

Review Paper:

Prenatal Care in Pregnancies Through Assisted Reproductive Technologies (ARTs): A Narrative Review Article



*Fahimeh Ranjbar¹, Zahra Behboodi Moghadam², Maryam Gharacheh¹

1. Nursing Care Research Center, Iran University of Medical Sciences, Tehran, Iran.

2. Department of Reproductive Health, School of Nursing & Midwifery, Tehran University of Medical Sciences, Tehran, Iran.



Citation: Ranjbar, F., Behboodi Moghadam, Z., & Gharacheh, M., 2017. Prenatal Care in Pregnancies Through Assisted Reproductive Technologies (ARTs): A Narrative Review Article. *Journal of Client-Centered Nursing Care*, 3(4), pp. 241-250.



Article info:

Received: 16 Jun 2017

Accepted: 20 Sep 2017

ABSTRACT

Background: Understanding the physiological and psycho-social effects of pregnancy through Assisted Reproductive Technologies (ARTs) will enable health care providers to identify and treat any adverse outcomes, and provide support to women seeking fertility treatments. The aim of this paper was to review studies describing prenatal care in pregnancy through ARTs.

Methods: A systematic search of the electronic databases including Medline/Pubmed, ISI Web of science and EMbase, persian databases and Google Scholar search engine was performed with keywords ‘assisted reproductive technology’, ‘in vitro fertilization’, ‘prenatal care’, ‘midwifery’ and ‘pregnancy’. Qualitative, quantitative and review studies in English and Persian languages, published between 1990–2017 were selected, and 51 papers related to prenatal care in assisted pregnancies (In Vitro Fertilization (IVF) and Intra Cytoplasmic Injection (ISCI)) that met the inclusion criteria were reviewed.

Results: The important issues regarding the prenatal care for women who conceive through ARTs include gaining the mother’s trust, involving the spouse in prenatal care, taking an accurate history, considering the underlying cause of infertility and the history of treatment, understanding the adverse consequences of ARTs on the health of the mother and fetus, helping the mother adapt to pregnancy and develop an attachment to the fetus, managing ARTs-related psychosocial issues, and maintaining confidentiality.

Conclusion: Midwives managing the assisted pregnancies should be well aware of the unavoidable effects of ARTs on pregnancy to provide appropriate prenatal care.

Keywords:

Pregnancy, Assisted Reproductive Technique, In Vitro Fertilization, Prenatal care

1. Background

Infertility is a medical condition affecting people worldwide with significant psychological and social consequences.

Although many people with infertility have reconciled to their situation, new reproductive technologies have made it possible for many married couples to conceive (Macaluso et al. 2010; Cousineau and Domar 2007). The success rate of these treatments is improving and

* Corresponding Author:

Maryam Gharacheh, PhD

Address: Nursing Care Research Center, Iran University of Medical Sciences, Tehran, Iran.

Tel: +98 (21) 88671613

E-mail: gharacheh.m@gmail.com

has reached to almost 40% for women under 35 years of age (Grainger, Frazier & Rowland 2006).

The new Assisted Reproductive Techniques (ARTs) involve the handling of the oocyte, sperm or both, followed by In-Vitro Fertilization (IVF) with or without Intra Cytoplasmic Sperm Injection (ICSI). Standard IVF techniques involve extracorporeal fertilization, embryo culture for two to five days and the transfer of embryos to the uterus. ICSI, or the microscopic injection of sperm into the oocyte cytoplasm, facilitates the process of fertilization (Zegers Hochschild et al. 2009). Sometimes these new techniques are the only way of conceiving for couples, but are accompanied by the physical and psychological pressures including hormonal manipulation, regular intake of oral and injectable drugs, the invasive procedures of surgical oocyte retrieval and embryo transfer, and the social stigma of infertility (Toscano and Montgomery 2009; Lukse and Vacc 1999).

Infertility treatments affect the physical and psychosocial health of the couples seeking treatment, and a successful pregnancy through these treatments does not necessarily mean the end of infertility (Wang & lee 2004; Behboodi Moghadam et al. 2012). In fact, pregnancies

through IVF are generally more stressful for the couples (Greil, Slauso Blevins & McQuillan 2010). Since infertility is on the rise and assisted pregnancy is increasingly becoming a standard option for couples pursuing their parental role, the physiological and psycho-social impact of ARTs is a critical issue for prenatal care providers in order to identify and treat complications and provide further support (Barnes et al. 2012; Ranjbar et al. 2015b; Ranjbar et al. 2015c). A significant proportion of women who become pregnant through ARTs are referred to midwives as the principal healthcare providers. The existing national policies for pregnant women have not specifically addressed this group of women, but based on professional medical standards, all women should receive midwifery services tailored to their individual needs (Younger, Hollins Martin & Choucri, 2015). The aim of this paper is to review the studies related to the prenatal care in pregnancies through ARTs.

2. Materials and Methods

All quantitative (descriptive, observational, interventional) studies, reviews and qualitative studies pertaining to complications related to assisted pregnancies published between 1990 and July 2017 were reviewed.

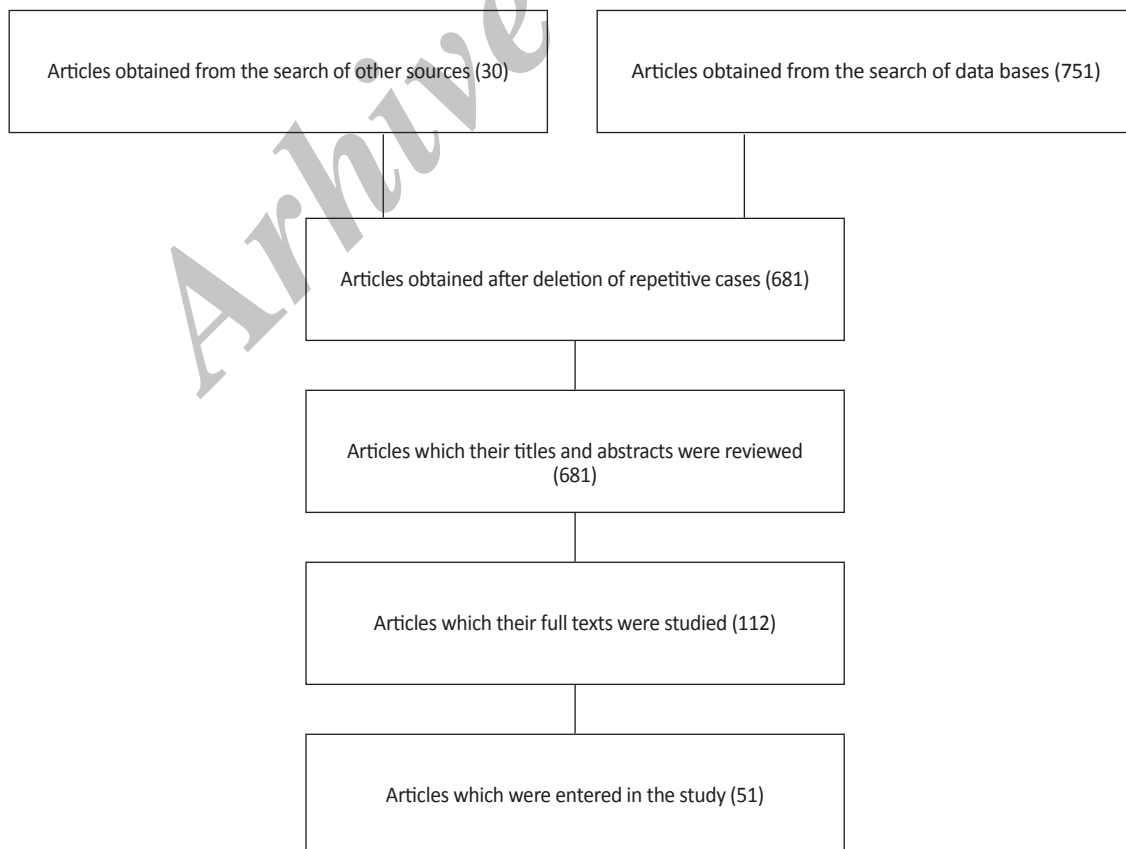


Figure 1. Diagram representing the search for the articles

A systematic search of the electronic databases including MEDLINE/PUBMED, EMBASE, ISI Web of Science, and the Persian databases such as SID and Google Scholar search engine, were performed through the digital library network of Iran University of Medical Sciences. The databases were searched for research papers using the following keywords and phrases: 'Assisted Reproductive Technology', 'In Vitro Fertilization', 'Prenatal Care, Midwife, and Pregnancy.

The inclusion criteria for the papers were: a. English or Persian language; b. presence of any of the above keywords in the title, abstract, or the keywords; and c. study subjects including infertile women who had become pregnant through ARTs such as IVF and ICSI. Those studies that investigated the infertility treatment, unsuccessful attempts, post-natal period, parenthood, growth and development of the children resulting from ARTs, and pregnancy through alternative treatments (embryo donation and gamete donation) were excluded from the review.

Simultaneously, the search, assessment and initial selection of articles were performed and the results of each database were saved separately, and after deleting the repetitive papers, the titles of the remaining articles were reviewed and the ones irrelevant to our cases were excluded. The articles with titles and/or abstracts fitting the inclusion criteria were first reviewed separately by two researchers, and eventually the full-texts were reviewed so that a proper judgment could be made on their relevance. In addition, a second round of selection was performed by manually searching the reference lists of the articles selected in the database search. Eventually, 51 articles were selected that met our inclusion criteria (Figure 1).

3. Results

Prenatal care is important in preserving the few pregnancies that are achieved through ARTs. A midwife should have a good understanding of infertility and ARTs to provide safe and effective care. As with other pregnancies, taking precise history on the first prenatal visit has been highly emphasized. Information about the underlying causes of infertility and the history of infertility treatment, related medical conditions and ARTs methods should be carefully recorded. Midwives and other healthcare providers should encourage the couples to take part in pre-childbirth classes, communicate with them regarding their experiences, and advise them on parenthood. Since infertility treatments affect the relationship of the couples, the midwives should also involve the husbands during prenatal care (Warmelink et al. 2016; French, Sharp & Turner 2015).

Normally, the prenatal care for women who become pregnant through ARTs begins earlier and is more frequent (Gissler, Silverio & Hemminki 1995). The tests for assisted pregnancies usually take place earlier than natural pregnancies due to the highly controlled nature of the fertility treatments. After pregnancy is confirmed, an early ultrasound is conducted between weeks 6-8 to make sure the intrauterine pregnancy, and to record the result of the in-vitro fertilization cycle. Clinical pregnancy is defined as the presence of the fetal heartbeat in ultrasonography scan. The expectant parents are then referred to a midwifery service. If the latter is separate from the team that conducted the infertility treatment, building trust with patients and attention to their infertility history is important, since it is a highly stressful period for the expectant mother (Boivin and Kentenich, 2002). Women who become pregnant through ARTs are acutely aware of the risks and may find it difficult to express their fears and uncertainties to the midwives. The relationship between the midwife and the mother is based on mutual respect and trust and can be achieved through the continuity of care (Younger et al. 2015).

Studies on the effects of ARTs on fetus and mother have yielded contradictory results. The complications associated with assisted pregnancies may be due to the fertilization techniques, underlying infertility, multiple pregnancies or the mother's age. The risk of adverse prenatal consequences in assisted pregnancies tends to be higher compared to natural pregnancies. In addition, the risks of midwifery complications, and prenatal mortality are in general high in previously infertile women who become pregnant (Geisler et al. 2014; Boulet et al. 2008; Reubinoff et al., 1997; Schieve et al. 2007; Sun et al. 2009) and is higher in assisted compared to natural pregnancies. These complications include prenatal mortality, preeclampsia, preterm delivery, low birth weight, and ectopic pregnancy which is more common after in-vitro fertilization. Although they could be related to the women's previous medical histories e.g. tubular problems, a regular examination should be conducted during pregnancy (El-Chaar et al. 2009; Mounce, 2009; Allen et al. 2006; Grainger, Frazier & Rowland 2006; Martin et al. 2016; Chen et al. 2009; Amini et al. 2017). A retrospective cohort study in Iran reported twice as many preterm childbirths in pregnancies resulting from ARTs compared to natural childbirths (Maroufizadeh, Omani Samani & Amini 2016). Placenta previa, placental abruption, gestational diabetes, high blood pressure, preterm rupture of embryonic membranes, pre-term labor, and cesarean sections are among the risks that increase in multiple pregnancies. It should be noted that although these pregnancies are high risk but may result in natural

vaginal delivery. The underlying cause of infertility has a greater impact than the ARTs. For example, Polycystic Ovarian Syndrome (PCOS) is a common cause of infertility and is related to insulin resistance and gestational diabetes (Al-Turki, 2010; Göçmen et al. 2015; Mounce 2009). Therefore, an initial screening for diabetes is recommended in case of a previous history of PCOS (O'Flynn 2014).

The risk of multiple pregnancies increases after using drugs such as gonadotropins. Couples seeking infertility treatments should be informed about this risk, in addition to the complications of multiple pregnancies such as increase in prenatal mortality, preterm delivery, low birth weight, gestational hypertension, placenta previa, placental abruption, and the likelihood of fetal reduction. Most obstetric and neonatal issues after using the ARTs are due to multiple pregnancies. Although multiple pregnancies resulting from ARTs does not require additional pre-natal care compared to natural multiple pregnancy, the risk of maternal-fetal morbidity and mortality related to twin pregnancy after ARTs increases more in women who have a history of hypertension and diabetes. The risk of such pregnancies can be minimized by single embryo transfer in the treatment cycle. Since infertility treatments have increased the chances of conception in older women and in those with prior underlying disease, the transfer of more than one embryo is not advisable. If the option of reducing one or more fetuses is considered during a multiple pregnancy, the couple should receive psychological counseling. After reducing the number of fetuses, the issues related to the growth of the remaining fetus should be carefully evaluated (Allen et al. 2006; Jauniaux, Ben Ami & Maymon 2013; Kanat-Pektas et al. 2008).

Since a significant proportion of women seeking infertility treatments are of advanced age, with almost 50 percent of treatment cycles conducted in women older than 35, they should be informed about the specific risks associated with advanced maternal age on pregnancy. Providing prenatal care to pregnant women older than 40 years of age is particularly important (Younger et al. 2015) since the risks of placenta previa, prolonged labor, high blood pressure, hemorrhage, and cesarean childbirth increase significantly with maternal age. The rate of spontaneous abortion in pregnancies resulting from ARTs is also higher as compared to natural pregnancies, and this is also strongly related to maternal age. Therefore, in pregnancies resulting from ARTs, prenatal ultrasound screening and aneuploidy tests are recommended depending on the maternal age and the number of fetuses (Mounce 2009).

Most pregnancies resulting from ARTs are without complications and the newborns are healthy. However, the risk of abnormalities in children born through such treatments may be more than that in the children born naturally (2005). More studies are needed to correlate the risk of congenital abnormalities and ARTs, and to investigate the underlying etiology for this higher risk (Allen et al. 2006). The parents should be informed that although the overall risk of long-term anomalies in children born through ARTs is low (O'Flynn 2014), the possibility of having a child with genetic or congenital problems should not be ignored, and they should be prepared to face that possibility. In addition to comparing their stress and anxiety to parents who had children spontaneously, the similarities and the differences of various infertility conditions should be explained to parents seeking treatment (Boivin and Kentenich 2002). Clinical / genetic counseling and chorionic villus sampling or amniocentesis are recommended in case the IVF/ICSI treatments because of male infertility (azoospermia or severe oligospermia) (Allen et al. 2006).

4. Adjusting to Pregnancy and the Emotional Relationship of the Mother with the Fetus

Pregnancy is a developmental event wherein women prepare themselves for their new maternal roles and incorporate the maternal role into their personalities. The support of their spouse, family and friends greatly helps women tolerate the changes and discomforts of pregnancy. In the first trimester, women usually concentrate on their body and protecting their growing fetus. However, as the second trimester progresses, the fetus and its movements become more palpable and it becomes a separate entity whose needs are prioritized by the mother. Therefore, pregnancy brings about changes in a woman's lifestyle as she devotes herself to the unborn child (Rubin 1975). The attachment toward the fetus is similar for all mothers regardless of whether the pregnancy is natural or assisted (Hjelmstedt, Widström & Collins 2006). However, if a woman had problems with infertility prior to becoming pregnant, she might have a different experience during pregnancy, depending on the socio-cultural environment and the type of infertility treatment. After successful conception through ARTs, the prenatal care givers should actively assist the women to adapt themselves to their new condition. The expectant couple should consider the pregnancy as natural and focus on establishing a relationship with the fetus to prepare for their new roles as parents. The expectant mothers should also be encouraged to realistically evaluate their needs as well as the impending joys

of motherhood, and express any doubts and uncertainties (Boivin and Kentenich 2002; Fisher et al. 2008). For women who become pregnant through ARTs, the first pregnancy is an important period of establishing the relationship between the mother and the fetus. The attachment starts in the early stages of pregnancy, around the ninth week, and increases as the pregnancy progresses. If this attachment is not established as expected, it might be helpful to keep the mother updated on the fetal development through ultrasonography. Prenatal education in the early stages of pregnancy provides more information to the mothers on the development of the fetus, and makes it possible for them to visualize their unborn child. Social support and community culture and its attitude to childbearing are also important factors that determine the attachment between the mother and the fetus. Prenatal visits should also include a culture-based question about the attachment to the fetus, and help them establish a relationship with the unborn child. Support groups for women who have become pregnant through artificial insemination can help reduce the stress levels accompanying these treatments, and improve maternal identity (Kuo et al. 2013). There are contradictory reports regarding maternal-fetal attachment being higher in women who have become pregnant through ARTs compared to natural pregnancy (Chen et al. 2004). Furthermore, the level of maternal education and participation in prenatal trainings also affect attachment. At present, little regard is given to a woman's knowledge of her changing body or her baby growing inside, and her natural concerns are therefore overestimated. Although a mother's natural instincts help her care for herself and her child, these concerns should not paralyze her life (Lothian 2008). Finally, the attention to the fathers who are less attached to the fetus, and are anxious and irritable is also important (Hjelmstedt and Collins 2008).

5. Anxiety and Stress During Pregnancy

The long-term effects of ARTs on the psychological health of the children are largely unknown and require further studies (McManus and McClure 2002). Infertile couples often endure many hardships in order to have children, and the pregnancy represents a major investment for them—in terms of time, emotions and money (Boivin and Kentenich 2002). This experience makes some people stronger and others vulnerable. Hence, couples conceived through ARTs are different in some aspects of their personality and emotional responses to the pregnancy and therefore have different needs compared to those who conceive spontaneously (Redshaw, Hockley & Davidson 2006; Hjelmstedt et al. 2003). Pre-

viously infertile women are known to remain emotionally vulnerable even after becoming pregnant through ARTs. The specific stressors of these treatments are beyond the positive pregnancy test and will continue until childbirth (Toscano and Montgomery, 2009). Infertility treatment is a very difficult emotionally and physically process since after every failure, and even after a successful conception, the feeling that they would never become parents tends to return to the couples (Redshaw et al. 2006). This leads to feelings of anxiety and decline in self-confidence, especially in the early stages of pregnancy (Hammarberg, Fisher & Wynter 2008).

The high level of anxiety in previously infertile women during pregnancy is rooted in the long and difficult path from infertility diagnosis to the conception and includes various dimensions. The first confirmation tests on pregnancy, the risks of ectopic pregnancy, congenital abnormalities and invasive diagnostic procedures all contribute to higher anxiety. The stress levels increase further in women with history of previous fetal loss. Pregnancy also brings issues like concern over the welfare and health of the unborn child, the fear of being separated from the newborn after birth, the quality of parent-child relationship and the child rearing. After passing through this stage and eventually accepting the role of parenthood, many couples are faced with psychosocial problems. All of the above can have a negative effect on the psychological health of the women prior to childbirth and may even lead to prenatal morbidity (Boivin and Kentenich 2002; Younger et al. 2015).

In married couples undergoing infertility treatments, pregnancy and childbirth are not considered a continuous process and often seen as an unconnected chain of events, which need to be overcome before they can eagerly anticipate childbirth. If the care giver cannot fully comprehend the uncertainties and the difficulties that these couples have experienced during their infertility treatments, the mother's anxiety may intensify.

Practical experiences indicates that most expectant mothers either show denial or excessive concern. Denial occurs in women who due to the likelihood or fear of adverse outcomes such as fetal loss are not able to establish an appropriate relationship with their fetus. The women who are excessively concerned about natural physical changes that occur during pregnancy often feel guilty or embarrassed. Reduction in the level of stress and anxiety helps expectant mothers confront these negative feelings and regain their self-confidence and control over their pregnancy (Boivin and Kentenich 2002). On some occasions, the physical changes in the early stages of preg-

nancy in these women, on the contrary, are worrisome rather than confirming pregnancy. Of course, this stage is gradually terminated as soon as the mother feels fetal movement (Smorti and Smorti 2012).

Although successful conception after infertility treatment initially provides relief from anxiety, the long-term psychological effects continue in these women. Along with joy, feelings of fear and disappointment continue till the end of pregnancy and leads to reluctance on the part of the expectant mother towards buying supplies for the child or informing others about the pregnancy (Toscano and Montgomery 2009). Parents face a range of feelings such as despair, hope, and uncertainty which do not disappear even after successful treatment. Feelings and emotions are important factors that affect the success of infertility treatments, pregnancy and childbirth (Warmlink et al. 2016). Pregnancy is one of the hardest parts of realizing the dream of motherhood, and therefore does not mean the end of infertility problems. While finally getting pregnant leads to the peace of mind and increases the feeling of strength and security in the women, these feelings are often transitory, and uncertainty and stress can lead to an overall negative experience of pregnancy (Ranjbar et al. 2015a).

A study by Dornelles et al (2014) on expectant mothers in Brazil showed that the women worried about fetal loss even at the third trimester. These fears exist even in natural pregnancies at the first trimester, but gradually dissolve by the third trimester. Past experience with unsuccessful treatments, challenges and feelings of inadequacy may cause fear and would negatively impact the experience of pregnancy. Taken together, pregnancies resulting from ARTs have unique issues, and it is essential to communicate with the expectant mothers to ensure their psychological health and ease their pregnancy. These researchers concluded that merging the psycho-therapeutic support groups with infertility clinic would provide an opportunity to the couples to express their feelings, and share their concerns and expectations. Furthermore, these support groups should encourage the expectant parents to think beyond childbirth and focus on the infancy period of their child and their own parental roles.

Psychological screening should be performed for all high-risk pregnant women, and counseling services should be provided to anxious pregnant women. Therefore, midwives and gynecologists should have sufficient training and education to identify and manage anxiety and depression among pregnant women (Gourounti, 2015). Only when the midwife is sufficiently aware of

the psychological aspects of infertility can she tactfully provide this information to the couples, and at the same time enable them to discuss their concerns and fears. In case the duration of standard visits cannot be extended, it may be necessary to make provision for extra visits. If the midwife is prepared to provide these services to the expectant parents, the counseling sessions can be conducted by herself, otherwise, they should be referred to a psychologist (Younger et al. 2015).

6. Social Issues

The inner desire of most infertile women for giving birth to the child has been forgotten and sometimes their social concern is much more than personal concerns. Most of them have been able to cope with infertility and accept it, but they were worried about the negative reactions of their spouses, families, and the society (Ranjbar et al. 2015a). In fact, the social stigma associated with infertility cannot be easily removed even after getting pregnant (Younger et al. 2015). Therefore, the issue of stigma should also be discussed during counseling women who have become pregnant through ARTs. The expectant mothers should also be encouraged to actively seek support from their spouses and health care providers. Public awareness campaigns on the issue of infertility by the relevant organizations can help diminish the associated stigma and educate people about infertility and its modern treatment methods (Hjelmstedt et al. 2003).

Although in most cases, IVF has been accepted by friends, family and the community, women are still reluctant to disclose IVF as their infertility treatment (Hammarberg et al. 2001). Therefore, preserving the confidentiality of the couples seeking treatment is of utmost importance, and many of them may ask that their information not be recorded. If there are no special concerns about the patients' health, their request should be obliged, and their privacy and confidentiality should be respected (Younger et al. 2015). Considering that making the decision on informing the pregnancy to others is an important and private issue, providing counseling on this matter should be taken into account (Ranjbar et al. 2015a).

7. Discussion

The objective of this study was to review the existing literature regarding prenatal care in pregnancies through ARTs. Important issues in pregnancies through ARTs can be summarized as follows: the absence of prenatal care, maternal and fetal safety and health, psychological issues such as stress and anxiety, fetal-maternal at-

tachment, and social issues such as the stigma associated with assisted pregnancy. The needs of the women who have become pregnant through ARTs are different than those who conceive naturally. Therefore, the health care providers should be familiar with the prenatal services that are recommended for assisted pregnancies to provide better care and support for these women. Warmelink et al reported that even when women who conceive through ARTs pretend that their pregnancy is a natural one, they have special needs (Warmelink et al. 2015), including frequent midwifery care, greater psychological support, knowledge about the infertility treatment, and more ultrasound scans (Warmelink et al. 2016). Couples who seek infertility treatments may even need more emotional support, and therefore should be given additional opportunities to discuss their feelings towards pregnancy, and future life as parents (Barnes et al. 2012; Hjelmstedt et al. 2003).

The duration between discharge from the infertility clinic after conception and entry into prenatal clinic is often without support from the health care provider that causes a great deal of fear of fetal loss. Therefore, an early counseling session should be arranged for the expectant couples immediately after their discharge from the infertility clinic (French et al. 2015). Since the safety and the health of the fetus is one of the primary concerns of the mother, they should be informed about the available techniques to monitor the health of their fetus (Lin, Tsai, & Lai 2013). Although the risk of birth defects is low, the exact evaluation of the neonate should be performed, and after consultation should be referred to specialized services if needed.

More support and attention to anxiety during pregnancy will help the mothers to demonstrate their negative feelings, and get ready for childbirth and their parental roles (French et al. 2015). One study by Darwiche et al showed that women who become pregnant through IVF/ICSI have more anxiety than women who conceive naturally. However, no significant differences were seen between the two groups with regard to the health of the fetus. These results show that the emotional health of women should be examined after assisted fertilization (usually when the counseling sessions ends), and during the first trimester. Furthermore, the counseling sessions should continue until the first trimester and even later, and should not end when pregnancy is achieved (Darwiche et al. 2014).

In a prospective controlled study entitled the impact of successful assisted reproduction treatment on female and male mental health during transition to parenthood,

Repokari et al revealed that the mental health in pregnant women, regardless of whether the pregnancy is assisted or natural, should be studied as a dynamically changing situation. Therefore, to determine the extent to which couples using ARTs are vulnerable toward socio-psychological stresses, it is important to understand how differently men and women experience the biological, social and psychological issues of infertility. Successful conception through ARTs is not always a good predictor of mental health of the married couple, and they may even be significantly resistant toward such problems (Repokari et al. 2005). In a systematic review, Gourounti et al showed that women who conceive through IVF have more pregnancy-related anxiety, lower quality of life, either the same or less depressive symptomatology, the same level of self-esteem, more positive attitudes toward pregnancy demands and higher levels of maternal-fetal attachment as compared to women who conceive naturally, irrespective of the trimester (Gourounti 2015).

There is also a significant relationship between the duration of infertility and the number of failed treatments with the level of anxiety (Hashemieh et al. 2013). Conversely, the findings of Kashdai and Kaitz on the antenatal moods among women who conceived by IVF, showed a more positive mood towards pregnancy and impending childbirth due to their history of infertility and experience of its various treatment methods (Harf-Kashdai and Kaitz 2007). In addition to the difficult experience of infertility, anxiety regarding the consequences of pregnancy may make it difficult for women who have become pregnant through ARTs to achieve maternal identity. It is essential to evaluate the emotional relationship of mother with the fetus, and help her accept the fetus as a separate entity.

Although reluctance towards accepting maternal identity, and delay in the psychological and actual preparedness for impending childbirth has been reported, a clear difference has not been observed between fertile and infertile women in putting on the pregnancy overalls, preparing infant supplies or participating in childbirth classes. Nevertheless, some studies have reported differences in these behaviors, in addition to providing information on pregnancy to others and preparing for childbirth (McMahon 1999). The change in the identity of a woman from infertile to fertile, and establishing the relationship with the fetus is a slow process. As the pregnancy progresses, especially after the movements of the fetus become palpable, the mother-child relationship becomes stronger. However, the expectant mothers believed that there was no way to make sure the baby was healthy until the birth of the baby. Family counselors and psycho-

therapists can help women who become pregnant after a period of infertility to face the cognitive, emotional and behavioral changes, and also control the anxiety related to the congenital abnormalities and other psycho-social stresses (Wang, 2004; Lin et al. 2013).

To help the women who have become pregnant through ARTs, midwives, nurses and other prenatal care givers should be sufficiently trained and educated (Smorti and Smorti, 2012). Although midwifery care alone is sufficient for many women with assisted pregnancies, and they are given care the same way as other low-risk pregnant women, it is necessary that the midwives are informed about potential complications. Frequent fetal heart monitoring and ultrasound scans, and emotional and psycho-social support even post childbirth should be considered. As the principal care givers for pregnant women, midwives should be aware of the potential risks for mother and the child, and provide them with proper and supportive care to achieve safe and satisfactory childbirth experience (Warmelink et al. 2015; Kennedy 1998).

However, in-training midwives do not have the sufficient knowledge of the special needs of women with assisted pregnancies, both during childbirth and maternity. To meet the growing needs of midwifery and reproductive health departments, the curricula of these groups should also include all issues related to the reproductive health sector, including the new assisted reproductive technologies. One limitation of the present study is that it did not review studies on prenatal and postnatal care in women with multiple pregnancies, and those who become pregnant by gamete donation or surrogacy. Therefore, further research is needed in this regard.

8. Conclusion

The important issues regarding the prenatal care in women conceiving through ARTs are gaining their trust and resolving their uncertainties and concerns, involving the spouses in prenatal care, taking an accurate history, examining the underlying cause of infertility and the history of treatment, being aware of the potential complications of the ARTs on the health of mother and the fetus, counseling the women with regards to announce her pregnancy to family and friends and accepting their new maternal identity, helping them develop an attachment to the fetus and address paradoxical feelings, managing psychosocial issues related to the ARTs, and preserving the confidentiality of the couples. To provide suitable prenatal care, midwives should have sufficient knowledge about ARTs and its potential consequences.

Therefore, defining new roles of midwives in providing care to women who conceive through ARTs is of utmost importance.

Acknowledgments

The authors of this article hereby express their gratitude towards all colleagues who have helped search the articles.

Conflict of Interest

There are no conflict of interest to declare.

References

- Allen, V. M. et al. 2006. Pregnancy outcomes after assisted reproductive technology. *Journal of Obstetrics and Gynaecology Canada*, 28(3), pp. 220-33. [DOI:10.1016/S1701-2163(16)32112-0]
- Al-Turki, H., 2010. Obstetric management after infertility treatment. *Annals of African Medicine*, 9(2), pp. 77-80. [DOI:10.4103/1596-3519.64753]
- American College of Obstetricians and Gynecologists, 2005. Perinatal risks associated with assisted reproductive technology, ACOG Committee Opinion No. 324. *Obstet Gynecol*, 106, pp. 1143-6. [DOI:10.1097/00006250-200511000-00061] [PMID]
- Amini, P. et al. 2017. Prevalence and determinants of preterm birth in tehran, iran: a comparison between logistic regression and decision tree methods. *Osong Public Health and Research Perspectives*, 8(3), pp. 195-200. [PMID]
- Barnes, M. et al. 2012. Outcomes for women and infants following assisted conception: Implications for perinatal education, care, and support. *The Journal of Perinatal Education*, 21(1), pp. 18-23. [DOI:10.1891/1058-1243.21.1.18]
- Behboodi Moghadam, Z. et al. 2012. Experiences of infertility through the lens of Iranian infertile women: A qualitative study. *Japan Journal of Nursing Science*, 10(1), pp. 41-6. [DOI:10.1111/j.1742-7924.2012.00208.x]
- Boivin, J. & Kertenich, H., 2002. *Guidelines for counselling in infertility*. Thessaloniki: ESHRE Special Interest Group on Psychology and Counselling.
- Boulet, S. L. et al. 2008. Perinatal outcomes of twin births conceived using assisted reproduction technology: a population-based study. *Human Reproduction*, 23(8), pp. 1941-8. [DOI:10.1093/humrep/den169]
- Chen, T. H. et al. 2004. Prevalence of depressive and anxiety disorders in an assisted reproductive technique clinic. *Human Reproduction*, 19(10), pp. 2313-8. [DOI:10.1093/humrep/deh414]
- Chen, X. K. et al. 2009. In-Vitro fertilization is associated with an increased risk for preeclampsia. *Hypertension in Pregnancy*, 28(1), pp. 1-12. [DOI:10.1080/10641950802001859]

- Cousineau, T. M. & Domar, A. D., 2007. Psychological impact of infertility. *Best Practice & Research Clinical Obstetrics & Gynaecology*, 21(2), pp. 293–308. [DOI:10.1016/j.bpobgyn.2006.12.003]
- Darwiche, J. et al. 2014. Anxiety and psychological stress before prenatal screening in first-time mothers who conceived through IVF/ICSI or spontaneously. *Women & Health*, 54(5), pp. 474–85. [DOI:10.1080/03630242.2014.897677]
- El-Chaar, D. et al. 2009. Risk of birth defects increased in pregnancies conceived by assisted human reproduction. *Fertility and Sterility*, 92(5), pp. 1557–61. doi: 10.1016/j.fertnstert.2008.08.080 [DOI:10.1016/j.fertnstert.2008.08.080]
- Fisher, J. R. W., Hammarberg, K. & Baker, G. H. W., 2008. Antenatal mood and fetal attachment after assisted conception. *Fertility and Sterility*, 89(5), pp. 1103–12. [DOI:10.1016/j.fertnstert.2007.05.022]
- French, L. R., Sharp, D. J. & Turner, K. M., 2015. Antenatal needs of couples following fertility treatment: a qualitative study in primary care. *British Journal of General Practice*, 65(638), pp. e570–7. [DOI:10.3399/bjgp15X686473]
- Geisler, M. E. et al. 2014. Obstetric and perinatal outcomes of twin pregnancies conceived following IVF/ICSI treatment compared with spontaneously conceived twin pregnancies. *European Journal of Obstetrics & Gynecology and Reproductive Biology*, 181, pp. 78–83. [DOI:10.1016/j.ejogrb.2014.07.033]
- Gissler, M., Silverio, M. M. & Hemminki, E., 1995. In-vitro fertilization pregnancies and perinatal health in Finland 1991–1993. *Human Reproduction*, 10(7), pp. 1856–61. [DOI:10.1093/oxfordjournals.humrep.a136191]
- Göçmen, A. et al. 2015. Comparison of maternal and fetal outcomes of IVF and spontaneously conceived twin pregnancies: three year experience of a tertiary hospital. *International Journal of Clinical and Experimental Medicine*, 8(4), pp. 6272–6. PMID: PMC4483991 [PMID] [PMCID]
- Gourounti, K., 2015. Psychological stress and adjustment in pregnancy following assisted reproductive technology and spontaneous conception: A systematic review. *Women & Health*, 56(1), pp. 98–118. [DOI:10.1080/03630242.2015.1074642]
- Grainger, D. A., Frazier, L. M. & Rowland, C. A., 2006. Preconception care and treatment with assisted reproductive technologies. *Maternal and Child Health Journal*, 10(S1), pp. 161–4. [DOI:10.1007/s10995-006-0094-y]
- Greil, A. L., Slauson Blevins, K. & McQuillan, J., 2010. The experience of infertility: A review of recent literature. *Sociology of Health & Illness*, 32(1), pp. 140–62. [DOI:10.1111/j.1467-9566.2009.01213.x]
- Hammarberg, K., Astbury, J. & Baker, H. W. G., 2001. Women's experience of IVF: A follow-up study. *Human Reproduction*, 16(2), pp. 374–83. [DOI:10.1093/humrep/16.2.374]
- Hammarberg, K., Fisher, J. R. W. & Wynter, K. H., 2008. Psychological and social aspects of pregnancy, childbirth and early parenting after assisted conception: A systematic review. *Human Reproduction Update*, 14(5), pp. 395–414. [DOI:10.1093/humupd/dmn030]
- Harf Kashdaei, E. & Kaitz, M., 2007. Antenatal moods regarding self, baby, and spouse among women who conceived by in vitro fertilization. *Fertility and Sterility*, 87(6), pp. 1306–13. [DOI:10.1016/j.fertnstert.2006.11.035]
- Hashemieh, C., Neisani, L. & Taghinejad, H., 2013. Assessment of anxiety in pregnancy following Assisted Reproductive Technology (ART) and associated infertility factors in women commencing treatment. *Iranian Red Crescent Medical Journal*, 15(12). [DOI:10.5812/ircmj.14465]
- Hjelmstedt, A. & Collins, A., 2008. Psychological functioning and predictors of father–infant relationship in IVF fathers and controls. *Scandinavian Journal of Caring Sciences*, 22(1), pp. 72–8. [DOI:10.1111/j.1471-6712.2007.00537.x]
- Hjelmstedt, A. et al. 2003. Personality factors and emotional responses to pregnancy among IVF couples in early pregnancy: a comparative study. *Acta Obstetrica et Gynecologica Scandinavica*, 82(2), pp. 152–61. [DOI:10.1034/j.1600-0412.2003.00040.x]
- Hjelmstedt, A., Widström, A. M. & Collins, A., 2006. Psychological correlates of prenatal attachment in women who conceived after in vitro fertilization and women who conceived naturally. *Birth*, 33(4), pp. 303–10. [DOI:10.1111/j.1523-536X.2006.00123.x]
- Jauniaux, E., Ben Ami, I. & Maymon, R., 2013. Do assisted-reproduction twin pregnancies require additional antenatal care. *Reproductive BioMedicine Online*, 26(2), pp. 107–19. doi: 10.1016/j.rbmo.2012.11.008 [DOI:10.1016/j.rbmo.2012.11.008]
- Kanat Pektaş, M. et al. 2008. Perinatal and first year outcomes of spontaneous versus assisted twins: A single center experience. *Archives of Gynecology and Obstetrics*, 278(2), pp. 143–7. [DOI:10.1007/s00404-007-0545-8]
- Kennedy, H., 1998. Enabling conception and pregnancy Midwifery care of women experiencing infertility. *Journal of Nurse-Midwifery*, 43(3), pp. 190–207. [DOI:10.1016/S0091-2182(98)00007-X]
- Kuo, P. C., et al. 2013. Maternal–foetal attachment during early pregnancy in Taiwanese women pregnant by in vitro fertilization. *Journal of Advanced Nursing*, 69(11), pp. 2502–13. [DOI:10.1111/jan.12135]
- Lin, Y., Tsai, Y. & Lai, P., 2013. The experience of Taiwanese women achieving post-infertility pregnancy through assisted reproductive treatment. *The Family Journal*, 21(2), pp. 189–97. [DOI:10.1177/1066480712466827]
- Lothian, J.A., 2008. The journey of becoming a mother. *Journal of Perinatal Education*, 17(4), pp. 43–7. [DOI:10.1624/105812408X364071]
- Lukse, M. P., & Vacc, N. A. (1999). Grief, depression, and coping in women undergoing infertility treatment. *Obstetrics & Gynecology*, 93(2), 245–51. [DOI:10.1097/00006250-199902000-00017]
- Lynley, A., Payne, D. & Dan, L., 2013. Midwifery and assisted reproductive technologies. *New Zealand College of Midwives Journal*, 47, pp. 10–3. [DOI:10.12784/nzcomjnl47.2013.2.10-13]
- Macaluso, M. et al. 2010. A public health focus on infertility prevention, detection, and management. *Fertility and Sterility*, 93(1), pp. 16.e1–10. [DOI:10.1016/j.fertnstert.2008.09.046]
- MacCallum, F. et al. 2014. Living each week as unique: Maternal fears in assisted reproductive technology pregnancies. *Midwifery*, 30(3), pp. e115–20. [DOI:10.1016/j.midw.2013.12.005]
- Maroufizadeh, S., Omani Samani, R. & Amini, P., 2016. Relationship between assisted reproductive technology and the risk of preterm labor among singleton live-birth in Tehran Province,

- Iran. *The Iranian Journal of Obstetrics, Gynecology and Infertility*, 19(33), pp. 1-6.
- Martin, A. S. et al. 2016. Antenatal hospitalizations among pregnancies conceived with and without assisted reproductive technology. *Obstetrics & Gynecology*, 127(5), pp. 941-50. [DOI:10.1097/AOG.0000000000001392]
- McMahon, C. A., 1999. Does assisted reproduction make an impact on the identity and self-esteem of infertile women during the transition to parenthood. *Journal of Assisted Reproduction and Genetics*, 16(2), pp. 59-62. [DOI:10.1023/A:1022508604606]
- McManus, J. & McClure, N., 2002. Complications of assisted reproduction. *The Obstetrician & Gynaecologist*, 4(3), pp. 124-9. [DOI:10.1576/toag.2002.4.3.124]
- Mounce, G., 2009. *Assisted reproduction: What do midwives need to know*. London: The Royal College of Midwives. [PMCID]
- O'Flynn, N., 2013. Assessment and treatment for people with fertility problems: NICE guideline. *British Journal of General Practice*, 64(618), pp. 50-1. [DOI:10.3399/bjgp14X676609]
- Ranjbar, F. et al. 2015a. Paradox of modern pregnancy: A phenomenological study of women's lived experiences from assisted pregnancy. *Journal of Pregnancy*, 2015, pp. 1-8. [DOI:10.1155/2015/543210]
- Ranjbar, F., et al. 2015b. Experiences of infertile women seeking assisted pregnancy in Iran: A qualitative study. *Journal of reproduction & infertility*, 16(4), pp. 221-8. PMID: PMC4819212 [PMID] [PMCID]
- Ranjbar, F., et al. 2015c. Fertility behaviour of Iranian women: A community-based, cross-sectional study. *Archives of Iranian medicine*, 18(1), pp. 2-5. [PMID]
- Redshaw, M., Hockley, C. & Davidson, L. L., 2006. A qualitative study of the experience of treatment for infertility among women who successfully became pregnant. *Human Reproduction*, 22(1), pp. 295-304. [DOI:10.1093/humrep/del344]
- Repokari, L. et al. 2005. The impact of successful assisted reproduction treatment on female and male mental health during transition to parenthood: A prospective controlled study. *Human Reproduction*, 20(11), pp. 3238-47. [DOI:10.1093/humrep/dei214]
- Reubini, B. E. et al., 1997. Is the obstetric outcome of in vitro fertilized singleton gestations different from natural ones: A controlled study. *Fertility and Sterility*, 67(6), pp. 1077-83. [DOI:10.1016/S0015-0282(97)81442-2]
- Rubin, R., 1975. Maternal tasks in pregnancy. *Maternal Child Nursing Journal*, 4(3), pp. 143-53. [PMID]
- Schieve, L. A. et al. 2007. A population-based study of maternal and perinatal outcomes associated with assisted reproductive technology in Massachusetts. *Maternal and Child Health Journal*, 11(6), pp. 517-25. [DOI:10.1007/s10995-007-0202-7]
- Smorti, M. & Smorti, A., 2012. Medical successes and couples' psychological problems in assisted reproduction treatment: a narrative based medicine approach. *The Journal of Maternal-Fetal & Neonatal Medicine*, 26(2), pp. 169-72. [DOI:10.3109/14767058.2012.722728]
- Stamatis, P. et al. 2010. Assisted reproduction and midwives: Student and certified midwives' educational needs on reproductive biology. *Sexual & Reproductive Healthcare*, 1(4), pp. 163-8. [DOI:10.1016/j.srhc.2010.07.002]
- Sun, L. M. et al. 2009. Assisted reproductive technology and placenta-mediated adverse pregnancy outcomes. *Obstetrics & Gynecology*, 114(4), pp. 818-24. [DOI:10.1097/AOG.0b013e3181b76bd1]
- Toscano, S. E. & Montgomery, R. M., 2009. The lived experience of women pregnant (including preconception) postin vitro fertilization through the lens of virtual communities. *Health Care for Women International*, 30(11), pp. 1014-36. [DOI:10.1080/07399330903159700]
- Wang, L. H. & Lee, T. Y., 2004. Assisted pregnancy after infertility: Taiwanese women. *Journal of Medical Sciences*, 24(5), pp. 249-56.
- Warmelink, J. C. et al. 2015. Client perspectives of midwifery care in the transition from subfertility to parenthood: A qualitative study in the Netherlands. *Journal of Psychosomatic Obstetrics & Gynecology*, 37(1), pp. 12-20. [DOI:10.3109/0167482X.2015.1106474]
- Warmelink, J. C. et al. 2016. Perception of the psychosocial aspects of subfertility by parents following successful medically assisted conception: A qualitative study. *Open Journal of Obstetrics and Gynecology*, 6(13), pp. 830-45. [DOI:10.4236/ojog.2016.613101]
- Younger, M., Hollins Martin, C. & Choucri, L., 2015. Individualised care for women with assisted conception pregnancies and midwifery practice implications: An analysis of the existing research and current practice. *Midwifery*, 31(2), pp. 265-70. [DOI:10.1016/j.midw.2014.06.008]
- Zegers Hochschild, F. et al. 2009. The International Committee for Monitoring Assisted Reproductive Technology (ICMART) and the World Health Organization (WHO) revised glossary on ART terminology, 2009. *Human Reproduction*, 24(11), pp. 2683-7. [DOI:10.1093/humrep/dep343]