

Comparison of Cognitive Abilities and Personality Traits in Infertile Women with and without Pelvic Inflammatory Disease¹

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Abstract

Objective: Pelvic inflammatory disease is a chronic disease and a common infection in women which is associated with significant complications. This study aimed to compare cognitive abilities and personality traits in infertile women with and without pelvic inflammatory disease.

Method: The research method was causal-comparative and the sample of research included 48 infertile women with pelvic inflammatory disease and 57 infertile women without the pelvic inflammatory disease, who were referred to Al-Zahra Hospital in Rasht in 2021 and were selected through the convenience sampling method. The research instruments were a demographic checklist, the Cognitive Ability Questionnaire (Nejati, 2013), and the Neo Personality Questionnaire (McCrae & Costa, 1985). Research data were analyzed using the Mann-whitney test and multivariate variance analysis.

Results: The results showed that there was no difference between infertile women with and without pelvic inflammatory disease in cognitive abilities and personality traits ($p > 0.05$). But there was a significant difference between four of the seven components of cognitive ability (memory; $P < 0.05$, $U = 899.00$, inhibitory control and selective attention; $P < 0.05$, $U = 933.00$, decision-making; $P < 0.05$, $U = 863.500$, and sustained attention; $P < 0.05$, $U = 924.500$), the total score of the cognitive ability variable ($P < 0.05$, $U = 815.000$), and openness in both upper and lower levels of education ($P < 0.05$, $U = 907.50$).

Conclusion: Infertility with causes of inflammatory and non-inflammatory did not lead to cognitive dysfunction and differences in personality traits but education as a potentially influential variable can play a crucial role, which needs further research.

Keywords: Cognitive abilities, Female infertility, Pelvic inflammatory disease, Personality traits, Tubal infertility.

Introduction

Infertility creates many physical, psychological, social, emotional, and financial effects. One of the consequences of infertility diagnosis is the change in emotions, thoughts, and beliefs of women with infertility. Infertility is defined as the inability

of a woman to get pregnant during an average period of one year. There are two types of infertility: primary and secondary. In primary infertility, couples can never get pregnant. While in secondary infertility, there is a problem of getting pregnant after a history of pregnancy (either terminated pregnancy or having abortions) (Olooto, Amballi, & Banjo et al., 2012). Pelvic inflammatory disease is the chief cause of secondary infertility (Zhang, Liang, Shang, & Li et al., 2020), which is the most common cause of tubal factor infertility following the acute inflammation of the fallopian tubes (Shetty, Shetty, & Rai, 2013).

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Pelvic inflammatory disease involves inflammation of the adnexa of the uterus, the uterus, fallopian tubes, the ovaries, and the pelvis. This disease is caused by resistant pathogens that microorganisms climb from the initial site of infection (vagina and endocervix) to the endometrium or higher.

It creates a wide range of clinical manifestations from completely asymptomatic to endometritis, parametritis, Tubo-ovarian abscess, salpingitis, oophoritis, pelvic peritonitis, perihepatitis (Fitz–Hugh–Curtis syndrome), and even ovarian carcinogenesis, and is the cause of about 30% of infertility cases and 50% of ectopic pregnancies; thus, it creates a significant public and economic health burden for women of reproductive ages (Al-Kuran, Al-Mehaisen, Alduraidei et al., 2021). Sexually transmitted infections are among the factors that cause damage to the female reproductive system. Chlamydia and gonorrhea are the most common sexually transmitted infections that lead to infertility in both men and women. If chlamydia is not treated, a woman will be at risk for pelvic inflammatory disease. This disease has no symptoms; therefore, it cannot be diagnosed and treated (Deyhoul et al., 2017). While the incidence of pelvic inflammatory disease is strongly associated with the prevalence of sexually transmitted diseases caused by high-risk sexual behaviors, some infections may be of internal origin. The use of intrauterine contraceptives and abortion methods, even legal methods, can increase the risk. A study in India has linked low socioeconomic status, illiteracy, intrauterine device use, multiple sexual partners, and low age of marriage to an increased incidence of pelvic inflammatory disease (Al-kuran et al., 2021).

Infertility has psychological dimensions that cause many problems in the field of cognition (Besharat, Lashkari, & Rezazadeh, 2014). Cognitive impairment in chronic diseases can be due to pathophysiological changes such as hypoxia,

cerebral hypo perfusion, inflammation, acidosis, etc. (Assonov, 2019). Damage to the structure of the brain disrupts a person's behaviors in daily life by impairing cognitive functions, and deficiencies in cognitive functions with a negative effect on daily functioning cause a decline in quality of life (Bakian Kole Marz et al., 2018). Cognitive flexibility increases human performance by reducing anxiety and stress. In structural neuroimaging studies, people with inflammatory bowel disease showed changes in gray matter in areas related to information processing and memory, including the cortical cortex and parahippocampal cortex, and also a sharp increase in white matter. In addition, previous systematic reviews of other inflammatory diseases of the immune system, such as rheumatoid arthritis and systemic lupus erythematosus, have shown evidence of cognitive impairment in patients compared with healthy individuals (Hopkins et al., 2021). Women attempting to get pregnant often have the same level of clinical depression as women with heart disease or cancer (Mustafa, Sharifa, Hadi, et al., 2019). Stress is associated with the incidence of sexually transmitted infections in women; among white women, poverty and personality traits are the most influential factors, and among black women, poverty, previous traumas, stressors, and psychotic personality traits are the most associated factors in chlamydia (Scheidell, Thorpe, Adimora, et al., 2020). Cognitive abilities comprise neural processes that are involved in receiving, processing, storing, and using information and are the link between behavior and brain structure with a wide range of abilities (planning, attention, response deterrence, problem-solving, simultaneous doing homework, and cognitive flexibility) (Bekian Koleh Marz, Karami, Momeni, Elahi, et al., 2018).

There is a reciprocal and progressive relationship with executive performance all over the health scope. Impairment in cognitive function predicts a

higher casual of dying from cancer, cardiovascular disease, respiratory disease, and other risk factors (including health behaviors). The findings also showed that this association is not limited to a specific disease and is not specifically due to poor health behavior. There is ample evidence that individual differences in cognitive function predict a wide range of chronic diseases and the risk of death resulting from them. Many chronic illnesses lead to poorer cognitive function, making it more difficult to adhere to medication diets (Williams, Tinajero, & Suchy, et al., 2017). Different clinical, psychological, and biological variables may be involved in the pathogenesis of cognitive decline in rheumatoid arthritis (chronic inflammatory disease), and depending on the clinical and psychological variables involved, the existence of cardiovascular factors, chronic pain, and depression may be influential. It seems that among the biological variables, along with changes in hormonal levels, drug side effects, and genetic predisposition, several autoimmune and inflammatory factors are involved. In general, inflammation plays a chief role in this issue (Basile, Ciurleo, Bramanti, et al., 2021). Activation of the immune system can play a crucial role in the neurodegenerative cascade (Garsia et al., 2021). Another factor that can affect the severity of the disease in people with chronic diseases such as pelvic inflammatory disease is personality factors. Personality is defined as the obvious or dominant attribute of a person, by which individuals are given the attributes of extraverted, introverted, aggressive, and the like. Eisenk (1963) introduced the three dimensions of introversion, psychosis, and neurosis, and McCrae and Costa (1985) outlining the five personality dimensions of psychoanalytic, extraversion, openness, adaptability, and conscientiousness, are among the first to classify people based on personality traits (Afshari & Kazemi Mahyari, 2010).

Personality consists of five principal and underlying factors. Personality influences many aspects of the health process, including its association with possible mechanisms such as inflammation and health behaviors, and uniquely predicts future levels of inflammatory markers (Wright, Weston, Norton, et al., 2021). The basic five dimensions of personality (especially conscientiousness, neuroticism, extraversion, agreeableness, and openness) predict several diseases. Neuroticism is associated with negative feelings, health complaints, and lower perceptions of health (Friedman & Kern, 2014). Women with infertility often have a neurotic personality structure, especially those who show an emotional need for love, a lack of self-acceptance, and a lack of meaning in life. This issue can be associated with maladaptation and psychiatric disorders. Lack of self-esteem in women with infertility also affects their relationship with their partners as well as their medical relationships with doctors (Podolska & Bidzan, 2011). Personality traits are also associated with health behavior. For example, people who score high on neuroticism often worry about their health and thus have more adherence to health habits. People who score low on agreeableness, extroversion, and openness to experience are more likely to prevent infectious diseases. Conscientiousness is also associated with healthy behaviors such as avoiding high-risk sexual behaviors and substance abuse (Abdelrahmanl, 2020; Deeming, Albitz, Monnin, et al., 2017). On the other hand, women with fertility problems are often similar to women with heart disease or cancer in terms of depression (Mustafa et al., 2019).

Pelvic inflammatory disease as an acute disease is rarely diagnosed and treated effectively, and sometimes, despite treatment, it still leaves long-term complications, especially tubular side effects. Given that chronic inflammation, pain, and depression are the three clinical symptoms and cognitive abilities

are one of the factors that can affect the severity of these symptoms (Ebrahimi & Abu al-Ma'ali al-Husseini, 2017), and also conscientiousness may be associated with poor coping abilities and pain catastrophe (Epperson, Phillips, Speth, et al., 2021). The most common cause of the pelvic inflammatory disease is an extramarital affair and its major complication is the closure of the fallopian tubes and permanent infertility. On the other hand, cognitive abilities and personality type are probably influential in this type of relationship and infertility treatment management. Despite examining these cases in some chronic diseases and observing the differences and also due to the lack of background in pelvic inflammatory disease and due to the importance of fertility in strengthening the family and mental health of women, the present study aimed to compare cognitive abilities and personality traits in infertile women with and without the pelvic inflammatory.

Method

The present study is descriptive. The research sample included 105 infertile women who because of infertility for more than a year (despite having intercourse at least twice a week without using any method of contraception) based on the specialist diagnosis were referred to the infertility clinic of Al-Zahra Medical Center in Rasht in 2021. They were selected from 2000 women with infertility by applying the convenience sampling method. The G Power software was used to determine the sample size. Considering the alpha level of 0.05, the acceptable level of test power equal to 0.80, and the size effect of 0.30, the sample size was determined 90 people (45 in each group). However, to increase the external validity and the possibility of defects in completing the questionnaires, 80 people were selected for each group (160 people). After reviewing the questionnaires and eliminating

the incomplete cases, 48 infertile women with pelvic inflammatory disease and 57 infertile women without pelvic inflammatory disease were selected. Inclusion criteria were: age (20 to 40 years), education (fifth grade to postgraduate), and infertility for more than one year. Exclusion criteria included those who were receiving psychotherapy or psychiatry at the same time, people who incompletely filled up the questionnaires, and those who completed the questionnaire by another person.

The present study was carried out in coordination with the University of Guilan, the Vice Chancellor for Research and Treatment of Guilan University of Medical Sciences, and the director of the hospital, to enter the Hazrat Zahra Educational and Medical Center. Then, the code of ethics with the ID IR.GUILAN.REC.1400.039 was received for human intervention and permission to enter the infertility clinic and submitted to the head of the hospital. The samples were identified and selected with the approval of a gynecologist. Subjects were then contacted. Due to the coronavirus pandemic and the impossibility of face-to-face access, all subjects were called to a virtual group with their consent. After the necessary explanations about the objectives of the research in the group and placing the instructional video on how to answer the questionnaire, the necessary instructions were given individually, and the subjects were asked to fill in the questionnaires online or in paper form. A demographic checklist, the cognitive ability questionnaire, and a short form of the Neo personality questionnaire were used to collect data. Cases whose education and age in the file did not match the results of the questionnaires were removed from the study. After extracting the results, the data were analyzed by one-way and multivariate analysis of variance using SPSS 24.

Ethical statement

Ethical considerations were fully observed in all

stages of the research so that the necessary and sufficient information about the purpose of the work and how to implement it was explained to the participants at the beginning of the research and all participants participated in the research voluntarily without any obligation. The result was completely encrypted and analyzed in a coded manner.

Measurement

Demography Checklist: Based on this checklist, the demographic information of the subjects including age, level of education, number of marriages, duration of the marriage, type of infertility (primary or secondary), duration of infertility, number of deliveries, number of children, number of pregnancies, number of abortions, social and economic status, and symptoms of the pelvic inflammatory disease were collected.

Cognitive Ability Questionnaire: The Cognitive Abilities Questionnaire is a self-report tool designed by Vahid Nejati (2013) to assess cognitive abilities. This questionnaire has 30 items and 7 subscales of memory, inhibitory control and selective attention, decision-making, planning, sustainable attention, social cognition, and cognitive flexibility. It is scored based on a five-point Likert scale ranging from 1 (for rarely) to 5 (for almost always). Except for the Social Cognition Scale, the rest items have a reverse score. The lowest and highest scores are 36 and 180, respectively. Nejati reported Cronbach's alpha for this questionnaire as 0.83, and the test-retest correlation was also significant at the level of 0.01. To measure concurrent validity, the Pearson correlation test was used, which was correlated at the level of 0.0001 (Nejati, 2013). In a study, Cronbach's alpha for the whole questionnaire was reported to be 0.86 (Ebrahimi & Abolmaali Al-Husseini, 2017). In addition, Cronbach's alpha coefficient for the whole questionnaire was 0.87, and for the memory, subscale was 0.74, inhibitory control and

selective attention was 0.70, decision-making was 0.72, planning was 0.68, sustainable attention was 0.76, and social cognition was 0.68, and cognitive flexibility was 0.74 (Zabet, Karami, & Yazdanbakhsh, et al., 2021). In the present study, the reliability and validity of the questionnaire were evaluated by Cronbach's alpha method and the coefficient was 0.88.

The Neo Personality Inventory (short form): This questionnaire, known as the Big Five Personality Factors, is the successor to the Neo test, developed in 1985 by McCrae and Costa. This questionnaire is one of the comprehensive tests that measures five aspects of the main range of personality and characteristics related to these aspects. The short form of the Neo Personality Questionnaire has 60 questions to evaluate 5 scales and each scale is evaluated with 12 separate questions. The indices of this test are emotional instability or nervousness, extraversion, openness, agreeableness, and conscientiousness. Subjects responded to each of the 60 sentences based on a five-part Likert scale (a score of zero for "I strongly disagree"; a score of 4 for "I strongly agree with") (Grossi Farshi, 2001). In total, the subject obtains scores between zero and 48 on each scale. McCrae (1992), using Cronbach's alpha method, reported the reliability of this test for neuroticism 0.93, extraversion 0.90, openness to experience 0.89, agreeability 0.95, and conscientiousness 0.92. The validity of this questionnaire was 0.56 to 0.62 (McCrae & Costa, 1992; Grossi Farshi, Mehryar, Ghazi Tabatabai, et al., 2001). The reliability of this test, using Cronbach's alpha method, was 0.88 for neuroticism, 0.89 for extraversion, 0.72 for openness to experience, 0.96 for agreement, and 0.81 for conscientiousness (Afshari & Kazemi Mahyari, 2010). In a study, Cronbach's alpha coefficient of the questionnaire was 0.89 (Pour Mohseni et al., 2020). The reliability and validity of the questionnaire in

the present study were 0.76 by Cronbach's alpha method.

Results

The present study included 48 infertile women with pelvic inflammatory disease with a mean and standard deviation of age (32.5 ± 67.075), 56.3% with a diploma and lower and 43.7% with an above diploma, and 57 infertile women without pelvic inflammatory disease with a mean and standard deviation of age ($56.31, 4.881$), and 70.2% with a diploma or lower and 29.8% with an above diploma. Based on the duration of the marriage, 44.8% of the marriages were between 1 to 6 years, 38.1% between 7 to 12 years, and 17.1% were between 13 to 18 years. According to the values of skewness and kurtosis between 2 and -2, the normality of variables was observed. Multivariate analysis of variance was used to compare the studied variables in the two groups. Table 1 shows the descriptive data related to the research variables.

The result of the Levene test on the homogeneity

of error variances for all components (Memory: $P > 0.05$, $F = 2.129$, Control: $P > 0.05$, $F = .786$, Decision making: $P > 0.05$, $F = 2.166$, Planning: $P > 0.05$, $F = .583$, Sustained attention: $P > 0.05$, $F = 1.090$, Social cognition: $P > 0.05$, $F = .480$, Flexibility: $P > 0.05$, $F = 1.882$, and the total score of cognitive ability ($P > 0.05$, $F = 0.489$) and the components of personality traits were not significant. As a

result, the assumption of homogeneity of error variances was established, and the result of the Ambox test ($M = 0.469$, $F = 1.004$, $P > 0.05$) showed that the assumption of homogeneity of variance and covariance matrices was also established. The results of Wilkes's Lambda test showed that the effect of group, educational levels, and group at educational levels on the combination of cognitive ability components and personality traits was not significant.

One of the side findings of this study was the effect of education on variables. In the two groups of women, there was a difference between women with infertility in terms of education (undergraduate

Table 1. Means, Standard Deviations, and Normality test of data

Variables	Pelvic Inflammatory Disease				without Pelvic Inflammatory Disease				
	M	SD	Kurt	Skew	M	SD	Kurt	Skew	
Cognitive ability	Memory	11.50	0.60	0.50	0.82	11.19	0.52	7.63	2.00
	Control	14.08	0.69	1.71	0.85	13.33	0.54	0.65	0.56
	Decision making	11.87	0.65	0.87	0.92	11.91	0.55	-0.16	0.54
	Planning	5.95	0.38	0.61	1.05	5.89	0.35	0.12	0.89
	Sustained attention	7.18	0.35	-0.37	-0.05	7.63	0.35	-0.54	0.12
	Social cognition	6.41	0.35	0.01	0.64	6.27	0.31	-0.61	0.33
	Flexibility	9.50	0.48	0.39	0.63	9.49	0.44	0.02	0.63
	Total	66.72	2.36	1.85	1.17	65.73	2.25	0.12	0.65
Personality traits	Neuroticism	28.95	0.93	0.27	0.84	29.52	0.86	0.05	0.04
	Extroversion	26.06	0.82	-0.69	0.38	24.89	0.75	0.16	0.71
	Openness to experience	29.52	0.94	-0.65	0.50	28.03	0.74	-0.14	-0.10
	Agreeableness	31.35	0.86	-0.66	0.30	29.80	0.91	-0.42	0.11
	Consciousness	31.83	1.30	-1.42	0.13	30.26	1.23	-1.13	0.15

Table 2. Results of MANOVA significance test for cognitive abilities and personality traits in infertile women with and without pelvic Inflammatory disease.

	Test	value	F	sig	Partial eta squared
group	Pillai's Trace	0.139	1.215	0.285	0.139
	Wilks' Lambda	0.861	1.215	0.285	0.139
	Hotelling's Trace	0.162	1.215	0.285	0.139
	Roy's Largest Root	0.162	1.215	0.285	0.139
Education	Pillai's Trace	0.193	1.799	0.060	0.193
	Wilks' Lambda	0.807	1.799	0.060	0.193
	Hotelling's Trace	0.240	1.799	0.060	0.193
	Roy's Largest Root	0.240	1.799	0.060	0.193
Education *group	Pillai's Trace	0.182	1.670	0.087	0.182
	Wilks' Lambda	0.818	1.670	0.087	0.182
	Hotelling's Trace	0.223	1.670	0.087	0.182
	Roy's Largest Root	0.223	1.670	0.087	0.182

and postgraduate) in four of the seven components of cognitive ability (memory; $P < 0.05$, $U = 899.00$, inhibitory control and selective attention; $P < 0.05$, $U = 933.00$, decision-making; $P < 0.05$, $U = 863.500$, and sustained attention; $P < 0.05$, $U = 924.500$), and The total score of the cognitive ability variable ($P < 0.05$, $U = 815.000$). There was a difference between infertile women in terms of education (undergraduate and postgraduate) of the one component of personality traits (openness to experience) in both groups with and without pelvic inflammatory disease ($P < 0.05$, $U = 907.50$).

Discussion and Conclusion

This study aimed to compare cognitive abilities and personality traits in infertile women with and without pelvic inflammatory disease. The results showed that there was no difference between infertile women with and without pelvic inflammatory disease in cognitive abilities. The results of this study do not support the previous research findings in non-pelvic inflammatory diseases, such as John and Morley (2017), Williams et al. (2017), Asunov (2019), Garcia, Júnior, dos Santos Gómez, et al. (2021), and Hopkins et al. (2021). To Explain this result, it can

Table 3. Results of univariate analysis of variance of cognitive ability and personality traits in the group and education

	Cognitive ability	F	p-value	Eta2	Op	Personality traits	F	p-value	Eta2	Op
Group	Memory	1.247	0.267	0.012	0.198	Neuroticism	0.752	0.388	0.007	0.138
	Control	1.615	0.207	0.016	0.242	Extroversion	1.348	0.248	0.013	0.21
	Decision making	0.515	0.475	0.005	0.11	Openness to experience	1.695	0.201	0.016	0.248
	Planning	0.548	0.461	0.005	0.113	Agreeableness	0.592	0.433	0.006	0.119
	Sustained attention	0.24	0.626	0.002	0.077					
	Social cognition	0.466	0.496	0.005	0.104	Consciousness	0.66	0.418	0.006	0.127
	Flexibility	0.244	0.622	0.002	0.078					
	Total	1.172	0.281	0.011	0.189					

be said that cognitive problems in chronic diseases can be due to pathophysiological changes such as hypoxia, cerebral hypoperfusion, inflammation, acidosis, etc. (Asonov, 2019). Therefore, cognitive problems occur when the anterior part of the brain is damaged due to reduced blood flow, and the greater the severity of the inflammation and the closer the site of inflammation to the brain, the greater the risk of damage.

Pelvic inflammatory disease often appears as inflammation with few clinical symptoms but high complications, in that sometimes with a minor symptom and without the realization of the person about the severity of the disease, infertility results from tubal closure, but the severity of the inflammation is not too great to cause brain damage due to a defective blood supply to the brain. Therefore, the result of no difference in patients with and without inflammation is not far-fetched and seems logical. Also, the side finding of this research in infertile women with diplomas and below and above diplomas, 4 of the 7 components of cognitive ability (memory, inhibitory control and selective attention, decision making, and sustained attention) were significantly different. This result is consistent with the findings of Nejati et al. (2013) and Amiri, Ebrahimi Moghaddam, Babakhani, et al. (2014), in that people with higher education were at a more desirable level in terms of many dimensions of cognitive abilities. Given that many cognitive components in infertile women with higher levels of education were more mature, it can be concluded that higher levels of education due to rational exposure and the choice of appropriate treatment can lead to better results in treatment.

The results of the present study also showed that the effect of the group on the linear composition of personality trait components is not meaningful. Neuroticism is the first component of Neo's dimensions that were not significantly different in

infertile women with and without pelvic inflammation and was normal in both groups. This result is not in line with the research of Graziottin, Skaper, Fusco, et al. (2013), Shen, Yang, Hung, et al. (2016), Till, As-Sanie, Schrepf, et al. (2019), Bogdan, Barnett, Ali, et al. (2020), Pourmohseni, Shojaei Moghaddam, Jafari, et al. (2020), Wright et al. (2021), and Pietnoczko, Brudek, Steuden, et al. (2021). In contrast, Rochefort, Hoerger, Turiano, et al. (2019) stated that cancer is associated with low neuroticism. These findings may be due to the development of various infertility treatment methods and the possibility of accessibility of women with infertility to these methods in government-covered insurance centers, which are very effective in providing psychological support to infertile women and reducing their anxiety and depression. On the other hand, as mentioned earlier, the severity of inflammatory mechanisms is also very vital in this result as the severity of inflammation may not be too wide to cause psychological disorders in the individual. Because the severity of inflammation has not been studied in existing studies, it can not be generalized to all cases, including pelvic inflammation.

The second Neo-factor that was investigated in the present study was extraversion, which was not significantly different between the two groups. This finding is not aligned with the results of Pourmohseni et al. (2020); Afshari et al. (2020); Silva, Carvalho, & Rodrigues, et al. (2022), and Gabriella, Klemens, Xiao-Hui, Corinna, & Eva, et al. (2021), probably due to the chronic nature of infertility. Because infertility has features in common with chronic diseases and due to their similarity, usually chronic patients and infertile people have long-term health problems. Therefore, considering that the study groups have common experiences in this regard, this lack of difference seems logical. However in the present study, in both groups of infertile women,

the rate of extraversion was lower than normal. The next factor was openness, which was not significantly different between the two groups. This finding was different from the results of research by Pourmohseni et al. (2020); Afshari et al. (2020); Vera Cruz, Bucourt, Réveillère, Martailié, Joncker-Vannier, Goupille, et al. (2021), and Pietnoczko et al. (2021). Despite the association between personality and inflammation, their effect size was small. These small connections may be due to the multifaceted nature of the inflammation. On the other hand, relying on a single assessment method, such as self-reporting, may not be able to demonstrate all related links between personality and inflammation (Wright et al., 2021). Also, in the side findings of the present study, people with higher levels of education had higher openness scores, which are likely to use different rational methods in the face of problems, fractures, and deadlocks.

Agreeableness was the next factor of personality that was not significantly different between the two groups. The result was not in line with the results of Bogdan et al. (2020), Vera Cruz et al. (2021), Babiu, Bevanda, Karin, Volariu, Bogut, Glibo, et al. (2021), and Lima, Machado, Irigaray, et al. (2018). In the present study, both groups of infertile women had normal scores in this component. People with high scores in this dimension of personality have a higher ability to experience and think divergently, which can make infertile women receptive and patient in accepting different methods of treatment and enduring treatment time to achieve desired results far from negative thoughts. The last Neo-component, which did not show a significant difference between the two groups and both groups were normal was conscientiousness. This finding was not consistent with previous results, such as Afshari et al. (2020), Pourmohseni et al. (2020), Wright et al. (2021), and O'Súilleabháin, Turiano, Gerstorff, et al. (2021), but it was consistent with

the results of Rockfort et al. (2019), who found that conscientiousness is higher in cancer patients. Excessive focus on sexual function and cognitive errors about the mechanism of reproduction and fertility disrupt the secretion of sex hormones and ultimately a double cause of infertility, which can intensify the cycle of depression and isolation in the individual, which in turn, as immune system inhibitors, impair the healing of inflammatory processes.

These factors can lead to further treatment failure in the infertility treatment process and tolerance of double problems due to poor awareness in these women. On the other hand, due to the importance of adaptation and acceptance of treatment conditions, which are sometimes accompanied by physical, mental, and financial problems, so the possibility of its weakness at lower levels of education must be considered. Of course, the failure or success of treatment for these women needs further investigation. One of the limitations of the present study was the lack of face-to-face access to participants due to the conditions of coronavirus prevalence and limited choice in the study population. So it is suggested that for further generalizability of the results, a wider statistical population is used. For further generalization, it is suggested to use a wider statistical population. Another limitation of this study was the comparison of two groups of women with infertility. It is suggested that the comparison be conducted between women with inflammation and healthy women. The results of this research can be useful for evaluating personality factors in predicting patient cooperation and affecting the outcome of treatment. Therefore, evaluating personality traits for more awareness of patients' expectations and their possible adaptation to the proposed treatment seems logical, and this method can prevent waste of time and effort and shorten the infertility treatment period according

to cognitive abilities and personality type in these women. This research is the result of a master's thesis approved by the University of Guilan. We appreciate the cooperation of the Vice Chancellor for Research of Guilan University as well as the Vice Chancellor for Research of Guilan University of Medical Sciences. We would also like to thank the director of the hospital, the gynecologists of the infertility ward of Al-Zahra Hospital in Rasht, and all the midwives, nurses, and patients of this ward who helped us in the present study.

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