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The Role of Demographic Variables on Predicting Outcome Success in IVF / ICSI

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Abstract

Objective: *Health is one of the essential and controversial concepts in the complex human life, and infertility is one of the issues associated with the mental health of some people in human society. In this regard, the purpose of the present study was to determine the role of demographic variables in the success rate of intra-cytoplasmic sperm injection (ICSI)/in vitro fertilization (IVF) treatment of infertile women.*

Methods: *This research was a descriptive study. The statistical population included all women referred to Royan Institute, Tehran, Iran. A purposive sampling method was used to select 130 individuals as study sample. The study instrument was a demographic questionnaire. We used the Chi-square test, t test, Mann-Whitney U test, and logistic regression analysis to analyze the data.*

Results: *The results of the Chi-square test indicated no significant difference between cause of infertility and initial and final success rate of ICSI/IVF treatment (X^2=0.835, P>0.05). In addition, the results showed that the predictor variables of education, cause of infertility, age, duration of marriage, duration of infertility, number of miscarriages, and type of infertility, together, explained 12% of the total variance of the ICSI/IVF treatment success rate.*

Conclusion*: Based on these results, we can conclude that demographic and contextual variables have no significant effect on the IVF success.*

Keywords: ICSI/IVF treatment, infertile women, Cause of infertility, Duration of infertility.

1. Introduction

One of the essential and controversial aspects of human life is the concept of health (Philips, 2006). Infertility is an issue that troubles the mental health of some people in human society. It is a stressful experience and defined, from a medical perspective, as inability to achieve pregnancy after 1 year of regular sexual intercourse, without using birth control methods. From a psychological viewpoint, infertility is a critical period with high levels of stress for infertile couples (Berk, 2007; as cited in Fahami, Hoseini, Ghouchani, Ehsanpour, & Zargham, 2010). About 10% to 15% of couples throughout the world experience infertility. Vahidi, Ardalan, and Mohammd (2009) reported that, on average, 21% to 22% of Iranian women, experience primary infertility during their marriage, and this is significantly different from the global average rate. The World Health Organization (2004) considers infertility as a major problem in reproductive health, with physical, mental, and social aspects. Infertility is accompanied by a sense of lack of personal control, health, and self-esteem. Emotions related to these losses are sadness, inferiority, loneliness, helplessness, and fear. In fact, the feelings experienced by an infertile person are similar to those experienced by a person who is coping with an important loss, such as loss of a loved one (Peterson, Newton, & Feingold, 2007).

A study by Mazaheri and Mohsenian (2011) showed that infertile couples, compared to other groups, had lower mental health, and were more vulnerable to mental health problems. Haghighatian, Haghighat, and Rostami (2014) also showed that infertile women, compared to fertile ones, suffer from significant levels of psychological problems and this can have a negative effect on other aspects of their lives, including social relationships and family conflicts.

Studies on the effects of infertility on the formation of signs and symptoms of psychopathologies, on the one hand, regard these disorders as reactions of an infertile person to her infertility and inability to have children (Carreno, 2007), and on the other hand, attribute them to personal and demographic characteristics, such as education, age, etc. Administration of IVF-ICSI treatment that usually takes several months makes the infertile women more anxious, and the increased anxiety makes it harder to continue the treatment. Previous studies have found that in the initial stages of infertility treatment, about 32% of women, experience symptoms of psychopathology, which is related to the way they respond to treatment (Souter, Hopton, Penney, & Templton, 2002). It has been reported that lower levels of adrenaline at the time of oocyte retrieval is related to an increase in the chance of pregnancy; this implies that an increase in anxiety level, shortly before oocyte retrieval, may affect ovulation (Smeenk, Verhaak, Vingerhoets, Sweep & Merkus, 2005). The ovarian response is one of the most important predictors of pregnancy, and it may be an important mediator in the relationship between psychological factors related to stress and pregnancy (Ebbesen. et al., 2009).

Although infertile people are not considered as patients, they need emotional and psychological support from treatment teams when receiving different diagnostic tests and therapeutic methods in infertility treatment centers. Infertile couples believe that in the course of treatment, they must receive enough information about their infertility, its cause, and treatments. In the long and complex process of infertility treatment, not having enough time for treatment is a matter of concern. Spending a lot of time for treatment may lead to frequent absences from work, and may

add to the stress. Infertility treatment costs, lack of adequate insurance coverage, and a need for repeating the treatment process are among the main factors that cause discomfort for the couples under infertility treatment (Khodakarami et al., 2010). Although in vitro fertilization (IVF) has been helpful in resolving many obstacles to pregnancy and giving hope to many infertile couples, it has also created some problems. Research studies indicate that individual experiences of infertile people, in addition to changes in patients' mental status, can predict their response to infertility treatment. For example Ebbesen.et al. (2009) showed that the amount of stress experienced by infertile people is associated with the number of eggs retrieved during treatment. Therefore, stress can affect the results of the IVF treatment. In a systematic review study, Gameiro et al. (2012) also reported that in 21453 infertile people in 8 countries, one of the most common reasons for people' leaving treatment, was mental pressure, something that is heavily influenced by demographic characteristics, such as education. Therefore, the present study aimed to identify and explain the role of demographic variables, such as age, education, etc. in successful treatment of infertile women. Regarding this objective, the research question is as follows:

What is the role of demographic variables in the success rate of ICSI/IVF treatment of infertile women?

2. Participants and Methods

This research is a descriptive study. The statistical population comprised all women referred to Royan Institute, Tehran, Iran. A total of 130 women as the study sample were selected by purposive sampling method. A researcher-made questionnaire was used to collect demographic data and other information useful in interpretation of the study results. This information included cause of infertility, duration of marriage, history of infertility treatments (IVF/ICSI), duration of infertility treatment, and number of miscarriages. Next, we used the logistic regression analysis to analyze the data.

3. Results

As you can see in Table 1, in the first assessment of the success rate of ICSI/IVF treatment, about 27% of the participants had positive pregnancy test results.

Table 1: Distribution of ICSI/IVF success rate in the first assessment

ICSI/IVF success rate in the assessment	Frequency	Percentage frequency	Cumulative frequency
Failed	95	73.1	73.1
Successful	35	26.9	100.0
Total	130	100.0	

As you can see in Table 2, in the second assessment of the ICSI/IVF treatment success rate, only 17% of the participants had positive ultrasound results. This finding shows that between the first and second assessments, several participants with positive pregnancy tests had lost their children. In order to examine the reason for the failure of those with positive pregnancy test results, the demographic variables and other data collected by the study questionnaires, were used to

compare 2 groups of participants; those who had success in the first assessment and those who had success in both assessments.

Table 2: Distribution of ICSI/IVF success rate in the second assessment

ICSI/IVF success in the assessment	Frequency	Percentage frequency	Cumulative frequency
Failed	108	83.1	83.1
Successful	22	16.9	100.0
Total	130	100.0	

As you can see in Table 3 and based on a comparison between 2 independent means, there is a significant age difference between those with success only in the first assessment and those who had success in both assessments ($t_{(33)} = -2.33$, $P<0.05$). Also, participants who had success only in the first assessment are older than those who had success in both assessments. There is a significant difference in duration of marriage between successful people only in the first assessment and those with success in both assessments ($t_{(33)} = -2.2$, $P<0.05$). And participants who had success only in the first assessment had longer marriages than those with success in both assessments. There is a significant difference in the number of miscarriages between those who had success in just the first stage of assessment and successful women in both assessments ($t_{(33)} = -3.77$, $P<0.05$). So, successful participants only in the first assessment had more miscarriages than those with success in both assessments.

Table 3: Comparing successful people in the first assessment with successful ones in both assessments of ICSI/IVF success rates, with regard to variables of age, duration of marriage, duration of infertility, and number of miscarriages

Group	Variable	Mean	SD	T	df	Significance level
Successful in the first assessment	Age	29.1364	5.72626	-2.333	33	0.026
Successful in the second assessment		33.5385	4.75422			
Successful in the first assessment	Duration of marriage	6.3636	4.42445	-2.200	33	0.035
Successful in the second assessment		10.0769	5.45377			
Successful in the first assessment	Duration of infertility	4.4000	4.52675	-1.087	33	0.285
Successful in the second assessment		6.1923	5.02302			
Successful in the first assessment	Number of miscarriages	0.1818	0.50108	-3.771	33	0.001

Successful in the second assessment		1.3077	1.25064			

The Mann-Whitney U test was used to compare those who had success only in the first assessment with those who had success in both assessments, with regard to education level.

Table 4: Comparing successful participants only in the first assessment with successful ones in both assessments, with regard to education level

Variable	Group	Mean Rank	Sum of Ranks	Mann-Whitney U	Z	Significance level
Education level	Successful in the first assessment	16.95	373.00	120	0.849	0.397
	Successful in the second assessment	19.77	257.00			

As you can see in Table 4, the results of the Mann-Whitney U test indicate a significant difference between those who had success only in the first assessment and those who had success in both assessments, with regard to education level (Z=0.849, P=0.397).

The Chi-square test was used to examine the relationship of cause and type of infertility with initial and final success in the assessment of the success of ICSI/IVF treatment (Table 5).

Table 5: The Chi-square test for examination of the relationship between cause of infertility and initial and final success in the assessment of the success of ICSI/IVF treatment

Variables	Chi-square value	df	Significance level
Cause of infertility * stage of assessment	0.835	3	0.841

As you can see, according to the results of the Chi-square test, there is no significant relationship between cause of infertility and initial and final success in the assessment of the success rate of ICSI/IVF treatment (X^2=0.835, P>0.05).

Table 6: The results of the Chi-square test for examination of the relationship between type of infertility and initial and final success in the assessment of the success rate of ICSI/IVF treatment

Variables	Chi-square value	df	Significance level
Type of infertility * stage of assessment	0.734	3	0.392

As you can see in Table 6, the results of the Chi-square test indicated no significant relationship between cause of infertility and initial and final success in the assessment of the success rate of ICSI/IVF treatment (X^2=0.734, P>0.05).

In the next step, the logistic regression analysis was used to examine the predictive role of education, cause of infertility, age, duration of marriage, duration of infertility, number of miscarriages, and type of infertility in the success rate of ICSI/IVF treatment.

Table 7. Correlation coefficients of multiple regression analysis

First step	Chi-square	df	Sig.
Model	4.805	7	0.684

As you can see in Table 7, given that the significance level is above 0.05, the model is not significant. Thus, we used the Hosmer-Lemeshow test to conduct a more accurate examination of the model significance.

Table 8: The results of the Hosmer-Lemeshow test

First step	Chi-square	df	Sig.
Model	12.531	8	0.129

As you can see in Table 8, given that the significance level is above 0.05, the Hosmer-Lemeshow test is not significant, i.e., the prediction model is not weak. In fact, as the significance level of the Hosmer-Lemeshow test increases, it becomes less likely for the model to be incapable of predicting the results. However, in the present model (because the Chi-square value in the Hosmer-Lemeshow test is high), this insignificance is not at a level to indicate high fitness of the model.

Table 9: Summary of the model

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
First	51.228[a]	0.059	0.116

As you can see in Table 9, the Nagelkerke R Square is equal to 0.116, i.e., the predictor variables of education, cause of infertility, age, duration of marriage, duration of infertility, number of miscarriages, and type of infertility, together, can explain 12% of the total variance of the dependent variable of ICSI/IVF treatment. For a more accurate examination of the effects of predictor variables on the dependent variable, the role of each predictor variable was examined.

Table 10: Equation variables

Predictor variables	B	S.E.	Wald	df	Significance level	EXp (B)
Education	0.353	0.331	1.138	1	0.286	1.423
Cause of infertility	0.066	0.352	0.035	1	0.851	1.069
Duration of marriage	-0.309	0.282	1.197	1	0.274	0.734
Duration of infertility	0.359	0.275	1.701	1	0.192	1.432
Age	0.012	0.098	0.014	1	0.906	1.012
Number of miscarriages	-0.382	0.688	0.308	1	0.579	0.683
Type of infertility	0.875	0.962	0.828	1	0.363	2.400

According to the coefficients and significance level of the Wald test provided in the above Table, it can be concluded that none of the predictor variables can significantly predict the dependent variable in the model.

4. Discussion

The study participants were assessed 2 times regarding the success of the ICSI/IVF treatment. In the first assessment, the success rate of the ICSI/IVF treatment was examined only based on the pregnancy test results (two weeks after operation), and about 27% of the participants had positive pregnancy test results. In the second assessment, in which the criterion for the treatment success was clinical pregnancy (ultrasound result), 17% of the participants had positive ultrasound results. These findings indicated that between the first and second assessments of ICSI/IVF success rate, several participants with positive pregnancy tests had lost their children.

The results of this comparison showed that there was a significant age difference between those who had success only in the first assessment of ICSI/IVF treatment and those who had success in both assessments, and participants who had success only in the first assessment were older than those who had success in both assessments. There was also a significant difference in duration of marriage between those who had success only in the first assessment and those who had success in both assessments, and participants who had success only in the first assessment had longer marriages than those who had success in both assessments. These findings show that younger women and women with shorter duration of marriage are more likely to keep their children until the final stages of treatment. Consistent with this finding, Meden (2004), showed that as age increases, it becomes more likely to get poor results from the IVF treatment. Viveca (2001) also showed that as the age increases, the success rate of the modern assisted reproductive techniques decreases.

The results also indicated a significant difference in the number of miscarriages between those who had success only in the first assessment of the success of ICSI/IVF and those who had success in both assessments. These findings indicate that in infertile people, as the number of miscarriages increases, the success rate of treatment (with clinical pregnancy as the criterion) decreases. These results agree with Vandenakker (2005) study results, showing that infertile women who have experienced miscarriage, compared to those without this experience, get poorer results from infertility treatment.

In conclusion, the predictor variables of education, cause of infertility, age, duration of marriage, duration of infertility, number of miscarriages, and type of infertility, together, can explain 12% of the total variance of the dependent variable of ICSI/IVF treatment success, and none of the predictor variables (i.e., demographic variables) significantly predicts the success rate of ICSI/IVF treatment. Based on these results, we can conclude that demographic and contextual variables have no significant effect on the IVF success.

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