

# Midwifery and Assisted Reproductive Technologies

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## ABSTRACT

Assisted reproductive technologies (ARTs), particularly in vitro fertilisation (IVF), are being used by women who are experiencing difficulties of conception to achieve parenthood. Many of these women and their partners will come to midwives for their maternity care. In this paper we examine the literature regarding the health and wellbeing of women who have used assisted reproductive technologies, and their babies. Our paper aims to provide an overview of fertility/infertility, and to highlight the adverse maternal and perinatal outcomes associated with ART pregnancies. We aim to inform midwives of the issues which they need to be mindful, when caring for these women and their families.

## KEY WORDS

Midwives, Assisted Reproductive Technologies, In Vitro Fertilisation, pregnancy, birth.

## INTRODUCTION

Women and their families who are experiencing difficulties in conception turn to assisted reproductive technologies (ARTs) to help them conceive. A significant number of women, once they become pregnant through ARTs, are approaching midwives to provide care for them as Lead Maternity Carers (LMCs). Pregnancies following ARTs might or might not be straightforward; the underlying reduced fertility condition, the drugs and the procedures involved may threaten maternal and neonatal wellbeing. This paper aims to provide an overview of fertility/infertility, and to highlight the adverse maternal and perinatal outcomes associated with ART pregnancies.

## FERTILITY AND INFERTILITY

The World Health Organisation defines infertility as the inability to conceive a child (<http://www.who.int/topics/infertility/en/>). A couple

may be considered infertile if, after two years of regular sexual intercourse, without contraception, the woman has not become pregnant (and there is no other reason, such as breastfeeding or postpartum amenorrhoea). Infertility has a significant emotional and psychological toll on those who experience it, and has been described as a life crisis (Evers, 2002; Paterno, 2008).

Over eighty percent of couples who are under the age of forty will conceive within the first year of regular, unprotected intercourse (NICE, 2013). Of those who do not, about half will conceive within the second year. Both men and women experience infertility at similar rates with about 20% of all cases being of unknown etiology or a combination of both male and female factors (Paterno, 2008). Factors that have been identified as causing infertility have been ovulatory factors, e.g. polycystic ovarian syndrome (present in about 20% of couples), utero-tubal, peritoneal factors, e.g. endometriosis, pelvic inflammatory disease (present in 30% of couples), semen migration factors, e.g. sperm immotility (10% of cases) and male factors, e.g. low semen count or poor semen quality (30% of couples).

It is estimated that 1-4% of all conceptions are due to ARTs. To some extent this is reflective of an older population of women, who have delayed childbearing until their fertility is already declining (Evers, 2002; Halliday, 2007). To illustrate the effect of maternal age on fertility in relation to IVF: for women aged 45 years or over the live birth rate per embryo transfer cycle was 0.5%; for women aged 40 – 44 years it was 9.0% and for women aged less than 30 years 35.9% (Wang, Chambers & Sullivan, 2010).

The Assisted reproductive technologies (ARTs) that are available in New Zealand are: In-Vitro Fertilisation (IVF), egg donation, sperm donation, intracytoplasmic sperm injection (ICSI), and, more recently, embryo donation. Since 2005, New Zealand women, accessing publicly funded IVF treatment, are restricted to single embryo transfer (SET) rather than multiple embryos (Murray, Hutton & Peek, 2005). Fertility clinics are located in five of New Zealand's main cities and several clinics offer satellite services in other urban centres. Thus women living in rural and other areas without fertility clinics are required to travel, sometimes long distances, to access fertility treatments and laboratory services.

Most fertility clinics offer privately funded and/or publicly funded IVF cycles. However, women need to meet specific criteria to qualify for publicly funded cycles of IVF. These criteria include: women who are unlikely to spontaneously conceive; women less than 40 years old; women with a body mass index < 32 kg/m<sup>2</sup>, and non-smokers. While the latter three are now well known to improve IVF outcomes, the success of IVF can continue to be compromised by other factors such as duration of infertility and the processes and protocols that dictate the fertility clinic's practice.

## MATERNAL OUTCOMES AFTER ART

In comparison to spontaneous conceptions, the risk to maternal health is increased in ART pregnancies (Jackson, Gibson, & Wu, 2004; Sutcliffe & Ludwig, 2007) with spontaneous abortion, gestational hypertension, and pre-eclampsia having been identified as the main potential risks. It is important to note that it remains uncertain as to whether these risks

are linked with the couple's underlying infertility factors, medical factors, maternal age, obesity or the ART processes themselves (Mukhopadhaya & Arulkumaran, 2007). For example, Chen et al. (2009) in their retrospective Canadian study found that pre-eclampsia occurred more frequently in women who had conceived through IVF than in women who had conceived through two other ARTs: ovulation induction or intrauterine insemination. Thus, women undergoing ART appear to have a significantly increased risk of gestational hypertension and pre-eclampsia, especially following an IVF conception.

In addition, while the exact cause is unknown, the couple's subfertility factors appear to be linked to an increased incidence of pre-eclampsia (Sutcliffe & Ludwig, 2007). Furthermore, a two fold increase in gestational diabetes mellitus is seen in women undergoing ART, which may be associated with the underlying cause of infertility, e.g. polycystic ovarian syndrome (Mukhopadhaya & Arulkumaran, 2007).

The incidence of placenta praevia is also significantly increased in both IVF and ICSI assisted pregnancies, as embryos are more likely to implant in the lower segment owing to placement position on embryo transfer (Hayashi & Nakai, Satoh & Matsuda 2012; Kallen, Finnstrom, Nygren, Olausson & Wennerholm, 2005; Nygren, Finnstrom, Kallen & Olausson, 2007; Poikkeus, Gissler, Unkila-Kallio, Hyden-Granskog, & Tiitinen, 2007; Sazonova, Kallen, Thurin-Kjellberg, Wennerholm & Bergh, 2011).

In New Zealand, the single embryo transfer (SET) policy has significantly reduced the risk of multiple births and their associated high risk of complications for the babies, mother and society (Murray, Hutton, & Peek, 2005). Multiple pregnancies are a well-recognised risk of ART treatments. These have the potential to increase complications in relation to perinatal outcomes and to the mother during pregnancy. Maternal complications are at least twice as common in multiple pregnancies, with increased incidence of anaemia, hypertension including pre-eclampsia, premature labour, haemorrhage and operative birth, including caesarean section (Gambone, 2006; Halliday, 2007; McDonald, Murphy, Byene & Ohlsson, 2005). Twins born after ART have an increased incidence of complications compared to those naturally conceived (Murray et al, 2005).

## PERINATAL OUTCOMES AFTER ART

Perinatal outcomes after ART have attracted increasing interest and research findings are now influencing the practice of the fertility providers (Hammadieh, Olufowobi, Afnan, & Sharif, 2003; Jackson et al., 2004). Again, multiple factors influence and complicate the review of research findings, such as whether the ART pregnancies are twin or singleton; what type of ART has been used; the treatment protocol; and the underlying cause of the initial infertility.

Historically IVF has been associated with a high rate of twin pregnancies due to the practice of transferring more than one embryo. This practice has been underpinned by the belief that it will increase the possibility of at least one live birth resulting from the procedure. Over time though, studies have shown that there are fewer obstetric risks for IVF conceived singleton pregnancies (Gelbaya, 2010), hence the increasing national and international trend towards SET. This trend reflects the overall increased risk of poor perinatal and obstetric outcome with twin pregnancies, independent of whether the babies are conceived naturally or after ART (Mukhopadhaya & Arulkumaran, 2007; Sutcliffe & Ludwig, 2007).

An interesting phenomenon that is theorised to contribute to the increased incidence of perinatal adverse outcomes in neonates conceived by ARTs is that of the vanishing twin. Ten percent of ART singleton pregnancies begin as twin pregnancies and it has been shown that such pregnancies have higher risk of ending with preterm births and consequently, low birth weight babies (Wisborg, Ingerslev, & Henriksen, 2010). Sazonova et al. (2011) in their Swedish National Registry based study found that the vanishing twin phenomenon was negatively associated with very preterm birth (i.e. <32 weeks).

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Preterm birth has also been associated with ARTs. For example, Sazonova et al's (2011) study examined whether there were differences in obstetric outcomes between singleton pregnancies from double embryo transfer (DET), SET and elective SET (eSET - where one quality embryo is selected and one or more are frozen for future use). In comparing all IVF singletons (n = 11/ 347) with singletons in the general population, they found significantly higher rates for: pre-term between 28 weeks and 37 weeks; low birth weight and very low birth weight (AOR between 1.1 and 1.7) amongst the IVF singletons. It is thought that the eSET singleton pregnancies may have better obstetric outcomes as the selected embryo may be of better quality. However, irrespective of the type of embryo transfer, Sazonova et al. found that the IVF cohort had poorer obstetric outcomes than the non IVF.

Low birth weight has been identified as an adverse neonatal outcome associated with the use of ARTs. Several robust studies have highlighted this association. For example, a large US population based study (Schieve et al., 2004) reported an increased incidence of low birth weight, very low birth weight and term low birth weight in neonates conceived through ARTs. A Danish prospective follow-up study (Wisborg et al, 2010) of a cohort of primiparous women with a singleton pregnancy, found that the birth weights of term infants conceived after IVF, ICSI and non IVF ARTs were significantly lower than that of the babies of the cohort of women who had conceived spontaneously. Hayashi et al. (2012), using the Japanese perinatal database, examined for differences between ovulation stimulation and intrauterine insemination with respect to their effects on perinatal outcomes of singleton pregnancies. They found an increase in the low birth weight rate regardless of fertility treatments. They suggested the increased risk may be attributed to maternal factors, particularly maternal age and body mass index which were both higher in the ART cohort.

Until 2002 it was thought that there was no increased risk of major birth abnormalities after ART. However, a Western Australian registry-based record linkage project (Hansen, Kurinczuk, Bower & Webb, 2002) identified a twofold increase in major birth defects in those children conceived by IVF and ICSI, as compared to those naturally conceived (9% v 4.2%). A systematic review and meta-analysis of birth defects in infants conceived after IVF and ICSI, compared with infants conceived naturally, found a 30% to 40% increase in the risk of birth defects in children conceived after ART (Hansen, Bower, Milne, de Klerk & Kurinczuk, 2005).

Birth defects that have been identified with singleton ART are: septal heart defects (i.e. atrial septal defects, secundum or not otherwise specified, and ventricular septal defects plus atrial septal defects), cleft lip (with or without cleft palate), oesophageal and anal atresia (Reefhuis

et al., 2009). This was a large retrospective study that used the American National Birth Defects Prevention Study data. Although the researchers could not demonstrate this connection with multiple pregnancies, they noted that infants of multiple pregnancies were more likely to have birth defects independent of the mode of conception. It is important to note that it is difficult to get an accurate picture of the true risk of birth defects as maternal age and parity may affect the findings. In addition, it is more likely that babies conceived through ART will be examined more thoroughly by maternity practitioners, thus abnormalities are more likely to be identified (Halliday, 2007).

Rare forms of birth defects have been linked to ART. These include imprinting disorders such as Beckwith-Wiedemann syndrome, and Angelman syndrome (Metwally & Ledger, 2011). It is thought that these imprinting disorders could result from ART procedures in the early stages of cell division causing “partial or complete suppression of one of the two parental alleles of a certain gene” (Metwally & Ledger, 2011, p. 82). The IVF culture conditions, cellular manipulation, drugs used for ovarian stimulation, and the process of cryopreservation are also thought to be causative factors of the increased risk of birth defects following ART (Hansen et al., 2005; Sutcliffe & Ludwig, 2007). But it is important to note that the incidence of imprinting disorders after ART remains very rare and further studies are needed to investigate this association more carefully (Owen & Segars, 2009).

## THE ROLE OF THE MIDWIFE AND ART

Infertility treatments may require significant physical, psychological and financial investment from the woman and her partner. The journey to become pregnant through ARTs can be difficult and prolonged for the couple. In addition, women who become pregnant following IVF may be more anxious because of their heightened fear of losing the pregnancy and the increased risks associated with an IVF pregnancy (Morgan, 2004). Pregnancy and birth may be seen as less of a continuum and more of a series of events, for example ‘completing the first trimester’ and ‘going to full term’, with each event having to be overcome before the parents can look forward to the birth (Toscano & Montgomery, 2009). A woman’s anxiety may be exacerbated if she is in the care of a maternity carer who does not appear to fully understand the uncertainties and difficulties they have experienced having conceived through ARTs.

In New Zealand primary antenatal care is provided by a Lead Maternity Carer, this is most commonly a midwife for low risk women. Women who become pregnant after ART may also contact a midwife for primary maternity care. At this time the midwife over the course of the pregnancy, will become familiar with the family and may be able to better assist them to negotiate the pregnancy with reduced anxiety. In this situation, the midwife needs to maintain a balance between: acknowledging the emotional investment that a woman and her partner place in the pregnancy along with their anxiety and concerns, with the goal of keeping the pregnancy as normal as possible and building the woman’s confidence and self-esteem. Physical pregnancy care for these women

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can follow the normal pattern of antenatal care and in principle could remain as for naturally conceived pregnancies (Morgan, 2004). But their emotional and psychological care needs may be different (Toscano & Montgomery, 2009).

However, the midwife must also be aware of the increased risks associated with ART pregnancies and the role that the underlying causes of infertility may play. Midwife-only care will be appropriate for many of these women although the midwife must be vigilant and aware of the potential complications (Morgan, 2004; Frith, 2004). Therefore, as with every woman, the significance of an in-depth and complete health history as a primary and critical component of the initial contact with the midwife is reinforced. Information should be documented regarding the cause of the woman’s infertility, her history of infertility treatments, any associated medical conditions, and the ART procedure itself. Consultation with, and referrals to, specialist services will need to be made as appropriate (New Zealand Ministry of Health, 2012). While the risk of birth defects is relatively small, careful assessment of the neonate should be performed. The midwife should also be aware of, and watch for, any exaggeration of the usual postnatal psychological issues, such as difficulty in adjusting to the impact of becoming parents (Fisher, Hammarberg & Baker, 2007).

A guideline produced by Mid Central Health Primary Policy Group (PMPG) (2010) addressed the issue of the appropriate and specific care these women should receive.

This guideline recommended careful history taking and for the LMC to always ask: “What underlying problem was present that necessitated the need for fertility treatment?” (p1). Also recommended is: routine screening for fetal abnormality, early screening for gestational diabetes mellitus if the woman has a history of polycystic ovary syndrome, and the provision of individual fetal growth charts as per the College of Midwives consensus statement of fetal wellbeing (NZCOM, 2012). In providing safe and effective care to such women, midwives need to have a good understanding of infertility and ARTs so that their care is “based upon the integration of knowledge that is derived from the arts and sciences” (NZCOM, 2008, p.3).

## CONCLUSION

In this review we have highlighted some of the issues both for women who have conceived through the use of ARTs and for the midwives who



provide their maternity care. While ARTs have become more normalised as a means of achieving parenthood, there may be associated risks. There is debate as to the causes of these risks, whether they are attributable to the underlying infertility issues and associated medical disorders, or to the ART procedures themselves. Midwives, as the main care givers for pregnant women in New Zealand, need to be well informed, mindful of the potential risks to the mother and her baby whilst providing care that is the most appropriate and supportive, to enable these women to achieve a safe and satisfying childbirth experience.

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