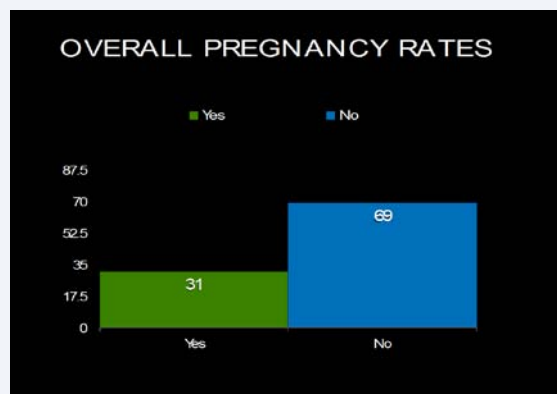


Figure 5 Overall pregnancy rates for patients with surgically documented endometriosis.

The p value was > 0.05, and the observed difference was not how ever statistically significant.

*Why EFI score?*

The EFI score ranges from 0–10, with 0 representing the poorest prognosis and 10 the best prognosis. Half of the points come from the historical factors and half from the surgical factors. Uterine abnormality was not included in the score [1].

The evaluation of historical factors showed that age, years infertile, and various alternative measures of pregnancy history were all statistically significant predictors of pregnancy.

Among the measures of pregnancy history, total pregnancies, at least one pregnancy, and pregnancy with current partner were all predictive [1].

The least function score determined intraoperatively after

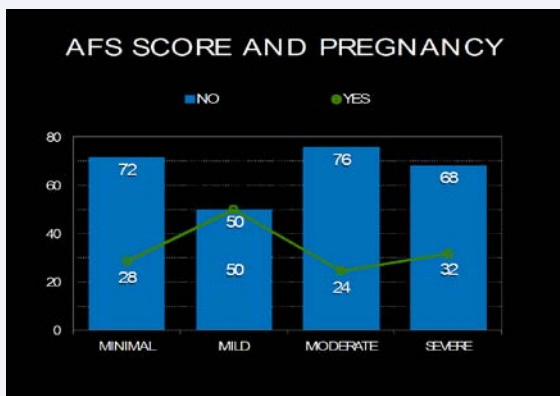


Figure 6 AFS scores and reproductive outcomes.

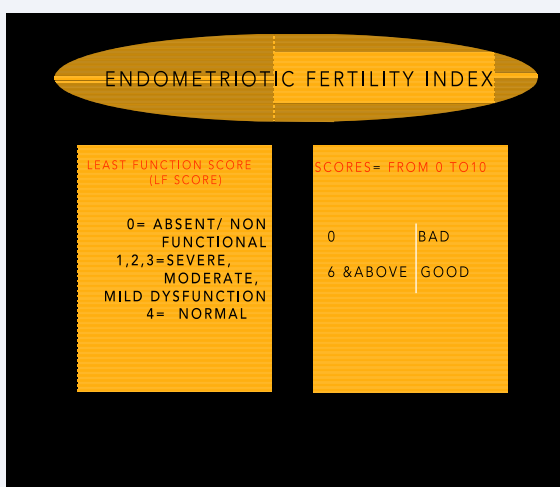


Figure 7 Least function score and its scoring.

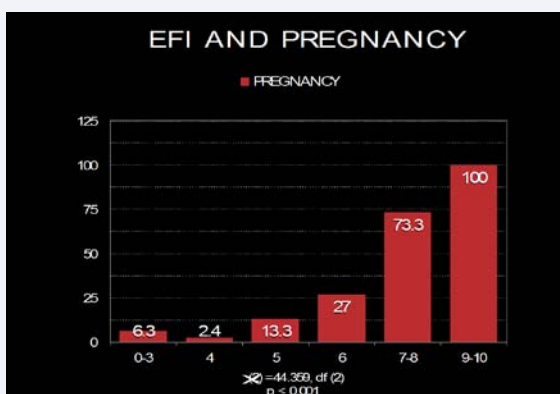


Figure 8 EFI scores and reproductive outcomes.

surgical intervention was a statistically significant predictor of fertility, even after controlling for AFS total score and years infertile. The predictive power of the least function score after controlling for the AFS total score and years infertile demonstrates that the least function score measures something different than the AFS total score, presumably the postoperative functionality

of the reproductive organs. There was high correlation between both dense adhesions, especially tubal adhesions, and the least function score. There was moderate correlation between filmy adhesions alone and the least function score (Figure 7).

The final score uses age (in three categories), years infertile (in two categories), prior pregnancy (whether or not with the present partner), the least function score (in three categories), the AFS endometriosis lesion score (in two categories), and the AFS total score (in two categories) (Figure 8).

The pregnancy rates, in our study, was higher in those patients with an Endometriotic Fertility Index scores of 6 and above. 73% of the patients who had a score of 6 and above conceived. The patients who had scores of 9 and above had a 100% pregnancy rate (Figure 8a).

EFI was not a good predictor of the mode of conception. In our study, those patients who had a score of 6 and less, conceived naturally, through IUI and through ART as well (Figure 9).

Those patients who had a score of 9 and above, conceived naturally, after COH and IUI as well. The ART requirement in this group was nil (Figure 10).

The least function score, which is the central part of the EFI scoring system, was a significant independent predictor of the pregnancy rates. The least function score, evaluated the

EFI	YES	PREGNANCY
0-3	1(6.3%)	15(64%)
4	1(2.4%)	40(97.6%)
5	4(13.8%)	25(66.2%)
6	10(27%)	27(73%)
7-8	23(73%)	8(27%)
9-10	13(100%)	0(100%)

Figure 8a Endometriotic Fertility Index and Pregnancy.

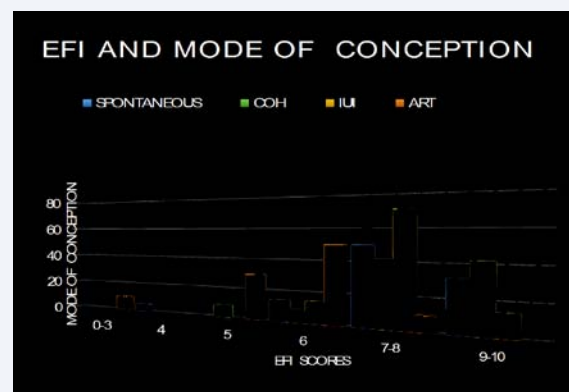


Figure 9 EFI and mode of conception.



functioning of the tubes, fimbria and ovary. Those patients who had a good LF score, had a pregnancy rate of 77% where as those patients who had a low LF score had a pregnancy rate of 12% (Figure 11).

So does it mean that those patients who have severe endometriosis, have a low EFI score?

There is no correlation between the two scoring systems.

Those patients who had a low EFI score (of 6 and less) could have minimal, mild, moderate or severe endometriosis. This is because the EFI staging systems takes into account, historical and surgical factors, and not just the intra operative findings (Figure 12).

The findings of our study, which shows that an EFI score of 6 and above was a good correlator of the pregnancy rate, was similar to the study conducted by Adamson and Pasta in 2010.

P value was <0.01, which was statistically significant (95% CL 6.697-43.880).

The odds of becoming pregnant increased by 31%, for increase in one point in the EFI score.

If the patient was categorised according to r-AFS scoring system, the risk of not conceiving was 8 times (95% CI 3.639-17.86).

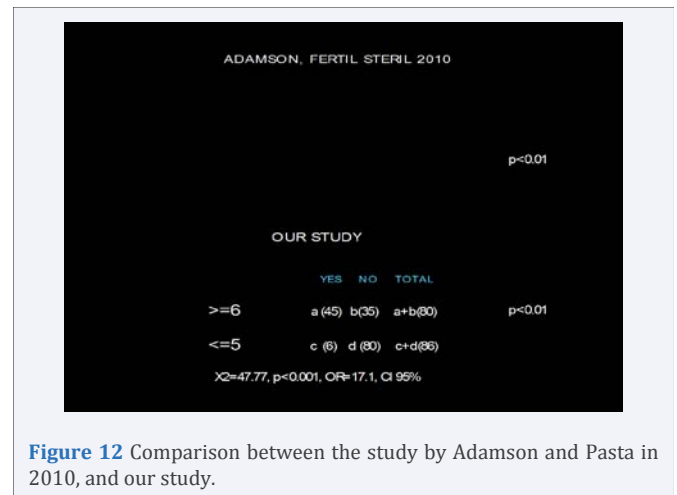


Figure 12 Comparison between the study by Adamson and Pasta in 2010, and our study.

## DISCUSSION

The r-AFS score is mainly used to assess disease severity and develop a post-operative treatment plan.

It contains only 20% of the EFI scores. The diameter of a 'chocolate cyst' in the ovary plays a critical role in determining the r-AFS score. For patients with endometriosis who want to become pregnant, this staging method has limited ability to predict future fertility after surgery [1].

Data suggested by Wang et al., [2] suggest that the r-AFS classification has limited potential in predicting the pregnancy outcome. EFI score maybe more sensitive in predicting pregnancy because it not only considers the size and number of lesions and the degree of local adhesion but also consider other reproductive factors, such as age, infertility duration, or fallopian tube and ovarian function [2].

In 2002, Fujushita et al., modified the AFS classification of endometriosis by adding the TOP score, fallopian tubes, ovaries, peritoneum, and other factors [3]. However, they did not consider the patient's age or other factors affecting pregnancy.

Adamson and Pasta (2010) further revised and updated the AFS classification system [1]. They prospectively collected detailed clinical and surgical data of 579 patients with endometriosis and analysed 275 variables associated with pregnancy, thereby establishing the EFI. In addition, they confirmed that the EFI had a close correlation with pregnancy rate in 222 patients. In 2013, Tomassetti C et al., suggested that the EFI could be used clinically to counsel infertile endometriosis patients receiving reproductive surgery in specialized centers about their post-operative conception options [4].

Unlike the r-AFS classification, the EFI objectively evaluates factors closely associated with female fertility, such as fallopian tube, tubal fimbria, and ovarian function. It incorporates the LF score which can evaluate the reproductive potential of pelvic organs and comprehensively includes several objective factors, such as patient's age, duration of infertility, and pregnancy history [2].

The EFI also incorporates all the components of the r-AFS scoring systems.

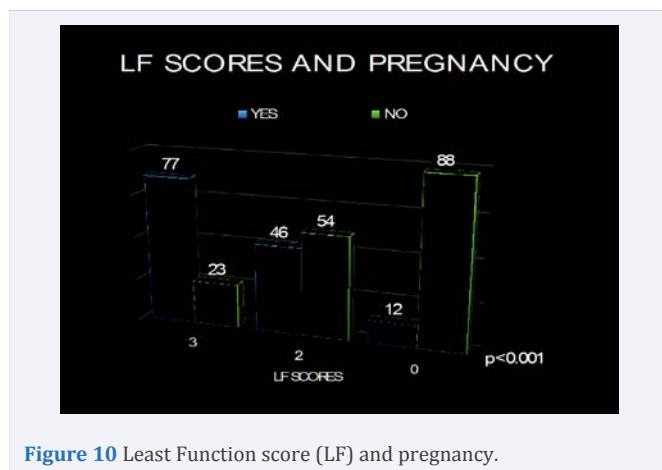


Figure 10 Least Function score (LF) and pregnancy.

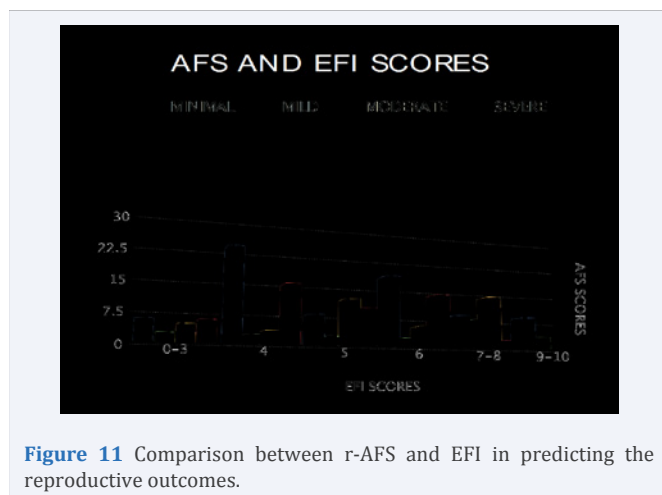


Figure 11 Comparison between r-AFS and EFI in predicting the reproductive outcomes.

The clinical pregnancy rate was higher in patients with  $EFI \geq 6$  score than with  $EFI \leq 5$  score.

Patients with a score of 6 accounted for the largest proportion in our study. Patients with a score  $\geq 6$  had a significantly higher pregnancy rate than patients with a score  $\leq 5$ . This was similar to the results from the study of Adamson et al.

Patients with a score of 6 and above, had a higher pregnancy rate than patients with a score of 5 and below

## LIMITATIONS

The EFI is useful only for infertility patients who have had surgical staging of their disease. It is not intended to predict any aspect of endometriosis-associated pain (1)

It cannot be used to predict the mode of conception as well.

Another limitation of the study was that, the stimulation protocols used in assisting conception, were not included as a part of the study.

## CONCLUSION

EFI is a simple robust and a validated clinical tool that predicts reproductive outcome after endometriosis surgical staging.

It is used clinically, to counsel infertile endometriosis patients receiving reproductive surgery in specialized centers, about their post operative conception options

With a larger sample size, in a different population, analysing the pregnancy rates with each score of EFI would be more helpful (2).

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