Do Lunar Phases Affect Conception Rates in Assisted Reproduction?

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Objectives: To assess the effect of the phases of the moon on pregnancy rates in humans following in-vitro fertilization (IVF) and intracytoplasmic sperm injection (ICSI) treatment.

Design: Retrospective, observational study.

Setting: Reproductive Medicine Unit, Liverpool Women's Hospital.

Patient: Complete data for all women undergoing assisted conception procedures over a period of 13 years (1995–2002).

Intervention: Assisted conception procedures-IVF and ICSI.

Main outcome measures: Biochemical pregnancy that is positive pregnancy test result following embryo transfer.

Results: There was no significant effect of any lunar phase on the incidence of biochemical pregnancy (p -value 0.71). Age of the woman significantly affects the chances of pregnancy, (OR 0.95, 95% CI 0.91, 0.998, and p -value 0.04). The chances of pregnancy rises significantly with increase in the number of embryos replaced from 1 to 2 (OR 2.97, CI 1.36, 6.48, and p -value 0.01).

Conclusion: Pregnancy rates in humans, following assisted conception, appears to be independent of the effect of the lunar phase during which embryo transfer is carried out.

KEY WORDS: Assisted conception; embryo transfer; lunar phase; new moon.

INTRODUCTION

As the moon orbits the earth, it reflects solar light that reaches its maximum at the time of the full moon and decreases thereafter. The gravitational force exerted by the moon on ocean tides is also strongest during this phase (1). Studies on the spawning activity in *Fundulus heteroclitus* fish (mummichogs) have shown peaks in the sperm index in males, and

increasing serum progesterone in females, suggesting increased spawning activity during the full moon phase (2). Lunar phase dependent, nocturnal periodicity for oestrus (mating) behaviour is also well documented in cattle (3,4).

Water constitutes 80% of the human body and, it has been the belief that the effect of lunar tidal pull may contribute to the cyclical changes within it (1). One study has suggested a synchronous relationship between the menstrual cycle and the lunar rhythm, showing that large proportions of women menstruate around the new moon (5). This would coincide with ovulation and an increased likelihood of conception around the time of the full moon phase (2 weeks after the new moon). Another study suggests human fertility to have been originally in some degree of synchrony with the lunar cycle (6). There

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Table 1. Patient Characteristics, Procedures, and Outcomes in Different Phases of the Moon. Values are Numbers (%) Unless Stated Otherwise

	New moon (N = 186)	First quarter (N = 175)	Full moon (N = 203)	Last quarter (N = 157)
Age years (SD)	33.9 (3.9)	33.9 (3.9)	34.1 (4.2)	34.2 (4.0)
Number of embryos (%)				
1	15 (8.1)	17 (9.7)	22 (10.8)	18 (11.5)
2	86 (46.2)	76 (43.4)	99 (48.8)	74 (47.1)
3	85 (45.7)	82 (46.9)	82 (40.4)	65 (41.4)
IVF (%)	107 (57.5)	121 (69.1)	118 (58.1)	98 (62.4)
ICSI (%)	86 (46.2)	55 (31.4)	90 (44.3)	62 (39.5)
Biochemical pregnancies, number (%)	56 (30.1)	45 (25.7)	51 (25.1)	36 (22.9)

are historical records of Claudius Ptolemy, in the 2nd Century AD advising farmers to “direct the copulation of their flocks and herds...” during the full moon phase for a profitable outcome (7). More recently, this claim has been endorsed in a study based on the lunar effect on the fertility in two thoroughbred stud farms over a period of 9 years (8). Several studies have been performed on spontaneous childbirth in relation to various lunar phases. An analysis of nearly 6 million births, found that more births occurred between the last quarter of the moon and the new moon, and fewer in the first quarter of the moon (9). Another study examining full-term spontaneous deliveries found a significant clustering of births in multigravid women around the full moon phase. No similar relationship was seen in primigravidae (10).

There appears to be a seasonal variation in the pregnancy rates following assisted reproduction with a slightly higher chance of success in the month of July (11). Recent study conducted by Weigert *et al.* (12) investigated the effect of the lunar cycle on in-vitro fertilization (IVF) outcome. The study covered a period of 7 years and concluded a borderline increase in pregnancy rates during the perigee. However, it is known that due to regression of the moon on its elliptical orbit, the points of apogee and perigee circle round the earth once every 9 years (8).

This retrospective, observational study included data from 13 years to smooth out the effects of such calendar-generated artefacts.

MATERIALS AND METHODS

Data was collected from the clinical data book from the Reproductive Medicine Unit, Liverpool Women's Hospital. Complete data for assisted conception techniques [i.e. IVF and intracytoplasmic sperm injection (ICSI)] over a period of 13 years,

from the year 1990 to 2002 were included. Data regarding embryo transfers during the four primary phases of the moon—new moon, first quarter, full moon and the last quarter—were collected. The dates for the phases of the moon were obtained from the Internet (13). The biochemical pregnancy test result after embryo transfer was used as the outcome measure.

Demographics and outcome of the embryo transfers, during the full moon phase were compared to the other moon phases. The age of the women, number of embryos replaced, and procedure (IVF or ICSI) undertaken, were compared by calculating the means (of normally distributed continuous variables), or percentages (of parametric variables). Continuous variables were compared using the independent samples *t*-test, and categorical variables were compared using Pearson's chi-square test (Fisher's exact test, if any expected values were <5). Forward stepwise logistic regression was performed to determine the variables that were significant predictors of pregnancy. The statistical analyses were

Fig. 1. The distribution of number of embryos transferred during each lunar phase.

Fig. 2. The age distribution of the patients in the study.

performed using STATA version 7.0 and Confidence Interval Analysis version 2.0.0.

RESULT

During the study period from 1990 to 2002 (13 years), 9,684 embryo transfers (fresh and frozen) have been carried out in our unit. From these, the records of embryo transfers carried out on the first day of the four lunar phases—new moon, first quarter, full moon, and last quarter—were selected for the study. A total of 744 such records were identified. Of these, 721 complete records were included in the study and 23 were excluded as incomplete. Of the 721 records, 186 women had embryo transfer during the new moon phase, 175 in the first quarter, 203 women underwent embryo transfer in the full moon, and 157 in the last quarter of the lunar phase.

Table I shows that the distributions of age in the women who had embryo transfer during the four moon phases under consideration were similar, as were the percentage of women who had IVF or ICSI during these phases. The percentages of women who had a positive pregnancy test in each lunar phase were comparable (i.e. 30.1 in the new moon, 25.7 during the first quarter, 25.1 in the full moon phase, and 22.9 in the last quarter respectively) (Table I).

There was a uniform distribution of the number of embryos transferred during each of the lunar phases under scrutiny (Fig. 1), transfer of two embryos being the most common practice. Figure 2 shows a normal distribution of the age groups of women in both the pregnant and nonpregnant groups. Women who did not become pregnant were on average 1-year older, with a mean (SD) of 34.3 (4.17), than those who became pregnant (mean (SD) 33.3 (3.45)). This difference was statistically significant ($p = 0.007$). A sharp

Table II. Compares the Characteristics of Women with Positive and Negative Pregnancy Tests. Unless Specified Otherwise, Entries Refer to Number (%) and p -Values are Obtained from Pearson's Chi-Square Tests

	Not pregnant ($N = 533$)	Pregnant ($N = 188$)	Difference (95% CI)	p -Value (χ^2 test)
Age mean (SD)	34.3 (4.17)	33.3 (3.45)	0.9 (0.25, 1.58)	0.007*
Number of embryos				
1	64 (12.0)	8 (4.3)	7.8 (3.1, 11.4)	0.003
2	234 (43.9)	101 (53.7)	-9.8 (-17.9, -1.5)	
3	235 (44.1)	79 (42.0)	2.1 (-6.2, 10.1)	
IVF	325 (61.0)	119 (63.3)	-2.3 (-10.1, 5.8)	0.574 (ns)
ICSI	217 (40.7)	76 (40.4)	0.3 (-7.9, 8.3)	0.945 (ns)
Lunar phase				
Full moon	152 (28.5)	51 (27.1)	1.4 (-6.3, 8.5)	0.479 (ns)
New moon	130 (24.4)	56 (29.8)	-5.4 (-13.1, 1.8)	
First quarter	130 (24.4)	45 (23.9)	0.5 (-7.0, 7.2)	
Last quarter	121 (22.7)	36 (19.1)	3.6 (-3.5, 9.8)	

Note. ns = not significant.

*Independent samples t -test.

Table III. Significant Variables in Logistic Regression Model (Multivariate Analysis)

	Coefficient	SE (coefficient)	OR (95% CI)	<i>p</i> -Value
Age	-0.05	0.02	0.95 (0.91, 0.998)	0.040
Number of embryos				
2	1.09	0.40	2.97 (1.36, 6.48)	0.011
3	0.94	0.40	2.56 (1.17, 5.59)	

decrease in the likelihood of pregnancy is seen with increase in age of 40 years or more (Table II).

To explore any relationship between a positive pregnancy test and other variables, a forward logistic regression model was used. The significant variables in the model were age, and the number of embryos transferred. The chance of pregnancy increased by nearly three times with transfer of two embryos instead of one (OR 2.9, 95% CI 1.36–6.48) (Table III).

DISCUSSION

This study failed to show any statistically significant difference in the likelihood of pregnancy as a result of embryo transfer following IVF or ICSI treatment in relation to the lunar phases. Multivariate analysis confirmed that the only variables, which had an effect on conception rates, were the age of the woman and the number of embryos transferred (Table III).

Our results did not concur with the small positive influence during the perigee shown in a previous study (12). This could be explained by the effect of apogee and perigee (that circle round the earth every 9 years) being nullified as this study covered a period of 13 years as opposed to the 7-year study period of the previous study. It is also possible that conception under controlled conditions i.e. in vitro negate any effect the moon may have on human conception.

The full moon has been shown to have a positive influence on the outcome of artificial insemination in

cattle (14). A similar study of couples undergoing intrauterine insemination in a natural menstrual cycle may provide an answer to any lunar effect on human conception.

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