Obstetric outcomes of pregnancies resulting from in vitro fertilization

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  Fellowship of infertility

- One in six couples worldwide experience infertility problem once during their reproductive lifetime.
- Prevalence of infertility lasting for at least 12 months is estimated to be 9% worldwide for women aged 20–44 years.
- Around 1.6 million ART cycles are now performed each year worldwide, with an estimated 400,000 babies born.

Infertility cases

- 20–30% are explained by male factor infertility,
- 20–35% by female factor infertility
- 25–40% of cases problem in both partners
- 10–20%, no clear
- Infertility is also associated with lifestyle factors
- Such as smoking, body weight and stress
- Increasing age in the female partner is one of the most common explanations today

- Obstetric outcomes in pregnancies resulting from invitro fertilization are not different in fertile, sterilized women compared to infertile women

- Fertility and Sterility® Vol. 115, No. 3, March 2021

Objective:

- To compare obstetric and neonatal outcomes resulting from ART in couples with a history of Female sterilization to couples with other infertility diagnoses.

Design:

- Retrospective cohort study.

MATERIALS AND METHODS

- The University of Texas
- Autologous cycles
- From 2004 through 2013
- Excluding oocyte banking and gestational surrogacy
- Were collected from the SART database.

Study Sample:

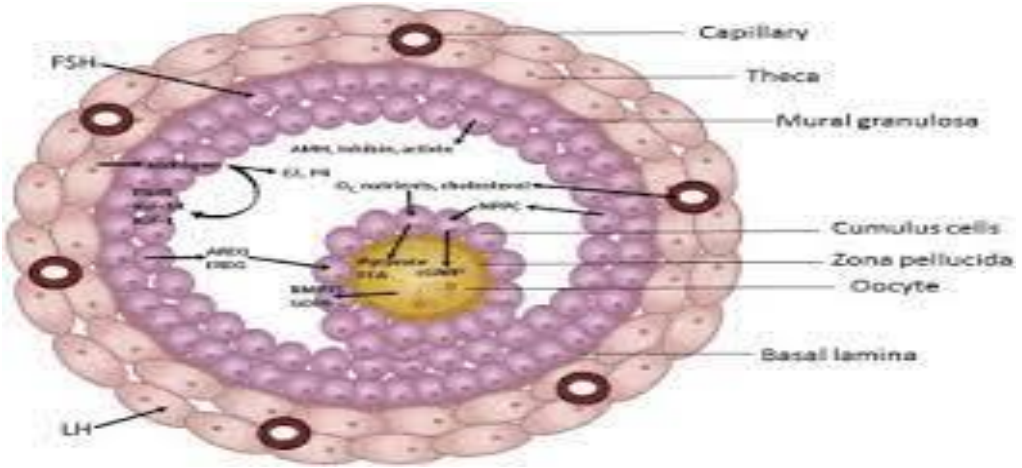
- A total of 193,072 cycles were excluded based :
- Age <18 or >50 years old
- BMI <18 or >50
- Frozen cycles
- Infertility diagnosis listed as PGD
- Tubal ligation with a infertility diagnosis
- The reason for ART was pre implantation genetic testing
- Cycles with no embryo transferred or cancelled

Main Outcome Measure(s):

- Preterm birth rates
- low birth weight rates
- In (IVF) pregnancies

Patient(s):

- Fresh
- Non donor cycles
- Excluding gestational surrogacy
- From 2004 to 2013 in the United States



Preterm birth and Birth weight:

- Incidence of was not significantly different
- In fertile, sterilized couples
- Compared
- Infertile couples

Conclusion(s)

- Fertile couples have similar preterm birth and low birth weight rates after IVF compared to infertile couples.
- This suggests that differences in perinatal outcomes may be due to ART procedures rather than infertility itself.

ART

- Increased risk
- Low birth weight (LBW)
- Preterm birth (PTB)
- Perinatal death
- Small for gestational age weight

Low birth weight infants

- At risk for long-term metabolic outcomes
- Obesity
- Diabetes
- Cardiovascular disease

ART-associated:

- Pregnancies placentation disorders
- Gestational hypertension
- Preeclampsia
- Cesarean sections

Parental factors

- Unclear whether parental factors
- Such as underlying infertility diagnosis
- Age or the process of ART
- Includes supra physiologic hormone levels
- Gamete manipulation
- Responsible for the differences perinatal outcomes

The other reasons

- Infertility diagnosis
- Increased maternal age
- Multiple gestations

Variables collected

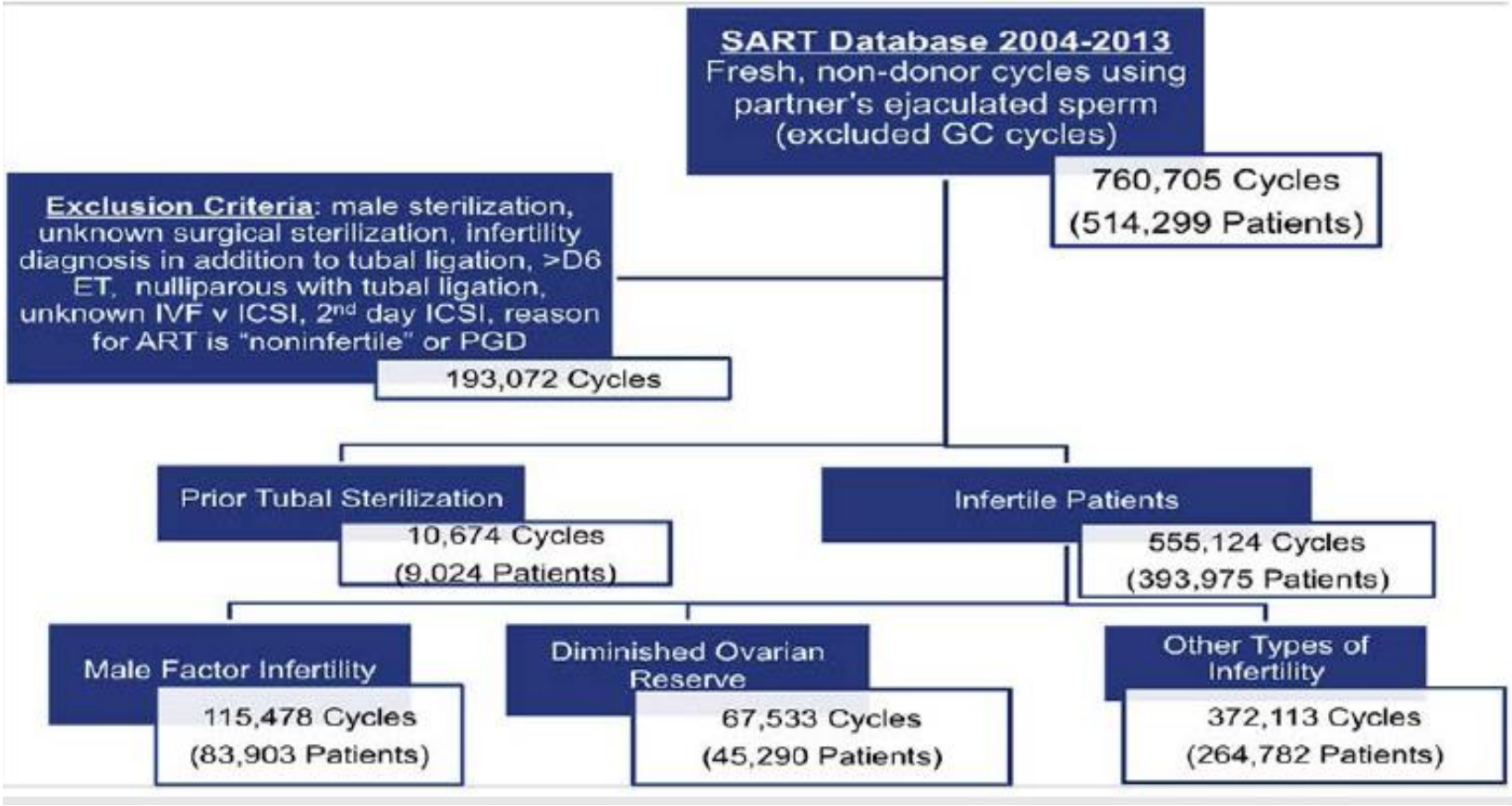
- Patient age
- Race/ethnicity, body mass index (BMI)
- Parity, prior sterilization
- Reason for ART, cycle cancellation
- Number of oocytes retrieved
- Number of embryos transferred
- Intra cytoplasmic sperm injection (ICSI)
- Day and number of embryos transferred

Birth outcomes

- Preterm birth was defined as delivery <37
- weeks.
- Low birth weight was defined as a neonate weighting<2,500 g.
- Neonatal death was defined as death of a live
- born infant within 28 days of life.

- Among infertile patients
- 20.8% with male factor infertility
- 12.2% with diminished ovarian reserve (DOR)
- 67.0% had other reasons

- The most common reason for cycle cancellation was the low response among all groups.


SART Database 2004-2013
Fresh, non-donor cycles using partner's ejaculated sperm (excluded GC cycles)
760,705 Cycles (514,299 Patients)
Exclusion Criteria: male sterilization, unknown surgical sterilization, infertility diagnosis in addition to tubal ligation, >D6 ET, nulliparous with tubal ligation, unknown IVF v ICSI, 2nd day ICSI, reason for ART is "noninfertile" or PGD
193,072 Cycles
Prior Tubal Sterilization
10,674 Cycles (9,024 Patients)
Infertile Patients
555,124 Cycles (393,975 Patients)
Male Factor Infertility
115,478 Cycles (83,903 Patients)
Diminished Ovarian Reserve
67,533 Cycles (45,290 Patients)
Other Types of Infertility
372,113 Cycles (264,782 Patients)

- Sterilized patients were older than infertile patients
- Mean ages of 35.3 years
- Among infertile women, DOR patients were older

- Most (86.4%) women with prior tubal sterilization had two or more previous births
- The majority (60.1%) of infertile women were either nulliparous or primiparous.

- Sterilized patients were to have a day 5 embryo transfer
- Infertile patients were to have a day 3 embryo transfer
- There was no clinically significant
- Difference in embryo transfer day.

- No meaningful difference in the number of oocytes retrieved in cycles of infertile compared to cycles of fertile women,
- Significantly fewer oocytes retrieved among the cycles of infertile patients with DOR reserve compared with the cycles of other infertile patients.

- No clinically significant differences in the
- miscarriage, NND, length of gestation, live birth
- Between sterilized and infertile patients, after adjusting for age, BMI, and parity

DISCUSSION:

- Prior analyses demonstrated differences
- in birth outcomes between pregnancies conceived spontaneously and pregnancies conceived through ART .
- Previous studies have demonstrated
- 60% increase in LBW
- 40% increase in PTB after ART compared with spontaneous conception
- Many researchers have attributed these differences to the underlying diagnosis of
- Infertility in women requiring ART

- This is the first study
- Pregnancy outcomes in previously sterilized pregnancy via ART by using this unique population of women, we are able to better understand the contribution of the infertility diagnosis to the outcomes of ART.
- These women have ‘‘proven fertility’’ because they are defined

- In this study, as women with a parity of one or more before sterilization without a infertility diagnosis, and Still be fertile if they had not undergone sterilization.
- The Original hypothesis was that ‘‘fertile’’ couples undergoing ART improved perinatal outcomes compared With infertile women
- Therefore, differences Perinatal Outcomes
- underlying infertility of The patient rather than the process of ART itself.

- This study demonstrated no difference in
- Clinical Pregnancy rate
- Pregnancy loss rate
- NND rate
- length of gestation
- between sterilized women and infertile women
- Undergoing ART after accounting for
- age, parity, and cycle type ICSI or IVF

- original hypothesis
- infertile patients
- less optimal outcomes than sterilized patients
- This study found lower birth weights sterilized patients compared infertile patients.

- After accounting for covariates
- There was an approximately 1% Increase in the LB rate of infertile patients compared with sterilized patients.

- This is the first study to use pregnancies after prior tubal ligation
- As a means of assessing the impact of fertility on IVF outcomes

- The strengths of our study the large number of ART pregnancies after prior tubal ligation
- From the SART database

- Our study included over
- 9,000 women with prior tubal ligation only and 400,000 women with other infertility diagnoses.

- SART does not collect information on pregnancy complications
- Such as placentation problems, gestational hypertension, preeclampsia, or other complications including ,cardiac or cerebral venous events, maternal death or embolic events

- It is unclear which aspects of ART procedures
- Super ovulated hormonal environment
- Gamete manipulation
- Laboratory culture
- Are responsible for these differences.

- More animal and human research studies are needed to explore
- The molecular and environmental mechanisms underlying the
- Effect of superovulation
- Gamete manipulation
- laboratory culture on pregnancy outcomes.

- In a large and comprehensive ART registry study, fertile couples
- Undergoing ART were not shown to have significantly different perinatal outcomes compared to infertile couples.

RESULT

- This study suggests that differences noted previously in perinatal outcomes including LBW and preterm delivery may arise from the ART process rather than the underlying infertility of the patient.

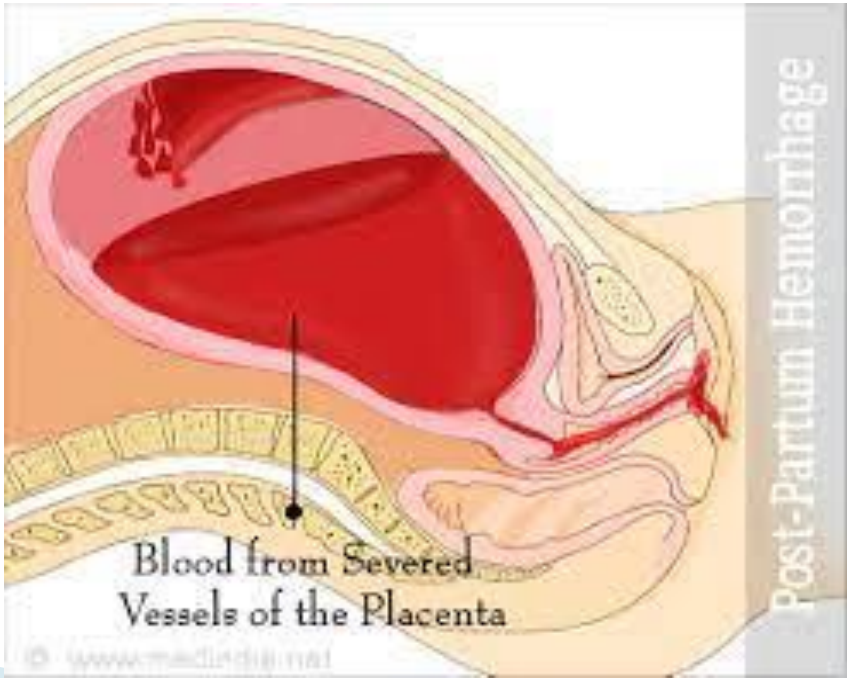
- Peripartum and postpartum outcomes
- In uncomplicated term pregnancy
- Following ART

- Submitted on April 9, 2017; resubmitted on May 27, 2018; editorial decision on June 22, 2018; accepted on June 26, 2018

Study

- Retrospective cohort
- From two Italian obstetric units

- The age of women from 25 to 45 years
- BMI ranged from 17 to 34 kg/m2
- Uncomplicated term pregnancies with ART conception had higher risk
- Operative delivery
- Retained placenta
- PPH



- ART conception
- had a higher risk of failed induction compared with the control group

- Infants born after ART had a similar
- Birth weight
- Apgar score
- Arterial blood pH compared with spontaneously-conceived ones

LIMITATIONS

- The database lacked information
- Details on ART (fresh versus frozen cycle, IVF versus ICSI)

- In the past to suggest
- More complications in pregnancy after IVF but it is not always clear this may linked to factors other than the treatment.

- The researchers looked at more than 8000 births at two hospitals in Italy, ruling out any births where there had been problems during the pregnancies or where the mothers had pre-existing medical conditions.
- All the pregnancies had progressed without any complications until the mother went into labor.

- They found that even when the IVF pregnancies had been problem-free, there was a higher chance of
- The placenta being retained
- Hemorrhage after birth
- Greater risk of induction not working
- Having a forceps or ventouse for the birth.

- The study did not specify
- The women had IVF or ICSI or
- They had a frozen or fresh treatment
- The researchers say further studies are needed to investigate the reasons behind these differences.

Adverse outcomes

- It is unclear whether
- ART procedures Or maternal factors associated with infertility such as maternal age, BMI, past obstetric outcome and medical history, contribute to these adverse outcomes

Materials and Methods

- A retrospective cohort study was conducted on 14415 deliveries
- The Careggi University Hospital in Florence and at the University Hospital in Siena, Italy
- From 1 January 2010 to 31 December 2014

Following exclusion

- Maternal pre-pregnancy diseases (diabetes, chronic
- Hypertension, thyroid disease, renal disease, neurological diseases, inflammatory
- Rheumatic diseases, respiratory diseases and gynecologic diseases
- Such as uterine fibroids, polycystic ovary syndrome (PCOS) and endometriosis)
- Prior uterine surgery

Following exclusion

- Obstetric complications diagnosed during pregnancy until labor onset (hypertensive disorders, gestational diabetes,
- Obstetric cholestasis, intrauterine growth restriction, small-for-gestational
- Age babies, oligopolyhydroamnios, placental diseases, placental abruption
- Fetal malformations, intrauterine deaths and elective CS (for breech or transverse fetal lie) including CS on maternal request.

- The final cohort included 8405 uncomplicated term pregnancies

Neonatal outcomes

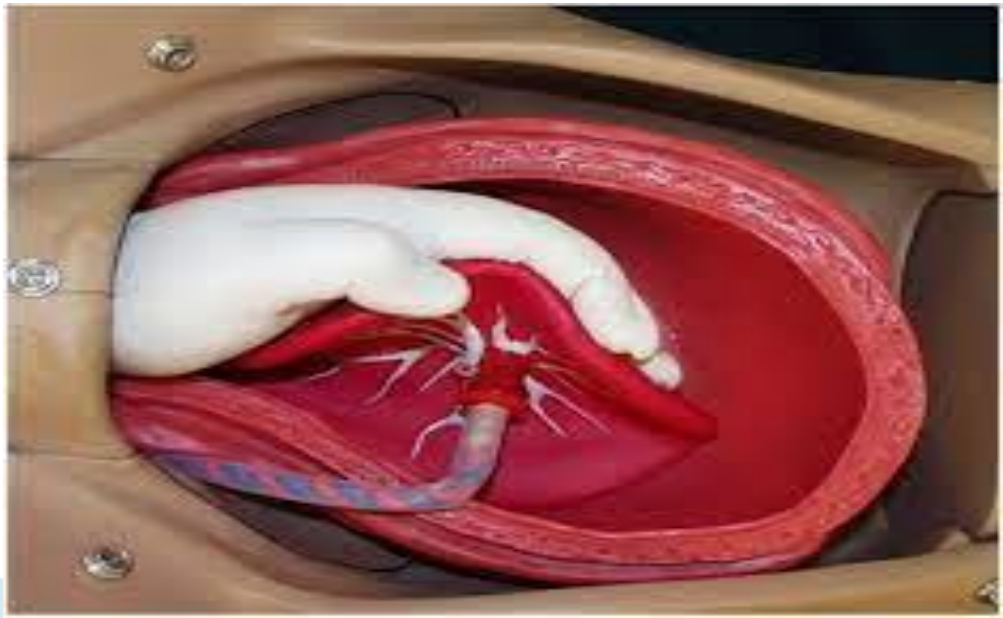
- Between ART conception And spontaneous conception
- ART did not increase the risks of
- Acute fetal distress
- Fetal hypoxemia.

- ART higher risk of failed induction
- Compared with the control group

- The present study compared
- Birth outcomes between
- women with healthy pregnancies through ART procedures and women who conceived naturally, matched by maternal characteristics.

- The results showed
- uncomplicated term pregnancies from ART conception have a higher risk
- Failed induction
- Retained placenta and PPH
- But no increased risk of
- Acute fetal distress
- Fetal hypoxemia

- Our results show that ART pregnancies had higher risks of
- Retained placenta
- Requiring manual removal
- PPH



- Previous studies demonstrated a higher incidence of PPH and placental disorders in ART gestation
- Mostly related to placenta previa In our cohort, all known placental pathologies were excluded

Reason

- Hormonal treatments in early pregnancy may cause changes
- In the structure and/or function of the extracellular matrix in the decidual layer, as loss of decidua
- And thereby contributing to an association with increased bleeding in deliveries

Reason

- High Estradiol and progesterone multiple folliculo genesis
- Produce suboptimal angiogenesis and placentation, predisposing to PPH.

- Therefore, a major role may be played by ART procedures themselves
- Uterine hormonal conditions
- Associated with infertility
- May contribute to the increased failed induction and postpartum

Neonatal outcome

- Concerning neonatal outcome, we observed that term newborns from ART gestation had the same weight as naturally conceived counterparts
- Same risk of perinatal hypoxemia.

- Our present findings in full-term infants Suggest that ART conception does not increase the risk of perinatal hypoxemia,
- Despite the possibly
- Increased risk of abnormal placentation.

Exclusion criteria

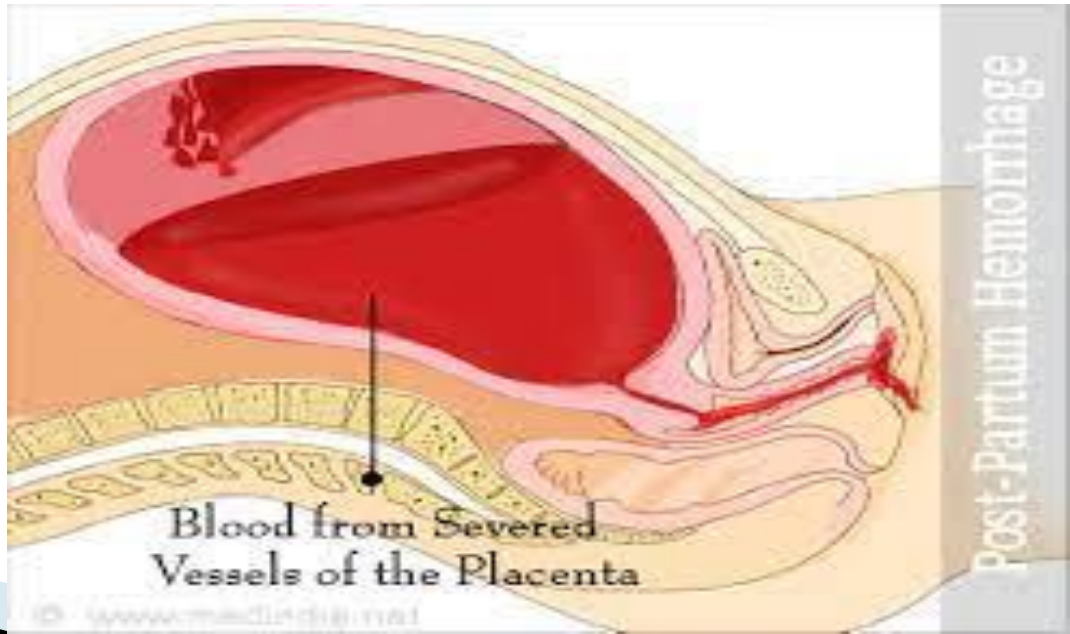
- Gynecological conditions, such as PCOS, uterine fibroids and endometriosis,
- Causes of infertility, smoking habit
- Lacks also specific information about the type of technique used (IVF or ICSI) and whether it was a fresh or a frozen cycle.

Inclusion criteria

- Only autologous IVF/ICSI pregnancies
- Remove the bias related to conception by oocyte/embryo donation

Conclusion

- Pregnancies conceived by autologous IVF or ICSI and
- Managed in well-resourced obstetric
- Facilities, even if uncomplicated
- Until birth, have a higher risk of
- Failed induction
- Retained placenta
- PPH



SUGGESTION

- Thus, patients should be counseled about the risk of peri partum and postpartum complications in the case of ART conception.

Result

- Therefore, further studies are needed in order to investigate the
- Potential endometrial or myometrial factors implicated in the pathogenesis
- Of peripartum and postpartum complications in pregnancies conceived by ART.

- In fact, this group of women should be considered as an ‘at risk’ category
- And thus preventative strategies should be applied for postpartum management

- The effects of depression, anxiety and stress
- Symptoms on the clinical pregnancy rate
- In women undergoing IVF treatment

- Received: 28 February 2019
  Accepted: 3 May 2019

Objective:

- Women undergoing assisted reproductive technology treatment, are often anxious and depressed
- Because of their fertility problem

- Recent studies have shown that the effects of psychological distress on the IVF treatment outcome is unclear
- This study aimed to examine the effects of anxiety, depression, and stress symptoms before IVF treatment on the clinical pregnancy rate

- 142 women undergoing IVF treatment participated in this prospective study

- The clinical pregnancy rate was 26.8% in this study.
- Controlling for age, infertility duration, and cause of infertility
- There were no relationship
- Between IVF outcome and anxiety, depression and stress symptoms.
- High woman's age and women with both cause of infertility were independent predictors of IVF clinical pregnancy rate

- Infertility is one of the greatest stressors in life that results in psychological distress.
- Anxiety, depression and stress symptoms are the most frequently occurring psychological disorders among infertile patients

- Women undergoing ART treatment
- Are often anxious and depressed
- Because of their infertility and
- The uncertainties of the treatment with which they have to deal

Material and methods

- This prospective study
- Conducted on 142 women undergoing
- IVF treatment at Royan Infertility Clinic
- Which is a referral center for infertility
- In Tehran, Iran
- February to March 2017.

Following criteria

- Experiencing couple infertility
- Age over 18 years;
- Ability to read, write, and comprehend Persian.

Measures

- Hospital Anxiety and Depression Scale (HADS)
- Measures both anxiety and depression symptoms Each item is scored
- Scores range from 0 to 21, with higher scores indicating greater symptoms of anxiety and depression.

Results

- In total, 142 women agreed to take part in this research
- And filled out the questionnaires completely
- The mean age of women was 32.04 years
- These women, 35.2% had university education
- 16.2% were employed

- The causes of infertility were as follows:
- Male factor, 47.2%
- Female factor, 23.9%
- Both, 12.7%
- Unknown, 16.2%
- The clinical pregnancy rate was 26.8% in this study

- There were no significant difference
- Between pregnant and non pregnant women with respect to anxiety ,depression and stress scores
- According to simple analysis, there was no relationship between IVF clinical pregnancy rate and anxiety , depression and stress symptoms

- Among known confounders
- Only high mother's age was associated with a decreased rate of IVF results
- Controlling for age, infertility duration, and cause of infertility
- There were also no association of anxiety depression, and stress symptoms with IVF results

- According to multiple analysis, women with both cause of infertility were
- Less likely to have a clinical pregnancy
- Than women with female infertility

Discussion

- Both simple and multiple analyses indicated that stress symptom had no influence on the outcome of IVF treatment, which is consistent with some studies but not with others .

- Consistent with previous research on anxiety and depression symptoms before and during first IVF treatment, we did not find effects of anxiety,depression symptoms
- On the clinical pregnancy rate

- However, other studies indicate that psychological distress are related to IVF outcomes
- On the other hand, infertile women had
- High level of depression and anxiety symptoms
- Low quality of life after unsuccessful ART treatment .

Recommendation

- Recommend a holistic approach, including psychosocial interventions
- Support to reduce the level of psychological distress in these women.

- In accordance with previous research
- Women’s age showed a significant impact on clinical pregnancy rate

- In comparison with women who had
- Female infertility
- Women with both cause of infertility
- Had a significantly increased risk of pregnancy rate

- We found that anxiety, depression, and stress
- Symptoms were not associated with the IVF clinical pregnancy rates

- The influence of age, body mass index, waist-to-hip ratio and anti-Mullerian
- Hormone level on clinical pregnancy rates in ART

- Published online: 21 Dec 2017.
- GYNECOLOGICAL ENDOCRINOLOGY, 2017
- VOL. 33, NO. S1, 41-43

- We used the database of the fertility clinic
- Both the in vitro fertilization (IVF)
- Intra cytoplasmic sperm injection (ICSI)
- A total of 1134 treatment cycles
- From 2013 through 2015 were analyzed

- The clinical pregnancy rate was 39.9%.
- The live birth rate was 25.5%.
- Women who conceived where statistically significantly
- Younger and had lower body mass index.

- No statistical differences across pregnancy groups were
- Found for waist-to-hip ratio
- Anti Mullerian hormone levels.
- Low AMH levels do not influence pregnancy
- Rates in younger patients (<36 years).

Infertility cases

- 20–30% male factor infertility
- 20–35% by female factor infertility
- 25–40% of cases of a problem in both partners
- 10–20% no clear cause is found

Infertility associated with lifestyle

- Such as smoking
- Body weight
- Stress
- Increasing age in the female partner is one of the most common explanations today

Excess body weight and obesity

- Several studies show that obesity adversely affects the outcome of (IVF)

Age

- Higher BMI had a pronounced negative Influence on pregnancy rate
- This effect was attenuated as age increased

AMH

- It is considered one of the markers for the ovarian reserve
- We know that a correlation exists between AMH levels and oocyte retrieval numbers
- Antral follicle count
- Pregnancy rates
- And birth rates

- Calculated that in women with very low circulating AMH level
- The probability of pregnancy was significantly affected by age

Material and methods

- We used the database of our fertility clinic
- On fresh IVF and ICSI treatment cycles
- From year 2013 through 2015
- 1134 fresh IVF/ICSI cycles
- Embryo transfer was performed in 1032 cycles

- The clinical pregnancy rate was 39.9%.
- The live birth rate was 25.5%.
- The rate of multiple pregnancies was 17.6%.

Results

- We divided all women to three age groups:
- (68.3%) women were 35 years old
- (23.6%) were 36–40 years old
- (8%) women were >40 years old

clinical pregnancy rates:

- The clinical pregnancy rates were:
- 44.4% for women 35
- 34.7% for women 36-40 years old
- 16.5% for women >40 years old

The live birth rates:

- 30.8% for women 35
- 18.3% for women 36-40 years old
- 1.1% for women >40 years old

BMI

- Evaluated BMI of 1133 women
- Divided to four groups according to BMI:
- (3.8%) were under weight (BMI >18.5);
- (71.3%) had normal weight (BMI 18.5 and 24.9)
- (18.2%) were overweight (BMI 25 and 29.9)
- (6.6%) were obese (BMI >30).

Clinical pregnancy rates:

- 44.2% for under weight women
- 44.7% for women who had normal weight
- 27.2% for overweight women
- 18.7% for obese women

The live birth rates:

- 30.23% for under weight women
- 29.42% for women who had normal weight
- 14.08% for overweight women
- 10.67% for obese women

- We also calculated clinical pregnancy rate depending on age and BMI.

Clinical pregnancy rates

- For women who were 35 years old the clinical pregnancy rates were:
- 43.8% for under weight women;
- 49.1% for women who had normal weight;
- 28% for overweight women and
- 22.5% for obese women.

Live birth rates

- The live birth rates were:
- 32.38% for under weight women
- 34.76% for women who had normal weight
- 16.1% for overweight women
- 12.5% for obese women.

Clinical pregnancy rates

- For women who were 36-40 years old
- Clinical pregnancy rates
- For under weight women 37.5%
- For women who had normal weight 37.4%
- For overweight women33.8%
- For obese women 16.7%

The live birth rates

- 20.47% for women who had normal weight
- 15.38% for over weight women
- 12.5% for obese women

Clinical pregnancy rates

- For women who were >40 years old
- The clinical pregnancy rates were
- 66.7% for underweight women
- 20.4% for women who had normal weight
- 4.3% for over weight women
- 9.1% for obese women

Most important predictor of IVF

- As we can see the main and most important predictor of IVF
- Outcome is woman's age and the best results are achieved in women under 35 years of age

- According to our results
- BMI did have an influence on clinical pregnancy rates
- Suggested that weight loss results
- Significantly increased live birth rate

AMH

- We did not find significant difference
- Between AMH group's clinical pregnancy rates
- However, we did find that in young women (35 years old) the clinical pregnancy
- Rate was not affected and remained quite high in all AMH groups.
- Suggesting AMH levels should only be monitored in women above 36 years of age.

Conclusions

- Women who conceived where statistically significantly younger and had lower BMI.
- No statistical differences across pregnancy
- Waist-to-hip ratio
- AMH levels
- Low AMH levels do not influence pregnancy rates in younger patients (<36 years).

- Assisted Reproductive Technology and Pregnancy Outcome

- 2005 by The American College of Obstetricians and Gynecologists.
- Published by Lippincott Williams & Wilkins.

- Subjects were divided into 3 groups:
- No ART use
- Use of ovulation induction
- Use of in vitro fertilization (IVF).

- A total of 36,062 pregnancies were analyzed
- (95.1%) were spontaneously conceived
- (3.4%) used ovulation induction
- (1.5%) used IVF

- Ovulation induction was associated with statistically significant Increase
- placental abruption
- Fetal loss after 24 weeks

IVF

- IVF associated with a statistically Significant Increase
- Preeclampsia
- Gestational hypertension
- Placental abruption
- Placenta previa
- Risk of cesarean delivery

CONCLUSION

- Patients who undergo IVF are at increased
- Risk for several adverse pregnancy outcomes
- Although many of these risks are not seen in patients undergoing ovulation induction
- There was no increased incidence of
- Fetal chromosomal
- Structural abnormalities

- It is well-recognized that ART procedures significantly increase the risk
- Multiple gestations
- Both mono chorionic and di chorionic

- Some studies have suggested an increased risk of
- Chromosome abnormalities
- Low birth weight
- Preterm delivery in singletons

- Studies have also suggested an association between the use of IVF
- Birth defects
- Adverse neurodevelopmental outcomes
- Preeclampsia
- Perinatal mortality
- Placenta previa
- Increased rate of cesarean delivery.

RESULTS

- Complete obstetric and pediatric outcome data
- For 36,062 pregnancies for this analysis.
- The control group consisted
- (95.1%) patients who did not use ART
- (3.4%) patients used ovulation induction
- (1.5%) underwent IVF

- Patients who underwent ovulation induction
- 2.4 times placental abruption
- 2.1 times more likely to have a fetal loss after 24 weeks
- Compared with controls
- Patients using IVF
- 2.7 times more likely to develop preeclampsia
- 2.4 times more likely to have a placental abruption
- 6.0 times more likely to have a placenta previa
- 2.3 times more likely to undergo a cesarean delivery
- Compared with controls

- We did not observe an increase in the incidence of
- Aneuploidy
- Congenital anomalies
- In patients undergoing IVF

- Although a statistically significant
- Increase
- Gestational hypertension
- Gestational diabetes in patients undergoing IVF and ovulation induction

- A recent meta-analysis of a large number of
- IVF pregnancies suggested that such pregnancies Increased risk for adverse perinatal outcome
- Preterm delivery
- Low birth weight
- Placenta previa
- Gestational diabetes
- Preeclampsia
- Neonatal intensive care admission

- Previous authors have suggested an
- Association between IVF
- Increased cesarean delivery rate
- Maternal age to the risk of cesarean delivery
  Increase remained significant in our study after adjustment for maternal age and parity

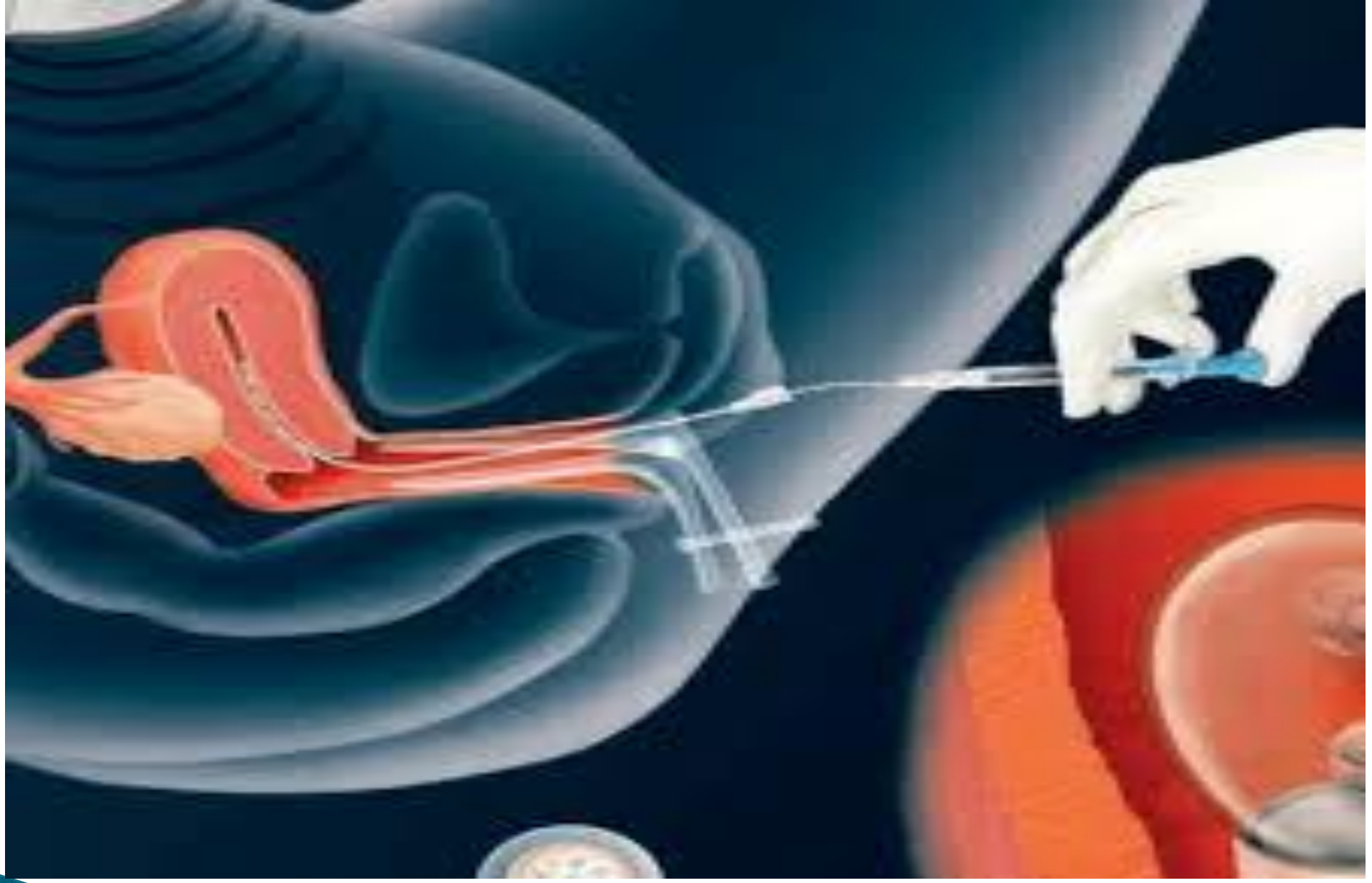
Suggestion

- Clinicians caring for such patients
- Should be aware of these possible associated adverse outcomes and may need to be aware for additional signs or symptoms of complications during antenatal care

- It is unlikely that a single
- Pathophysiologic approach
- Is responsible for the wide range
- Of adverse obstetric outcomes noted in this study
- Because the causes of infertility
- The nature presence of infertility itself
- Or by other associated
- Underlying conditions such as PCOS

Recommendation

- The possible associations
- Between infertility, or its therapies with a range of adverse obstetric outcomes should be discussed with prospective patients before embarking on fertility therapy.



- IVF cycles involving fresh ,non donor oocytes
- 29.3% resulting in a pregnancy
- The live birth rates 23.9% per cycle

- frozen non donor resulting in a pregnancy rate ,live birth rate of 44.3% per transfer
- success rates were higher for women with a previous live birth

Multiple Gestation

- Following the introduction of ART there has been a substantial increase in multiple gestations
- The higher maternal and neonatal risks associated with multiple pregnancies

Children from IVF

- Studies of the offspring resulting from IVF have raised concerns that the children Increased risk for
- Prematurity
- Low birth weight
- Birth defects
- Genetic and epigenetic abnormalities
- Vascular and metabolic abnormalities delayed neurologic development, and cancer.

ART

- Antepartum hemorrhage
- Hypertensive disorders of pregnancy
- Gestational diabetes
- Preterm rupture of membranes
- Caesarean section and induction of labor compared to spontaneously conceived Increased

Pregnancy complications

- Antepartum hemorrhage
- Placenta previa
- Hypertensive disorders of pregnancy
- More precautious antenatal care of ART pregnancies

Large-for-Gestational Age Babies

- Singletons conceived after FET
- Increased risk of being LGA
- Macrosomia, defined as a birth weight greater than 4,500g

Congenital Anomalies

- Study comparing the prevalence of birth defects among live born infants
- Conceived using ART, non-ART infants including singleton and multiple pregnancies
- Tracheoesophageal fistula
- Esophageal atresia
- Rectal and large intestinal atresia/stenosis
- Reduction deformity of the lower limbs were significantly increased with ART use.

- However, similar to the data on obstetric risk, it is unclear if it is the actual exposure
- Ovarian hyper stimulation
- Embryo culture
- Underlying infertility that is the primary driver of this effect

Thank you