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Original article

Seasonal variability in the pregnancy rate of women undergoing Intracytoplasmic Sperm Injection Technique

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Abstract

Background: It is evident that seasonal changes can affect the function of animal reproductive system, and human reproductive system is no exception in this regard. These changes can be attributed to the effect of light during different seasons, especially on the reproductive system of females. There are, on the other hand, many reports that indicate no significant relation between seasons and the fertility rate of pregnancy and implantation. The aim of the present study was to clarify different views in case of seasonal effects on the rate of fertility and pregnancy.

Methods: The present study was conducted on 1287 couples at the Infertility Center, Babol University of medical sciences. The couples received embryos after intracytoplasmic sperm injection (ICSI) was included in the study. The participants were divided into five groups based on their age (18-23, 24-28, 29-33, 34-38 and 39-43). The level of significance was set at $p < 0.05$.

Results: Women who received embryos were between the age range of 18 and 43. It should be mentioned that the range of pregnancy in different seasons was different, and that the maximum number of pregnancies happened in autumn. Most pregnancies happened in 28 to 33 year olds. The quality of embryos was better in autumn than other seasons.

Conclusion: The results indicated that seasonal changes can have an effect on the pregnancy rate through ICSI technique.

Keywords: Season, Pregnancy rate, ICSI

Introduction

It is known that seasonal changes can affect different aspects of human life. Changes in seasons can cause changes in food supply, temperature, the rate of rain, and light. These changes can affect different aspects of human life like the reproductive system and the fertility (1). As the fertility rate in human varies throughout the year due to unknown reasons, the question is as to whether seasonal changes can have good or bad effects on the fertility. If so, we can arrange to do ART in optimal months (2). There is no doubt that seasonal changes can affect the reproductive system of animals, and that the human reproductive system is no exception, although human sexual activity is not limited to a particular season (2). Many studies have shown that the rate of fertility and birth decrease, not only in animals but also in human beings, in warm places during spring (3, 4). The quality of semen, the sperm count, the rate of ovulation, and the function of endometrium can decrease during summer compared with those in winter (5). These changes can be

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attributed to the effect of light during different seasons, especially on the reproductive system of females. (6). There are various views on the effect of season on the human reproductive system. Some studies have reported no significant seasonal effects on the sperm parameters (count, motility, morphology). The decrease in sperm parameters have been reported when the body temperature increased artificially to the extent that it resembled the temperature in summer (7).

Studies on animals like cows have shown that the heat stress of summer can cause a decrease in the fertility rate, which is due to the damage to the ovum (8). These findings show that the mammalian ovum, in its different stage of follicular growth, is susceptible to heat stress damage (9). In contrast, there are many reports that indicate no significant relationship between the seasonal changes and the fertility rate of pregnancy and implantation (2). According to different views on the effect of seasonal changes on the rate of fertility and pregnancy, we strove to conduct this study to investigate the effect of seasonal changes on the rate of pregnancy after embryo transferring was performed through an ICSI method.

Materials and Methods

This retrospective study was performed at the Infertility and Reproductive Health Research Center, affiliated with Babol University of Medical Sciences. The study was conducted on patients who received embryo after ICSI over the period between 2010 and 2014.

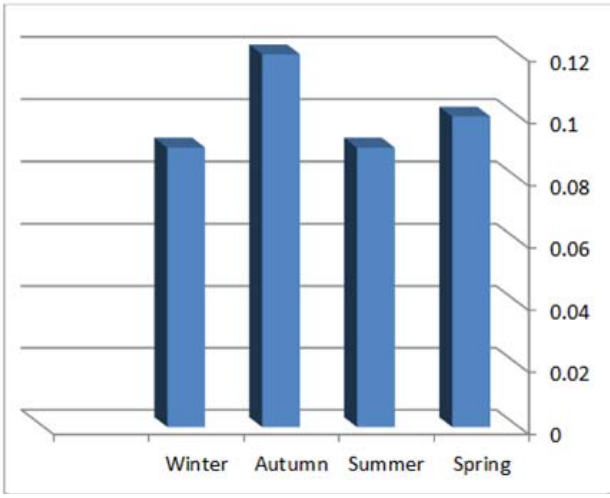

Fig 1.: Maximum pregnancy rate was observed in autumn after embryo transfer.

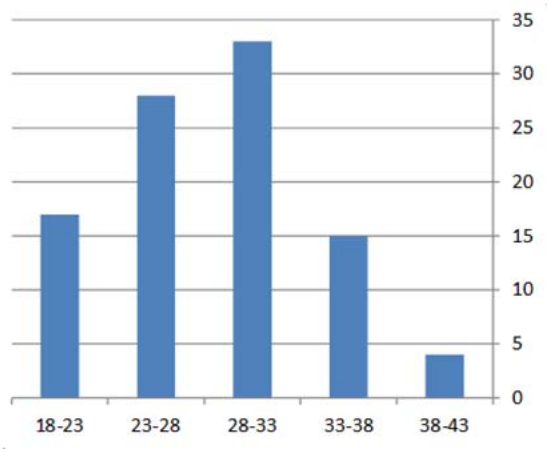

Fig 2.: Percentages of pregnancies in different age groups groups in different seasons

The documents of the patients were studied according to different seasons. The total number of patients who were accepted for ICSI at this center was 1287. Some documents were overlooked by the center for various reasons, and the patients were excluded from the study, as a result. The ovarian stimulation, the oocyte pickup, the embryo transfer process, and the reproductive success were all done based on the ordinary protocol of the center (10). According to the equalization of blastomers and fragmentation, all embryos were graded on A, B and C scales, and then the best quality was selected and transferred.

The patients were divided into five groups according to their age (18-23, 24-28, 29-33, 34-38 and 39-43). The frequencies of the variables were calculated using the SPSS version 22 and the statistical significance was evaluated using the Chi-square analyses. The level of significance was set at $p < 0.05$.

Results

Our study demonstrated that the range of pregnancy in different seasons was different, and also the maximum number of pregnancies happened in autumn (Figure 1).

According to the results, there are wide differences in the rates of pregnancy in different age groups in different seasons. Moreover, most pregnancies happened to 28-33 age group in spring. Women who received embryo were between 18 and 43 years of age (Figure 2).

The period of infertility was between 1 to 10 years for couples attending the center. On average, each

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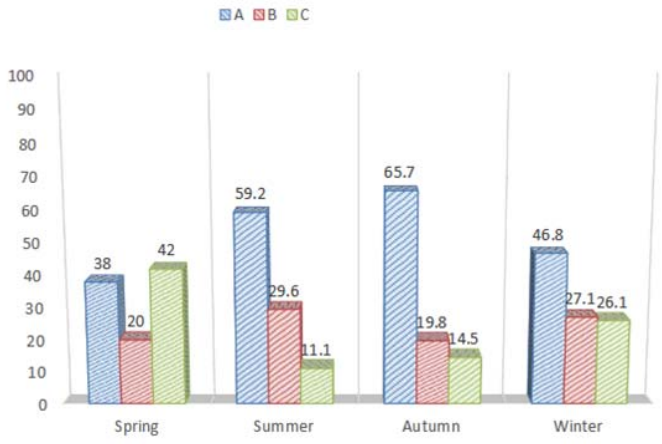

Fig 3.: Quality of embryos in various seasons

couple attended the center for 1 to 4 times. The best quality embryos were identified in autumn (Figure 3).

Discussion

Research demonstrates that there are various views on the effect of seasonal changes on the reproductive system. Due to the wide varieties of light and temperature in different environments, the results of different studies could not be compared with one another. Since research studies have various views about the effect of seasons, we can claim that seasonal effect is very complicated (2).

In the year 2000, Rojansk reported a low rate of pregnancies, although good quality embryos were seen in spring. On the other hand, he found a high rate of pregnancies in autumn, although the worst quality embryos were seen then (2, 10). This finding is congruent with the result of our study as a high rate of pregnancies was seen in autumn, although we found better quality embryos compared with what they had found. It can be claimed that better embryos will lead to better outcomes; accordingly, there is a one-to-one correspondence between the quality of embryos and the pregnancy rate. In another study, Wunder et al. showed no seasonal differences in the rates of fertility and pregnancy. In his study, the highest rate of pregnancy was in December, even though the number of transferred embryos was low in this month. These results were not statistically significant (2). In another study conducted in Australia, the highest rate of pregnancies was seen in December. This result is in line with the result of our study (11). Another study from the Netherlands demonstrated that the rate of fertility, the quality of the embryos, and the rate of pregnancy were high in November (12). Some studies illustrated the effect of seasonal changes in ART in mammalians and reported that the maturation of ovum was very weak in winter (13). Al-katanani et al. reported that the heat stress of summer caused a decrease in the fertility rate of cows, and that even cooling the cows 42 days before the ovulation cannot prevent the effect of heat stress on the quality of ovum (8).

The effect of seasonal changes on the sperm parameters is still controversial. Some studies indicated that seasonal changes caused a decrease in the sperm count; on the other hand, other studies reported no seasonal effect on sperm parameters (7). Carlsen found no seasonal effect on sperm parameters in his study. He only found lower concentrations of sperm in May compared with those of October, which was not statistically significant (7).

In the same vein, Saint and Levine reported high rates of sperm concentrations after summer, and they also found sperms with high quality in winter and spring (5). There are some hypotheses about how the rates of pregnancy and fertility are related to annual changes in sunlight.

It is highly assumed that hypophysis and hypothalamus; neurotransmitters and Melatonin are related to fertility. The effect of seasonal changes on human fertility is thought to be directly related to the effect of melatonin and neurotransmitters on the body organs (14). Melatonin is the product of the pineal gland and can control the function of female gonad as well as the reproductive system of mammalians (15). Research indicates that female mice that received melatonin showed blocked ovulation (16); nevertheless, the role of melatonin in the reproductive system is not definitely known yet. Moreover, the rate of ovulation and the endometrium functions decreased in winter due to the weak sun light (6). But these findings can not be attributed to pregnancies of ART because the hypothalamus-hypophisis pathways were suppressed in ART (2).

To sum up, the results of this study revealed a significant difference in pregnancy in autumn. We came to this conclusion through studying the patients who attended the infertility center between 2010 and 2014. We also found the effect of seasonal changes on the quality of embryos. Finally, our findings are consistent with the results of studies that found seasonal changes had effects on the fertility rate.

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Conflict of interest

None declared.

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