ANTENATAL MOOD AND FOETAL ATTACHMENT AFTER ASSISTED CONCEPTION

Jane RW Fisher^a PhD

Karin Hammarberg^a PhD

Gordon HW Baker^b PhD

^a Key Centre for Women's Health in Society, School of Population Health, The University of Melbourne, Victoria, Australia, 3010

^b University of Melbourne, Department of Obstetrics and Gynaecology, and Melbourne IVF Reproductive Services, Royal Women's Hospital, 132 Grattan Street, Carlton, Australia, 3053

This research was supported by a competitively awarded grant from The Bertarelli Foundation, seed funding from Melbourne IVF and an Australian Postgraduate Research Award to Karin Hammarberg

Reprint requests: Jane Fisher, Key Centre for Women's Health in Society, School of Population Health, The University of Melbourne, Victoria, Australia 3010

Fax: + 61 3 9347 9824

Email: jrwf@unimelb.edu.au

ABSTRACT

Objective: Australian women conceiving with ART are at fourfold risk of admission to early parenting treatment programs compared to those conceiving spontaneously. The study aimed to identify prevalence and determinants of antenatal mood disturbance and other risks for early parenting difficulties after assisted conception.

Design: A prospective longitudinal investigation from conception to 18 months postpartum using telephone interviews and self-report questionnaires.

Setting: Melbourne IVF and Royal Women's Hospital Reproductive Services, Victoria, Australia.

Patient(s): A consecutive cohort of English-speaking women with ultrasound-confirmed ART -conceived pregnancies.

Main outcome measure(s): Standardized psychometric measures of mood, quality of marital relationship, mother to fetus emotional attachment, and personality.

Intervention(s): None

Result(s): Of the 288 women with a confirmed pregnancy, 239 were contactable, 183 (77%) recruited and 95% completed both early and late pregnancy assessments. Participants were socioeconomically advantaged, had very good pregnancy health, exceptional marital relationships, normal personality styles and intense affectionate attachment to the fetus. Very few (< 5%) had clinically significant mood disturbance in late pregnancy.

Conclusions: There were low rates of antenatal mood disturbance and other risk factors for postpartum depression. Pregnancy and motherhood might be idealised after ART conception and preparation for the realities of infant care might then be insufficient.

INTRODUCTION

Fertility difficulties, the diagnosis of infertility and treatment with assisted reproductive technologies (ART) each have well documented psychological and social correlates for individuals and their intimate relationships (1). It is understandable that parents and clinicians might presume that the realisation of the goal of a conception, sustained pregnancy and birth of an infant will lead to a reduction in the psychological distress of infertility and perhaps to elevated mood. However, in Australia, women giving birth after conceiving with ART are four times more likely to be admitted with their babies to residential early parenting centres for treatment of mild to moderate maternal mood disturbance or unsettled infant behaviour than those conceiving spontaneously (2, 3). It is not known whether psychological functioning in pregnancy contributes to this elevated risk. As yet accurate prediction in pregnancy of individuals vulnerable to developing postpartum mood disorder is not possible (4), but one of the main risk factors for postpartum mood disturbance is pregnancy mood disorder (5). Mood in pregnancy is governed by a range of psychosocial factors, including whether or not the pregnancy is desired, quality of support from an intimate partner, socioeconomic status, personality and coincidental adverse events (5). A number of comparisons of the psychological aspects of pregnancy after assisted and spontaneous conceptions are available, but the evidence is inconsistent.

Anxiety

Similar general anxiety levels assessed by the State-Trait Anxiety Inventory (Spielberger, Gorsuch et al. 1983) have been found between women who have conceived spontaneously (SC) or with ART in both early (Klock and Greenfeld 2000) and late pregnancy (Stanton and Golombok 1993; McMahon, Ungerer et al. 1997). In contrast van Balen et al (1996) using single Likert scales found that women who had conceived with ART rated the experience of pregnancy as significantly *more stressful* than those who had conceived spontaneously. In qualitative interviews Bernstein et al (1994) reported that previously infertile pregnant women described higher anxiety and more compulsive checking for vaginal bleeding and frequent disturbing dreams than SC women. Hjelmstedt et al (2003) using the Karolinska Scales of Personality found that women conceiving with IVF had more *muscular tension*, although the significance of this was not discussed, and were more irritable than SC women. Although most concluded that anxiety levels were within the normal range, the proportion scoring above clinical cut off levels were not reported in these investigations.

McMahon et al (1997) found that specific anxieties as assessed by the Baby Schema Questionnaire (Gloger-Tippelt 1991) about foetal normality and survival; potential for childbirth to damage the infant and anticipatory anxiety about being separated from the baby were more common among women who had conceived with ART than spontaneously. In contrast Hjelmstedt et al (2003) who derived the Emotional Reactions to Pregnancy Scale from the Gloger-Tippelt instrument found that women conceiving with ART were less anxious about the health of the baby than SC women at 13 weeks gestation, but were more anxious about the potential to lose the pregnancy, although this decreased as pregnancy advanced.

Depression

There have been fewer comparisons of the prevalence of depression or low mood during pregnancy. Klock and Greenfeld (2000) found no differences between ART and SC groups in symptoms of depression in the first or third trimester measured on the Beck Depression Inventory (Beck, Ward et al. 1961). In contrast, using the Courtauld Emotional Control Scale (Watson and Greer 1983) McMahon et al (1997) found that the ART group was less likely than the SC group to report feelings of depression. Although Cox et al (2006) used the Hospital Anxiety and Depression Scale (Zigmond and Snaith 1983) they did not report the results of the depression subscale. Ulrich et al (2004) using psychoanalytic interviews found that women in both groups described themselves as being *rather depressed*, but did not quantify this in terms of severity or persistence of symptoms.

Self regard

The experience of infertility can have adverse effects on self esteem (Abbey, Andrews et al. 1992; Gibson, Ungerer et al. 2000) and it has been argued that infertility related low self esteem might persist in pregnancy (Cox, Glazenbrook et al. 2006). Neither Klock and Greenfeld (2000) who utilised the Rosenberg Self Esteem Scale (Rosenberg 1979) or Cox et al (2006) who used the Self Concept Questionnaire (Robson 1989) found differences in self esteem between ART and SC groups of pregnant women. Stanton and Golombok (1993) using the Childbearing Attitudes Questionnaire (Ruble, Brooks-Gunn et al. 1990) found no differences between the two groups in terms of self-confidence and formation of a maternal identity. In contrast Bernstein et al (1994) using the Tennessee Self-Concept Scale (Fitts 1965) found that in early pregnancy, women who had conceived with ART were more self critical and had more *fragile ego strength* than SC women.

Adjustment to pregnancy

Hjelmstedt et al (2003) found that the physical demands of pregnancy and the changes in body form were less problematic for an ART than a SC group. They were also less concerned about the sex of the foetus and about the potential losses associated with motherhood. Klock and Greenfeld (2000) found that compared to SC women, women who had conceived with IVF were more gratified to be pregnant and had significantly fewer concerns about the loss of independence and income associated with impending parenthood. Similarly Ulrich et al (2004) found that although the ART group had more antenatal medical complications and hospital admissions, they had fewer complaints about the pregnant state and McMahon et al (1999) that pregnancy was more *positive and fulfilling* and less uncomfortable than for the SC comparison groups. In direct contrast Bernstein et al (1994) found that the ART group used more frequent negative self descriptors including being *fat and bloated*, were more exhausted and had more *limbic pain*, (a concept that was not defined) than the SC group. Sandelowski et al (1990) using repeated in-depth interviews informed by grounded theory concluded that the formation of a pregnant identity was more complex for the ART than the SC group partly as a result of the earlier consciousness of the biological reality of conception.

Marital relationship

There is consistent evidence that the quality of relationship with an intimate partner is a determinant of mood in pregnant women (Scottish Intercollegiate Guidelines Network 2002). Hjelmstedt et al (2004) using the Barnett Scale (Barnett, Marshall et al. 1993) to assess satisfaction with a range of aspects of the marital relationship found no differences between ART and SC groups in pregnancy. Similarly Ulrich et al (2004) found that most participants were highly satisfied with their marital relationships and that although the ART group had a more traditional division of roles, there were no differences between groups in *appreciation of their partners* and marital contentment. In contrast Klock and Greenfeld (2000) using a modified form of a questionnaire designed by Belsky, Spanier et al. (1983) found lower levels of marital satisfaction in the ART than the SC group and Stanton and Golombok (1993) that the marital relationship was generally poorer and perceived more negatively by the ART than the SC group.

Antenatal attachment to the foetus

The formation of an emotional relationship between a mother and her growing foetus continues through pregnancy and is reflected in maternal protective and health behaviours. Neither Stanton and Golombok (1993) using the Maternal Fetal Attachment Scale (Cranley 1981) nor McMahon et al (1997) using the Antenatal Attachment Questionnaire (Condon 1993) found differences between ART and SC groups in antenatal emotional attachment.

However, Bernstein et al (1994) and McMahon et al (1999) found that women pregnant after ART delayed preparation of a room for the baby until late in the pregnancy and the latter group that they had *fewer conversations* with the foetus.

A particularly vulnerable sub-group?

Overall these investigators concluded that there were few differences in pregnancy psychological functioning between ART and SC groups and in most of these investigations the clinical significance of any differences that were found are not elaborated. There are however, some suggestions that a sub group of women might be vulnerable to psychological distress in pregnancy after ART. Stanton and Golombok (1993) (8) found that those with generally *negative attitudes to childbearing* had poorer maternal attachment scores. Bernstein et al. (1994) (11) suggest that in some women adjustment to pregnancy after ART is *problematic* because of the persistence of an *infertile* [sense of] *self*, leading to tentative acceptance of the pregnancy. Sandelowski et al. (1990) (18) suggested that SC women adapt rapidly to the notion of a self as pregnant, but that women conceiving with ART have prolonged uncertainty about whether pregnancy is real, high anticipation of failure and have had to tolerate intrusions into intimate experiences and disproportionate exposure to reproductive loss that are likely to influence pregnancy psychological functioning. McMahon et al. (1999) (17) found that women having two or more treatment cycles had significantly more anxiety about foetal health and development than those who had conceived in a first cycle.

While these investigations have begun to describe the psychological functioning in pregnancy of women conceiving with ART, the inconsistent findings might be attributable to methodological limitations. In most of these studies the sampling strategies including those described as *random* (8) were not described. None reported a power calculation to demonstrate that the sample was of adequate size to test the questions of interest. Several had very small samples: Bernstein et al. (1994) (11) investigated 5 women conceiving with IVF and Stanton and Golombok (1993) (8) 15. Different recruitment strategies were used for the ART and SC groups, including recruiting the latter group from single private practices which did not represent the whole pregnant population (6, 7, 17). Relevant groups were excluded such as: multiparae (10, 16), women younger than age 25 (8, 13, 16) or older than 36 (10) or those with multiple gestations (10, 16). None included women conceiving with donor gametes. In several of these studies recruitment rates from at least one of the eligible populations were relatively low (< 50%) (9, 13, 16). In some studies there were high rates of loss to follow up (>30%) between early and late pregnancy assessments (6, 13, 16).

Women with fertility problems are a sociodemographically and gynaecologically heterogeneous group and there is a wide range of intervals between when they decide to have a child and when they conceive. There is therefore no comparison group with which they can be accurately matched. It has been argued that the use of control groups is intrinsically problematic in research about the psychological impact of infertility and ART as few other adverse life events continue for the duration of infertility; have a comparable limited chance of resolution and involve invasive procedures (20). In most of the comparisons of pregnancy psychological functioning between ART and SC groups, there were significant between group differences in sample characteristics, which may have influenced the findings. These include in average level of education (6, 7, 13); average age (10); ethnic diversity (6) and socioeconomic status (6). In addition to differences between ART and SC groups in marital status (13), the ART participants had been married for significantly longer than SC participants in most studies (6, 7, 13). Apart from McMahon et al. (1999) (17) the extent of ART treatment was not assessed systematically nor controlled for in analyses, but the ART group had taken much longer to conceive (10) than the SC group.

The aim of this prospective longitudinal study was to describe the nature and determinants of antenatal mood; quality of mother to foetus attachment and intimate relationship and prevalence of risk factors for postpartum depression in an inclusive, consecutively recruited cohort of women conceiving after ART and compare them to the general childbearing population .

METHOD

The project was approved by the Research and Ethics Committee of the Royal Women's Hospital, the Freemason's Hospital Ethics Committee and the University of Melbourne's Human Research Ethics Committee.

Sample and recruitment

Australia's Medicare is a universal health care scheme which pays a proportion of costs incurred in approved medical treatments to all citizens. Medicare rebates are available for an unlimited number of ART treatment cycles. Although additional costs are levied by some services, these are covered in part for those with private health insurance and therefore infertility treatments are available and accessible to all. There is existing evidence that prevalence of mental health problems is no higher in populations seeking fertility treatment than in women of reproductive age (ref). Women are not excluded from fertility treatment on

the basis of mental health status. Melbourne IVF (MIVF) and the Royal Women's Hospital Reproductive Services (RWHRS) in Melbourne Australia are run by the same clinicians using the same protocols and together provide half the infertility treatment services for the Australian state of Victoria, and the patient group represents accurately the general population seeking fertility treatment in Australia (21).

The sample for this study was a consecutive cohort of women treated with ART in these services and having an ultrasound verified viable intrauterine pregnancy at six weeks gestation between July 1st and December 20th 2001. The only exclusion criterion was insufficient English language and literacy levels to complete questionnaires. It was decided in this study to compare participant characteristics with existing evidence about general populations of pregnant women almost all of whom will have conceived spontaneously rather than using a comparison group. The calculation of the sample size was based on a conservative estimate that the rate of admission to residential early parenting centres in the first postpartum year would be 2.5 times higher in the study population than among all women who gave birth in Victoria in 2002 (15% versus 6%). A sample of 144 was needed to detect this difference in admission rates with 95% power at the 5% level, using a 2-sided test based on a single proportion and, allowing for an attrition rate of 20%, 180 participants needed to be recruited.

Personally addressed letters of invitation, a plain language description of the study and a reply paid form to indicate willingness or not to participate were mailed to all women meeting the inclusion criteria. Two weeks later those who had neither declined nor accepted the invitation to participate were contacted by telephone. Participants were asked to consent to participate in a prospective longitudinal study involving repeated assessments and to permit information about fertility treatments to be retrieved from their medical records.

Materials

Data were collected by brief telephone interviews and structured self-report postal questionnaires in the first and third trimesters of pregnancy. Details of fertility treatments were retrieved from individual medical records.

Sociodemographic factors and fertility history

Sociodemographic factors including: age; marital, educational, occupational and health insurance status and fertility history were collected in a brief structured telephone interview.

Structured questionnaires

Structured fixed choice questions assessed: the experience of ART treatment in first trimester and pregnancy physical and emotional health, antenatal care, and beliefs and concerns about the impending birth in the third trimester.

Self-report psychometric measures

The questionnaires incorporated standardized, self-report psychometric instruments, some as repeated and some as single measures.

Mood

Mood was assessed on two measures in both early and late pregnancy. The Edinburgh Postnatal Depression Scale (EPDS) (22) is a 10-item self-report instrument developed to screen for non-somatic symptoms of depression in parturient women. It has now been validated for use in pregnancy, when it is known as the Edinburgh Depression Scale (EDS) with demonstrated high specificity (87%) and sensitivity (100%) for major depression when a cut-off of ≥ 12 is used. The Profile of Mood States (POMS) (23) is a 64-item mood adjective checklist which yields subscale scores on one positive (Vigour-Activity) and five negative (Anxiety-Tension, Depression-Dejection, Fatigue-Inertia, Anger-Hostility and Confusion-Bewilderment) dimensions of mood. A research concept of overall mood disturbance (Total Mood Score) can be calculated by deducting the positive score from the sum of the scores on the negative dimensions. It is designed specifically to assess normal mood variation in psychologically normal populations, in particular in response to intervening events, has been widely used in pregnancy and has clinical cut off scores (24-26).

Mother to foetus emotional attachment

The relationship between mother and unborn baby was assessed in both first and third trimesters of pregnancy. The Antenatal Attachment Questionnaire (AAQ) (27) assesses two dimensions of mother to foetus attachment on separate subscales, derived from factor analyses. The Time subscale captures the intensity of preoccupation and the amount of time spent talking to and thinking or dreaming about the foetus. The Quality subscale assesses the degree of tenderness, affection and protectiveness in the mother's thoughts about the foetus. The two subscale scores are added to produce a total attachment score. The AAQ was validated in a sample which included both primiparous and multiparous Australian women recruited from antenatal clinics at a teaching hospital; 42% of them were in professional or semi-professional occupations and all were partnered (27).

Quality of relationship with intimate partner

The perceived quality of relationship with the intimate partner was assessed in the first trimester by the Intimate Bonds Measure (IBM) (28). It is a 24-item Australian self-report measure, which examines two independent dimensions of perceived quality of relationship with partner: Care and Control. The IBM was formally validated against structured interviews with adults attending general practices about perception of both aspects of their intimate relationship.

Personality

The Vulnerable Personality Style Questionnaire (VPSQ) (29), is a brief measure of personality traits that may increase vulnerability to psychological morbidity at times of life change. It was developed through administration to a representative sample of 475 parturient Australian women recruited at a teaching hospital. Scores on the Vulnerability subscale, which includes worry, inhibition, sensitivity to the opinions of others and lack of assertiveness were significantly higher in women diagnosed with Major Depression and scoring in the clinical range on the EPDS than those who were not depressed. It was administered in early pregnancy

Data were analysed in SPSS v11.5. Univariate comparisons were made by Student's t-test, Chi-square and one way ANOVA and multivariate analysis was by linear regression.

RESULTS

Sociodemographic characteristics of the sample

In total 288 women had at least one ultrasound verified foetal heart beat at six weeks gestation. Of these 16 had insufficient English language and literacy to participate and the invitation was posted to the remaining 272 women. Of these 135 (50%) responded within two weeks and the remaining 137 were contacted by telephone by a designated clinic nurse to ascertain their intention to participate. Seventeen of these women had experienced pregnancy loss and in spite of repeated attempts a further 16 women could not be contacted. The potential sample was therefore 239 women, of whom 183 (77%) agreed to participate and 56 (23%) declined. Two women miscarried in the week following recruitment before the telephone interview, leaving a sample of 181 who completed the telephone interview, and two miscarried before the administration of the first questionnaire. Of the remaining 179 participants, 95% (176) returned the first questionnaire. Two women miscarried in the second trimester of pregnancy and of the 174 remaining, 170 (98%) returned the late pregnancy questionnaire. The questionnaires were completed at 16 (± 2.8) and 32 (± 2.3) weeks. As summarized in Table 1 there were no differences between participants and non-participants in nature or extent of fertility treatments.

Most participants (81%) were born in Australia or New Zealand. Their average age (SD) at recruitment was 34.3 ($\pm$ 4.2) years. Almost all participants (97%) were partnered: 161 (89%) married, 15 (8%) in de facto relationships, one of which was a same sex relationship and five (3%) were single. Those who were partnered had been in the intimate relationship for an average of 9.9 years (range 3 to 23 years). More than half of participants (56%) had a tertiary qualification, two-thirds (67%) were in professional employment, and a high proportion (79%) had private health insurance.

Compared with other Australian women in comparable age groups, participants were relatively socio-economically advantaged, with higher proportions having been born in Australia or New Zealand (81% versus 79%, $p < 0.01$) (30); tertiary qualifications (56% versus 29%, $p < 0.0001$) ; professional employment (67% versus 52%, $p < 0.0001$) (30); private health insurance (79% versus approximately 40%) (31) and purchasing rather than renting their homes (88% versus 66%, $p < 0.0001$) .

Cause of infertility and fertility treatments

The causes of infertility in this sample were similar to those of the overall population of couples treated for infertility in Australia and New Zealand at the time (see Table 2). More study participants reported that infertility was unexplained and fewer that it was attributable to multiple causes than the national data provided for all assisted conceptions by ART clinics. These differences in ascription might be attributable to differences in understanding and classification between consumers and clinicians, rather than to actual differences between the sample and the population.

Pregnancy health and health care

Participants' pregnancies were closely monitored. On average they attended 16 antenatal visits including for ultrasound scans. Overall significantly more underwent chorionic villus sampling or amniocentesis for foetal chromosomal abnormality (21%), than in the general population of Victorian pregnant women in 2002 (8%) ($p < 0.0001$). There was no difference in rates for women aged ≥ 37 years, but many more women aged < 37 years than in the general population underwent these procedures (13% versus 3.6%, $p < 0.0001$) (32). Although almost all (86%) reported very good general health in the pregnancy, one in seven (24/169, 14%) experienced at least one serious pregnancy complication including bleeding, pre-eclampsia, premature uterine contractions and placenta praevia. This was similar to the rate of reported pregnancy complications among all Australian and New Zealand women who conceived with ART in 2002 (13.2%, ns) (21). In addition, 25 (15%) participants reported less severe complications such as hyperemesis, abdominal pain and backache.

Mother to foetus emotional attachment in late pregnancy

Condon (1993) reported norms for the Antenatal Attachment Questionnaire only in late pregnancy and found that mother to foetus attachment increased as pregnancy advanced, in particular following quickening. Comparisons with these norms have therefore only been made for advanced pregnancy. In this cohort there were no associations between AAQ scores and health insurance or educational status, gravidity, parity, multiple gestation or experience of previous pregnancy loss. It was found that mothers thought more about and had a more intense emotional attachment to their foetus(es) in early pregnancy than the general population of mothers did in advanced pregnancy. These continued to grow and in advanced pregnancy participants spent significantly more time and had significantly more intense protective emotional attachments to their unborn baby(ies) than the normative sample (see Table 3).

Relationship with partner and personality

There were no associations between demographic and most obstetric factors and scores on the Intimate Bonds Measure. However, compared with women who were pregnant with a single foetus, those with a twin gestation had lower Care (28.8 versus 31.3, 95% CI 0.55 to 4.58, $p < 0.01$) and higher Control scores (5.5 versus 4.1, 95% CI -2.82 to -0.09, $p < 0.01$). These scores were still more optimal than population averages and may reflect that interactions between partners are influenced adversely by the additional emotional, financial and practical demands of a twin pregnancy (Fisher and Stocky, 2003). Overall participants perceived their intimate relationships as being of exceptionally high quality: significantly more affectionate, sensitive, trusting and companionable and less coercive, critical and domineering than in population norms.

There were no associations between demographic and obstetric factors and scores on the Vulnerability Personality Scale. There were no differences between the study cohort and the normative sample on the personality measure indicating that they were no more likely than women in general to worry, be unassertive or over eager to please others (29) (see Table 4).

Maternal mood

In this relatively homogeneous cohort mood was not associated with health insurance or educational status or with gravidity, parity, previous pregnancy loss or multiple gestation. It was striking that in general participants reported very little mood disturbance in either early or late pregnancy (See Tables 5 and 6). This was reflected both in significantly lower average

scores indicating less mood disturbance on the Profile of Mood States subscales measuring self-reported anxiety, depression, irritability, fatigue and overall mood disturbance than in existing data derived from a spontaneously conceiving group of multiparous Australian women (Kermode et al, 2000). In addition participants reported significantly better functional efficiency (POMS Vigour Activity subscale). Similarly the average scores on the Edinburgh Depression Scale were significantly lower than in comparison studies of socially and culturally similar Australian and English cohorts at similar gestational age. On the Profile of Mood States subscales <10% scored in the clinical range except on the Fatigue-Inertia and Vigour–Activity subscales and only one participant scored in the clinical range of ≥ 15 on the Edinburgh Depression Scale in late pregnancy (See Tables 5 and 6). Given this, it was not possible to identify risk factors for clinically significant depression and anxiety in advanced pregnancy in this group. In order to identify factors assessed in early pregnancy which contributed to mood in advanced pregnancy, the relationship between post-secondary education, health insurance status, quality of intimate partner relationship, reproductive factors, a vulnerable personality style, early pregnancy anxious (POMS Tension-Anxiety subscale) and depressive (EDS score) mood symptoms and EDS scores in late pregnancy were examined. In univariate analyses higher EDS scores in late pregnancy were associated with higher early pregnancy EDS ($r^2 = 0.47$, $p < 0.01$); IBM Control ($r^2 = 0.20$, $p < 0.05$); VPS Vulnerability ($r^2 = 0.32$, $p < 0.01$); POMS Tension-Anxiety subscale ($r^2 = 0.42$, $p < 0.01$) and lower IBM Care ($r^2 = -0.17$, $p < 0.05$) scores. In linear regression analysis this constellation of variables explained 26% of the variance (adjusted $r^2 = 0.26$) but only EDS score in early pregnancy made a significant independent contribution to higher late pregnancy EDS scores (See Table 7).

DISCUSSION

This study has considerable methodological strengths in comparison to existing research in the field. The sample was accurately representative in terms of age, gravidity, multiplicity, parity, and health insurance status of women treated for infertility in Australia and large enough to detect the outcomes of interest. Forms of treatment, including conception with donor gametes were accurately representative of the population treated at the service. Both recruitment and retention rates were higher than in all previous investigations. Data were collected using standardized measures with relevant population norms for comparison.

The limitations were that non-English speaking women were not included and that although mood in pregnancy was assessed carefully, past psychiatric history was not ascertained directly. Comparison data was derived from populations that were broadly representative of the community and this sample was more highly educated, socioeconomically advantaged and likely to be partnered than the general Australian population of pregnant women. The differences we found might reflect these sociodemographic factors rather than mode of

conception. However, within the group sociodemographic differences did not contribute to variance in outcome measures. Overall therefore, we argue that these findings can be generalized with reasonable confidence to English speaking populations of women treated for infertility in high-income countries.

In a comprehensive review Hendrick et al. (1998) (33) concluded that approximately 10% of pregnant women in the industrialized world experienced major depression and that the highest level of psychological symptoms occurred in the third trimester. The striking finding of this study is that there are exceptionally low rates of self-reported symptoms of anxiety, depression or other mood disturbance ascertained both in average scores and in proportion scoring in the clinical range on standardized measures of mood in both early and late pregnancy in this cohort of women conceiving with assisted reproductive technologies. In contrast to the previous investigations in this field which reported merely that there were no differences between SC and ART groups (6-8) we have found that women conceiving with ART report significantly better pregnancy mental health in terms of mood disturbance, quality of relationship with the intimate partner and emotional attachment to the baby than general populations of pregnant women, almost all of whom will have conceived spontaneously. We propose two interpretations of these findings.

First, in this group there were high rates of the psychosocial factors which are protective for perinatal mood disturbance. The group was disproportionately highly educated and socioeconomically advantaged. Intimate relationships were experienced as sensitive, supportive and affectionate with low rates of coercive criticism. It is also possible that in being of older than average age at the time of pregnancy participants had secure housing and employment. The pregnancies were actively sought and highly desired.

Second however it is possible that this low rate of distress is reflecting an almost elated mood in which the pregnant state and family formation achieved after a long period of anticipation and via intrusive and disruptive interventions are somewhat idealized. Evidence for this interpretation is the remarkably low rates of mood disturbance, high ratings of general health, intense and sustained protective and affectionate preoccupation with the foetus and perception of the marital relationship as exceptionally affectionate, sensitive and supportive. Psychoanalytic observers and subsequent investigators report an increase in anticipatory anxiety in advanced pregnancy which is interpreted as normal and serving a positive function in preparing women for a major life transition (34, 35) The lack of self-reported anxiety in either early or late pregnancy in this group is striking and might indicate

an expectation that the transition to parenthood will be unproblematic and that the experience of caring for an infant will be entirely gratifying.

It has been suggested (11) that a small sub group of women do find adjustment to pregnancy after ART more difficult. There was some evidence for this proposition in that the small group of women whose scores were in the clinical range on the EDS in late pregnancy were more likely than others to have had an elevated score in early pregnancy. However, specific reproductive, social or psychological risk factors were not identified and it might be that this group have longstanding mood disturbance that preceded pregnancy. It would appear that the most accurate means of identifying this group is to use a brief screening measure of mood disturbance like the EDS in early pregnancy.

Overall, given that pregnancy mood disturbance is consistently found to be a risk factor for postpartum depression, these findings indicate that there would be negligible postnatal mood disturbance or adjustment difficulties in women conceiving with ART. The consistent finding of an elevated rate of admission to early parenting centres with mild to moderate mood disturbance in women conceiving with ART is therefore perplexing and likely to be attributable to events occurring during childbirth or in the early postpartum period, rather than during pregnancy. Covington and Burns (36) assert that moving from having an 'infertile identity' to a 'maternal identity' is particularly psychologically demanding and it might be that this shift is not fully realised until the baby is born. Ambivalence is normal in mothers of newborns as they accommodate the permanence of the life change that has occurred and the losses to occupational identity, personal liberty, autonomy, social and leisure activities and bodily integrity that it entails. It is possible that a woman who has conceived under the much more difficult circumstances of ART feels a low sense of entitlement to complain or to express any doubts, uncertainty or mixed feelings about the realities of motherhood. Expression of uncertainty is an important mechanism in eliciting social support and it is possible that in having few doubts or complaints about the pregnant state or the desire for motherhood, women conceiving with ART receive less social support than those conceiving spontaneously. Greenfeld et al. (37) concluded that women conceiving after IVF might need greater support in pregnancy. However, the findings of this study suggest that these women feel well-supported, but that perhaps opportunities to engage in realistic appraisal of the demands as well as the delights of motherhood, including permission to complain and express ambivalence and uncertainty might be useful in promoting optimal postpartum adjustment.

References

1. Greil AL. Infertility and psychological distress: a critical review of the literature. *Soc Sci Med* 1997; 45: 1679-704.
2. Fisher JRW, Hammarberg K, Baker HWG. Assisted conception is a risk factor for postnatal mood disturbance and early parenting difficulties. *Fertil Steril* 2005; 84: 426-30.
3. Fisher JRW, Feekery CJ, Amir LH, Sneddon M. Health and social circumstances of women admitted to a private mother baby unit. *Aust Fam Physician* 2002; 31: 966-71.
4. Austin M-P, Lumley J. Antenatal screening for postnatal depression: a systematic review. *Acta Psychiatr Scand* 2003; 107: 10-7.
5. Scottish Intercollegiate Guidelines Network: Postnatal depression and puerperal psychosis A national clinical guideline. Edinburgh: SIGN Executive, 2002.
6. Klock S, Greenfeld DA. Psychological status of in vitro fertilization patients during pregnancy: a longitudinal study. *Fertil Steril* 2000; 73: 1159-64.
7. McMahon CA, Ungerer JA, Beaurepaire J, Tennant C, Saunders D. Anxiety during pregnancy and fetal attachment after in-vitro fertilization conception. *Hum Reprod* 1997; 12: 176-82.
8. Stanton F, Golombok S. Maternal-fetal attachment during pregnancy following in vitro fertilization. *J Psychosom Obstet Gynecol* 1993; 14: 153-8.
9. van Balen F, Naaktgeboren N, Trimbos-Kemper TCM. In-vitro fertilization: the experience of treatment, pregnancy and delivery. *Hum Reprod* 1996; 11: 95-8.
10. Hjelmstedt A, Widström A-M, Wramsby H, Matthiesen A-S, Collins A. Personality factors and emotional responses to pregnancy among IVF couples in early pregnancy: a comparative study. *Acta Obstet Gynecol Scand* 2003; 82: 152-61.
11. Bernstein J, Lewis J, Seibel M. Effect of previous infertility on maternal-fetal attachment, coping styles and self-concept during pregnancy. *J Women's Health* 1994; 3: 125-33.
12. Hjelmstedt A, Widström A-M, Wramsby H, Collins A. Patterns of emotional responses to pregnancy, experience of pregnancy and attitudes to parenthood among IVF couples: a longitudinal study. *J Psychosom Obstet Gynecol* 2003; 24: 153-62.
13. Ulrich D, Gagel DE, Hemmerling A, Parstor V-S, Kentenich H. Couples becoming parents: something special after IVF? *J Psychosom Obstet Gynecol* 2004; 25: 99-113.
14. Abbey A, Andrews FM, Halman JL. Infertility and subjective well-being: the mediating roles of self-esteem, internal control, and interpersonal conflict. *Journal of Marriage and the Family* 1992; 54: 408-17.
15. Gibson FL, Ungerer JA, Tennant CC, Saunders DM. Parental adjustment and attitudes to parenting after in vitro fertilization. *Fertil Steril* 2000; 73: 565-74.
16. Cox SJ, Glazenbrook C, Sheard C, Ndukwe G, Oates M. Maternal self-esteem after successful treatment for infertility. *Fertil Steril* 2006; 85: 84-9.
17. McMahon CA, Tennant C, Ungerer JA, Saunders D. 'Don't count your chickens': A comparative study of the experience of pregnancy after IVF conception. *Journal of Reproductive and Infant Psychology* 1999; 17: 345-56.
18. Sandelowski M, Harris B, Holditch-Davis D. Pregnant moments: The process of conception in infertile couples. *Res Nurs Health* 1990; 13: 273-82.
19. Hjelmstedt A, Widström A-M, Wramsby H, Collins A. Emotional adaptation following successful in vitro fertilization. *Fertil Steril* 2004; 81: 1254-64.

20. Hearn MT, Yuzpe AA, Brown SE, Casper RF. Psychological characteristics of in vitro fertilization participants. *Am J Obstet Gynecol* 1987; 156: 269-74.
21. Bryant J, Sullivan EA, Dean JH. Assisted reproductive technology in Australia and New Zealand 2002 AIHW Cat. No. PER 26. Sydney: AIHW National Perinatal Statistics Unit, 2004.
22. Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression: Development of the Edinburgh Postnatal Depression Scale. *Br J Psychiatry* 1987; 150: 782-6.
23. McNair D, Lorr M, Droppleman L. Manual of the Profile of Mood States. San Diego: Educational and Industrial Testing Service, 1971.
24. Condon JT, Esuvaranthan V. The influence of parity on the experience of pregnancy: a comparison of first- and second-time expectant couples. *Br J Med Psychol* 1990; 63: 369-77.
25. Fisher J, Smith A, Astbury J. Private health insurance and a healthy personality: new risk factors for obstetric intervention? *J Psychosom Obstet Gynecol* 1995; 16: 1-9.
26. Kermode M, Fisher J, Jolley D. Health insurance status and mood during pregnancy and following birth: a longitudinal study of multiparous women. *Aust N Z J Psychiatry* 2000; 34: 664-70.
27. Condon JT. The assessment of antenatal emotional attachment: development of a questionnaire instrument. *Br J Med Psychol* 1993; 66: 167-83.
28. Wilhelm K, Parker G. The development of a measure of intimate bonds. *Psychol Med* 1988; 18: 225-34.
29. Boyce P, Hickey A, Gilchrist J, Talley NJ. The development of a brief personality scale to measure vulnerability to postnatal depression. *Archives of Women's Mental Health* 2001; 3: 147-53.
30. ABS. 2001 Census of population and housing. Canberra: Australian Bureau of Statistics, 2003.
31. ABS. Health insurance survey, Australia, Aus Stats 4335.0. Canberra: Australian Bureau of Statistics, 1999.
32. Muggli E, Halliday J. Report on Prenatal Diagnostic Testing in Victoria 2002. Victorian Perinatal Data Collection Unit, Victorian Government Department of Human Services, 2003.
33. Hendrick V. Evaluation of mental health and depression during pregnancy. *Psychopharmacol Bull* 1998; 34: 297-9.
34. Deutsch H: *The Psychology of Women. A Psychoanalytic Interpretation*, Vol 12; *Motherhood*, Vol. 2. New York: Grune&Stratton, 1945.
35. Astbury J. The crisis of childbirth: can information and childbirth education help? *J Psychosom Res* 1980; 24: 9-13.
36. Covington SN, Hammer Burns L: *Pregnancy after infertility*. In: Burns LH, Covington SN, eds. *Infertility counselling: A comprehensive handbook for clinicians*. Pearl River, New York: The Parthenon Publishing Group, 1999; 425-47.
37. Greenfeld DA, Ort SI, Greenfeld DG, Jones EE, Olive DL. Attitudes of IVF parents regarding the IVF experience and their children. *J Assist Reprod Genet* 1996; 13: 266-74.
38. Dean JH, Sullivan EA. Assisted conception in Australia and New Zealand 2000 and 2001, AIHW Cat. No. PER 22. Sydney: Australian Institute of Health and Welfare National Perinatal Statistics Unit, 2003.
39. Evans J, Heron J, Francomb H, Oke S, Golding J. Cohort study of depressed mood during pregnancy and after childbirth. *BMJ* 2001; 323: 257-60.

Table 1 Comparison of ART treatment between participants and non-participants

	Participants n =183	Non- participants n = 56	95% CI for the difference	p-value
Mean ± sd initiated treatments cycles	2.1 ± 1.4	2.4 ± 1.9	-0.78 to 0.15	ns
Mean ± sd initiated thaw cycles	2.0 ± 2.2	2.2 ± 2.2	-0.70 to 0.58	ns
Mean ± sd embryo transfers	3.5 ± 2.6	4.0 ± 3.1	-1.34 to 0.33	ns
ICSI %	54	63		ns
Donor gametes %	9	7		ns
Previous ART birth %	16	25		ns
Multiple gestation %	20	19		ns

Table 2 Comparison between study participants and all Australian and New Zealand women conceiving with ART in 2000

	Study sample (n=181)	Australasian ART conceptions 2000¹ (n=5466)	p-value
Female cause of infertility (%)	31	30	ns
Male cause of infertility (%)	31	30	ns
Multiple causes of infertility (%)	8	25	<0.001
Unexplained cause of infertility (%)	30	15	<0.001
ICSI (%)	54	48	ns
Primigravida (%)	44	51	ns
Nulliparous (%)	70	76 ²	ns
Multiple gestation (%)	20	22.1	ns

¹ Dean and Sullivan (38)

² Sullivan E, Director National Perinatal Statistics Unit (personal communication) Parity of women delivering babies of at least 20 weeks gestation following ART in 2002

Table 3 Antenatal Attachment Questionnaire scores and comparison with existing data

	Early pregnancy n = 176	Late pregnancy n=166	Comparison¹ n=112	95% CI for the difference in late pregnancy
AAQ Quality mean	50.2 ± 4.2	51.4 ± 3.1	49.2 ± 4.9	1.76 to 2.69**
AAQ Time mean	27.9 ± 4.6	29.9 ± 4.0	26.5 ± 4.8	2.78 to 4.02**
AAQ Total mean	78.1 ± 7.9	81.3 ± 6.1	75.7 ± 8.1	4.69 to 6.56**

¹Condon (27) Mean scores at 32 weeks gestation

** p<0.0001

Table 4 Comparison of IBM and VPSQ scores

	Early pregnancy Mean $\pm$ sd (n=170)	Comparison Mean $\pm$ sd	95% CI for the difference
IBM Care	30.8 $\pm$ 5.5	27.1 $\pm$ 8.3 ¹	2.9 to 4.6**
IBM Control	4.4 $\pm$ 3.7	9.6 $\pm$ 7.1 ¹	-5.8 to -4.7**
VPS Vulnerability	15.1 $\pm$ 3.9	14.8 $\pm$ 4.9 ²	-0.33 to 0.85

¹ Wilhelm and Parker (28)

² Boyce et al. (29)

** p<0.0001

Table 5 Profile of Mood States scores and comparison with existing data

Sub-scales	Early pregnancy Mean $\pm$ sd n = 176	Comparison Mean n=175 ¹	95% CI for the difference	% in clinical range ²	Late pregnancy Mean $\pm$ sd n = 163	Comparison Mean n =175 ¹	95% CI for the difference	% in clinical range ²
Tension – Anxiety	8.1 $\pm$ 5.5	9.5	-2.2 to -0.6*	3% > 19	8.4 $\pm$ 4.7	8.5	-1.8 to -0.3*	4% > 19
Depression – Dejection	4.9 $\pm$ 6.6	8.9	-4.9 to -3.0**	3% > 22	4.8 $\pm$ 5.2	6.8	-2.9 to -1.3**	1% > 22
Anger – Hostility	4.7 $\pm$ 5.0	8.9	-4.9 to -3.4**	7% > 13	4.0 $\pm$ 3.9	7.2	-3.9 to -2.6**	2% > 13
Vigour – Activity [#]	13.8 $\pm$ 5.9	10.4	2.5 to 4.2**	25% < 11	13.4 $\pm$ 5.8	10.8	1.7 to 3.5**	33% < 11
Fatigue – Inertia	13.1 $\pm$ 6.5	15.8	-3.7 to 1.7**	49% >12	13.1 $\pm$ 6.6	15.1	-3.0 to -1.0**	52% >12
Confusion - Bewilderment	6.7 $\pm$ 4.0	8.1	-1.9 to -0.8**	8% > 12	7.4 $\pm$ 3.8	7.5	-0.7 to 0.5	9% < 12
Total POMS	23.8 $\pm$ 25.2	40.7	-20.7 to -13.2**	4% >72	24.3 $\pm$ 23.2	35.4	-14.7 to -7.5**	2% > 72

¹Kermode et al. 2000 (26) Privately insured Australian multiparous women assessed in first and third trimester of pregnancy

²McNair et al. 1971 (23)

*p<0.01

**p < 0.001

Higher scores indicate better functioning

Table 6 Edinburgh Depression Scale scores and comparison with existing data

	Early pregnancy n=176	Comparison¹ n=12,059	95% CI for the difference	Late pregnancy n=168	Comparison¹ n=11,968	95% CI for the difference
EDS mean $\pm$ sd	6.55 $\pm$ 4.16	6.99 $\pm$ 4.87	-1.06 to 0.17	6.05 $\pm$ 3.74	7.07 $\pm$ 5.08	-1.59 to -0.45*
Score $\geq$ 13 n (%)	14 (7.9)	1676 (13.9) *		7 (4.2)	1819 (15.2) **	
Score $\geq$ 15 n (%)	9 (5.1)	N/A		1 (0.5)	N/A	

¹Evans et al. (39) British community cohort assessed at 18 and 32 weeks gestation

* p<0.05

** p<0.0001

Table 7 Factors associated with higher EDS scores in late pregnancy

Factor	β	p	95% CI
EDS in early pregnancy	0.29	<0.0001	0.14 to 0.42
IBM Care	-0.03	0.56	-0.13 to 0.07
IBM Control	0.06	0.43	-0.09 to 0.21
VPS Vulnerability	0.14	0.06	-0.007 to 0.28
POMS Tension-Anxiety	0.11	0.06	-0.003 to 0.29

Minerva Access is the Institutional Repository of The University of Melbourne

Author/s:

Fisher, Jane R. W.;HAMMARBERG, KARIN;Baker, Gordon H. W.

Title:

Antenatal mood and fetal attachment after assisted conception

Date:

2007

Citation:

Fisher, J. R. W., Hammarberg, K., & Baker, G. H. W. (2008). Antenatal mood and fetal attachment after assisted conception. *Fertility and Sterility*, 89(5), 1103-1112.

Publication Status:

In Press

Persistent Link:

<http://hdl.handle.net/11343/34951>