Success Rate among Couples with Intra-uterine Insemination versus in Vitro Fertilization

Israa Haitham Murtadha FICMS, **Shawq K Alashab** FICMS

ABSTRACT

Background: Intra uterine insemination is an assisted reproductive technique using husband or donor sperms, at the time of ovulation in natural or stimulated cycle, to be placed in the uterine cavity or in the cervical canal. In vitro fertilization is a method of assisted reproduction in which a man's sperm and a woman's eggs are combined outside of the body in a laboratory dish.

Objectives: To estimate success rate in intra uterine insemination and in vitro fertilization, the factors that can predict successful outcome in each, and socio-demographic characteristics for couples visiting infertility hospital.

Methods: A descriptive study in Baghdad (review of records) was conducted from Feb 2016 to Dec. 2016. The records of all couples with successful outcome, from both procedures were retrieved from the statistical unit at the hospital and reviewed by the investigator to obtain the needed information.

Results: The overall pregnancy rate was 1.3% (18 cases) for intra-uterine insemination and 15.1% (82 cases) for in vitro fertilization. The age of the wife and husband was the most important factor in success rate. As duration of infertility increased; the success rate decreased. For intra-uterine insemination; females with successful outcome were significantly younger than those with failed outcome, same noticed for males.

Conclusion: Success rates with both procedures were low compared to other national and international studies. Intra-uterine insemination is a suitable and good option for many couples prior to considering more complicated and expensive assisted reproductive techniques.

Keywords: Infertility, Assisted reproductive technology, In vitro fertilization, Intra-uterine insemination.

Iraqi Medical Journal Vol. 68, No. 2, July-Dec 2022; p. 96-101.

Infertility is inability of a couple to achieve pregnancy after 12 months of regular unprotected intercourse. Approximately 10-15% of couples will experience some forms of infertility problems[1]. For most couples, the term "subfertility" is more appropriate, as achieving pregnancy is difficult but not impossible. One third of infertility problems are due to female factor, one third is due to male factor and in the remaining cases, infertility affects both partners or the cause is unexplained[2].

Infertility is classified into two types: Primary infertility which is the inability to achieve pregnancy in a couple who have had no previous pregnancy and secondary infertility which is the inability to achieve another pregnancy in a couple who have had at least one previous pregnancy.

Significant improvements in fertility treatment have been made it possible for many couples to conceive with medical assistance. In many countries, intra-uterine insemination (IUI) with ovarian stimulation is first-line treatment in couples with unexplained subfertility[2]. As IUI ovarian stimulation finds its effectiveness in multiple ovulations, an inevitable side effect of ovarian stimulation is the occurrence of multiple pregnancies with a prevalence varying between 10 and 18%[3].

In vitro-fertilization-embryo transfer (IVF-ET) and intracytoplasmic sperm injection (ICSI) are now commonly used for the treatment of infertility attributable to tubal factor, significant endometriosis, and male factor and also used to treat persistent unexplained infertility. The procedures of the assisted reproductive technologies

(ART) are not only time consuming, stressful, invasive and expensive but also they are related to the increased risks of adverse pregnancy outcomes including the spontaneous abortions and ectopic pregnancies[4].

Infertility treatment has been dramatically advanced; however, age related infertility remains as one of the most difficult challenges. Age must be taken into account when couples are considering assisted reproductive technology. It is well known for years that the pregnancy rate is inversely related to the age of the female[5].

This was explained by diminished ovarian reserve, increased rate of aneuploidy, decreased frequency of sexual intercourse, diminished desire for childbearing and increased rate of spontaneous abortion[6].

The cause of infertility and women's age are the major determinants of ART procedure of choice[2].

A patient with blocked tubes and no male factor needs in-vitro fertilization (IVF) while a severe male factor or men with obstructive azoospermia need to be treated by ICSI. Men with sperm parameters slightly below normal range can often achieve pregnancy with less aggressive techniques like IUI[7].

Intra-uterine insemination is a relatively simple method; generally considered to be an intermediate step of low to moderate complexity before the application of more sophisticated ART such as IVF with or without ICSI[8].

Intra-uterine insemination is one of the most commonly performed treatments for infertile or sub-fertile patients with male factor and consists of instrumental introduction of processed sperm into the uterus via the cervix to deliver motile sperm to the fallopian tubes around ovulation time. In this procedure the sperm sample is centrifuged then washed in culture media followed by separating seminal fluid, poorly motile sperm, and other cellular debris in the ejaculate to produce a clean sample of highly motile sperm and kept in the incubator for capacitation prior to insemination into the uterine cavity[9].

This treatment is used for women with patent tubes and considered the most cost-effective initial treatment for unexplained and moderate male factor infertility. The simple and noninvasive nature of IUI has allowed it to be performed by nurses in some centers with analogous pregnancy rates to the procedures performed by physicians[10].

In-vitro fertilization is a method of assisted reproduction in which a man's sperm and a woman's eggs are combined outside of the body in a laboratory dish. One or more fertilized eggs (embryos) may be transferred into the woman's uterus, where they may implant in the uterine lining and develop. Excess embryos may be cryopreserved (frozen) for future use[11]. Initially, IVF was used to treat women with blocked, damaged, or absent fallopian tubes. Today, IVF is used to treat many causes of infertility, such as endometriosis and male factor, or when a couple's infertility is unexplained. The basic steps in an IVF treatment cycle are ovarian stimulation, egg retrieval, fertilization, embryo culture, and embryo transfer[12].

The aim of this study is to estimate the success rate of intra-uterine insemination and in-vitro fertilization and the factors associated with successful outcome in both procedures.

————————————Methods

A cross-sectional study was carried at Al-Samarrai Hospital, in Baghdad of Iraq during the period from 1st of February, to end of December 2016.

The total number of procedures done in the center during 2015 were 1874. There were 544 IVF and 1330 IUI. We studied the records of 243 couples with IVF and 63 couples with IUI who attended the hospital during 2015 with fertility problems.

The records of all couples with successful outcome during 2015, which were 82 cases for IVF (out of 243) and 18 cases for IUI (out of 63) from both

procedures were retrieved from the statistical unit at the hospital and reviewed by the investigator to obtain the needed information. After retrieving the records of all couples with successful outcome a random sample of couples with unsuccessful outcome (Negative HCG), from both procedures (161 for IVF; 45 for IUI), using their statistical number were retrieved and reviewed by the investigator.

The unsuccessful outcome was selected by lottery method, every four file; the fifth file was selected, every file took half an hour, 3 days per week for 3 months. The statistical unit, the files of patients were isolated according to outcome result.

Successful outcome mean biochemical (positive HCG) and/or clinical pregnancies (gestational sac seen by ultrasound).

A special form was designed by the investigator to collect the needed data from patient's records. These include: Age of both partners, occupation both partners, date of marriage, type of infertility; primary or secondary, causes of infertility, how many trials the couple did? (IUI or IVF) and outcome result.

Official agreements to conduct the study were obtained from the Ethical Committee at the Iraqi Council for Medical Specialization Council of Family and Community Medicine and AL- Resafa Health Directorate, Ministry of Health, Iraq.

Data entry and analysis was done by SPSS version 23. Variables were presented in tables and figures. Chi-square test was used to test the significance of association between categorical variables. P value of less than 0.05 was considered statistically significant.

Results

Study was enrolled infertile couples with mean age of females with IVF was 30.3 ±5.7, and the mean age of males 36.4 ±6.9 years, whereas the age of females with IUI mean 31.9 ±6.5, and the mean age of males 36.8 ±6.3 years. Successful outcome was found in 18 out of 1330 (1.35%) couples with IUI, and 82 out of 544 (15.4%) couples with IVF.

As for the type of infertility; 73.7% of those with IVF were with secondary infertility whereas 69.8% of those with IUI were with primary infertility. Among those with IVF trial the cause of infertility in 59.3% of them was related to male factors whereas with IUI trials unexplained infertility was found in 74.6% of cases, (Table 1).

Females with successful outcome after IVF were younger than those with failed outcome, yet he difference was statistically not significant. But males those with successful outcome were significantly younger than those with failed outcome. For IUI; females with successful outcome were significantly younger than those with failed outcome, same as noticed for males, (Table 2).

Table 3 shows the differences between duration of infertility and outcome of ART, although the duration of infertility was longer among couples with failed outcome the differences were statistically significant among IUI cases only.

Regarding previous trials of ART, table 4 showed that all those with successful outcome in IUI were doing the procedure for the first time and repeated trial was not associated with increased success.

Table 1: Distribution of the studied couples by type and causes of infertility.

		IVF (243)		IUI (63)	
		No.	%	No.	%
Type of infertility	Primary	64	26.3	44	69.8
	Secondary	179	73.7	19	30.2
Causes of infertility	Female's causes	40	16.4	6	9.5
	Male's causes	144	59.3	10	15.9
	Unexplained	59	24.4	47	74.6

Table 2: Age distribution of the studied couples by gender, procedure and outcome.

	IVF			IUI		
	Male age (year) Mean ± SD	Female age (year) Mean ± SD	Total	Male age ((year) Mean ± SD	Female age (year) Mean ± SD	Total
Successful	35.1 ± 6.3	29.5 ± 5.6	82	32.9 ± 7.7	27.9 ± 4.9	18
Failure	37.1± 7.1	30.8 ± 5.7	161	37.8± 5.5	33.0 ± 6.5	45
P-value	0.03	0.09		0.006	0.003	

Table 3: Differences between duration of infertility and outcome of assisted reproductive technologies.

	IVF duration (Mean ± SD)	No.	IUI duration (Mean ± SD)	No.
Successful	7 ± 3.8	82	3.7 ± 1.6	18
Failure	7.7 ± 4.2	161	6.2 ± 4.1	45
P-value	0.2		0.01	

Table 4: Association between previous trials and outcome of assisted reproductive technologies.

		Previous trail of ART			p-value
		No	Yes	Total	
IVF	Successful	25	57	82	0.7
	Failed	45	116	161	
IUI	Successful	18	0	18	0.02
	Failed	33	12	45	

——————————Discussion

The success rate of assisted reproduction globally ranged from 5-30% depending on the procedure and the available facilities[13]. In the current study the success rate was 1.3% with IUI and 15.1% with IVF. Van Rumste et al. who compared the outcome of IUI and

IVF in nine clinics in Netherlands and their success rate was 24% for IVF and 21% with IUI. These differences may be explained that in the Netherlands study they include couples with unexplained sub-fertility not like the current study that all couples with infertility were included[14].

Khalil on studying the outcome of IUI at AL-Yarmouk Infertility Center, Baghdad-Iraq, (2012) found that the success rate was 27.4% which was much higher than what was found by the current study.

This difference may be attributed to the fact that the researcher in the above study reviewed the records of five years (2007-2011) [15].

A worth mentioning point was noticed AL-Samarrai Hospital, that in this center not only the infertile couples undergone IUI trial but women with late marriage (>40 years) underwent IUI to avoid time consuming to get pregnant by natural intercourse this is supported by that there is a definite advantage for IUI over timed intercourse, both in natural cycles and in cycles with controlled ovarian hyperstimulation[11].

Despite the improvements in semen preparation and controlled ovarian stimulation techniques, the success rates reported for IUI are lower than the rates reported for other ART procedures[16]. Data from the European Society of Human Reproduction and Embryology indicates that the pregnancy rate per IUI cycle has

remained stable for many years at about 12%[17]. Several prognostic factors that help determine the IUI treatment outcome have been identified including the woman's age, cause and duration of infertility, mature follicle number, endometrial thickness, number of sperm inseminated, sperm morphology, and progressive motile sperm count[16].

In the current study successful outcome was higher among younger age group with IUI, same finding was reached by Demir et al[18] who studied the factors affecting pregnancy outcome of IUI in Ankara; Turkey, 2011, found that female age was an important factor in achieving pregnancy. Other study Sicchieri et al reported that female patient age was the only variable significantly correlated with IUI success rate and found no association between sperm progressive motility and pregnancy rate[17]. While Lanska et al from Prague, Czech Republic[19] and Khalil[15] who studied IUI In Al-Yarmouk Infertility Center, Baghdad, Iraq for five years stated that woman's age did not significantly affect pregnancy rates. The difference that Khalil took couples with unexplained infertility while all cause of infertility were included in this study.

As for the husband's age the current study revealed that the possibility of successful outcome of IUI procedure decreased with increasing age, which disagrees with study of Khalil from Iraq[15].

Starosta et al found with advancing maternal and paternal age negatively impact pregnancy rates, although the effects of paternal age are inconsistent in the literature while the negative impacts of maternal age are well documented[8]. Advancing maternal age leads to decreased fertility due to diminished ovarian reserve and increased aneuploidy[20].

Regarding the impact of duration of infertility on outcome; in the current study the duration was significantly shorter among couples with successful outcome in IUI it consistent with other study by Anabel Starosta[8] but disagreed with the study conducted in Baghdad, Iraq by Khalil during (2012)[21]. Yet was attributed to age factor as older women tend to have longer duration of infertility[21].

In the current study all cases with successful outcome of IUI were from the first trial unlike couples with IVF, this finding agreed with the finding of Khalil[15]and Starosta (2020)[8] .

In conclusion; Success rates with both procedures were low compared to other national and international studies. IUI is a suitable and good option for many couples prior to considering more complicated and expensive assisted reproductive techniques. Success rate was higher among women with younger age group in both procedures.

References

1- Chirputkar R, Vaidya AJIJRFSH. Understanding infertility and the potential role of stem cells in infertility treatment: A short communication. International Journal of Reproduction, Fertility & Sexual Health. 2015:2(1):37-40. doi. org/ 10. 19070/ 2377- 1887- 150007

2- Ainsworth AJ, Barnard EP, Baumgarten SC, Weaver AL, Khan Z. Intrauterine insemination cycles: prediction of success and thresholds for poor prognosis and futile care. Journal of Assisted Reproduction and Genetics 2020; 37(10):2435-42. doi. org/ 10. 1007/ s10815- 020- 01918-z

3- Brandes M, Hamilton CJ, Bergevoet KA, de Bruin JP, Nelen WL, Kremer JA. Origin of multiple pregnancies in a Subfertile population. Acta Obstet Gynecol Scand 2010; 89: 1149-54.

4- Ruiter-Ligeti J, Agbo C, Mjmg D. The impact of semen processing on sperm parameters and pregnancy rates with intrauterine inseminations. Minerva Ginecol 2017; 69(3):218. doi. org/ 10. 23736/ S0026- 4784.

5- Kessler LM, Craig BM, Plosker SM, Reed DR, Quinn GP. Infertility evaluation and treatment among women in the United States. Fertil Steril. 2013; 100: 1025-32.

6- Mohammadi F, Mehdinia Z. Ghasemi SJIititeacpa. Relationship between sperm parameters and clinical outcomes of intra uterine insemination (IUI). Caspian J Intern Med 2021: 12(1):70-76. https:// doi. org/ 10.

7- Reigstad MM, Storeng R. Development of *In Vitro* Fertilization, a Very Important Part of Human Reproductive Medicine, in the Last 40 Years. Int J Women's Health Wellness 2019;5:089. doi. org/10.23937/2474-1353/1510089.

8- Anabel Starosta, Catherine E. Gordon and Mark D. Hornstein. Predictive factors for intrauterine

insemination outcomes: a review. Fertility Research and Practice 2020; 6:23.
9- Azadeh Akbari Sene, Zahra Zandieh, Mojgan Soflaei, Hamid Mokhtari Torshizi, Kourosh Sheibani. Using artificial intelligence to predict the intrauterine insemination success rate among infertile couples. Middle East Fertility Society Journal 2021; 26:46.
10- Dimitriadis I, Batsis M, Petrozza JC, Souter I. Racial disparities in fertility care: An analysis of 4537 intrauterine insemination cycles. J Racial Ethnic Health Disparities 2017;4:169-77.
11- Brooke V Rossi, Leah Hawkins Bressler, Katharine F Correia, Shane Lipskind, Stacey A Missmer. Lifestyle and in vitro fertilization: what do patients believe? Fertility Research and Practice 2016; 2:11.
12- Faddy MJ, Gosden MD, Gosden RG. A demographic projection of the contribution of assisted reproductive technologies to world population growth. Reprod Biomed Online 2018;36:455-8.
13- Alireza Zarinara, Hojjat Zeraati, Koorosh Kamali, Kazem Mohammad. The success rate and factors affecting the outcome of assisted reproductive treatment in subfertile men. Iran J Public Health 2020; 49(2): 332-40.
14- Van Rumste ME, Custers M, Van Wely M, Koks A, Van Weering H. IVF with planned single-embryo transfer versus IUI with ovarian stimulation in couples with unexplained subfertility: An economic analysis. Reproductive BioMedicine Online 2014; 28: 336-42.
15- Khalil HQ. The intra-uterine insemination In Al-Yarmouk Infertility Center: A five-year records review, 2012.
16- Ghaffari F, Sadatmahalleh SJ, Akhoond MR, Yazdi PE, Zolfaghari ZJI. Evaluating the effective factors in pregnancy after intrauterine insemination: a retrospective study. Int J Fertil Steril 2015; 9(3):300.
17- Sicchieri F, Silva AB, De Sá Rosa ACJJJ. Prognostic factors in intrauterine insemination cycles. JBRA Assist Reprod 2018; 22(1): 2. https:// doi. org/ 10.
18- Demir B, Dilbaz B, Cinar O, Karadag B, Tasci Y et al. Factors affecting pregnancy outcome of intrauterine insemination cycles in couples with favorable female characteristics. Journal of Obstetrics & Gynaecology 2011; 31: 420-3.
19- Lanska V, Koubkova B, Rezacova J, Krcmar M, Darebny P et al. Intrauterine insemination—our results between the years 2008-2012. Advances in Reproductive Sciences 2015; 3: 34-40.
20- Crawford NM, Steiner AZ. Age-related infertility. Obstet Gynecol Clin North Am 2015;42:15–25.
21- Kafeel S, Mahjabeen W, Alam S. Role of female age in determining causes of infertility and predicting outcome of in vitro fertilization. Journal of Islamabad Medical & Dental College (JIMDC) 2012; (2):56-61.

IMJ 2022; 68(2): 96-101.