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Relationships between couple collaboration, well-being, and psychological health of infertile couples undergoing assisted reproductive treatment

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Abstract

Background Social problems related to infertility are associated with a significant psychological burden for the involved couple. Previous studies have shown the positive effects of couple interactions on the psychological health of these couples; however, the specific conditions of participating in assisted reproductive treatments (ART) might influence the effect of couple collaboration. Therefore, the present study aimed to evaluate the relationship between couple collaboration, well-being during infertility, and the psychological indicators of infertile couples undergoing fertility treatment.

Methods This cross-sectional study was conducted on 200 ART volunteer couples. Couple collaboration and well-being during infertility were evaluated using a validated researcher-made questionnaire, and the level of depression, anxiety, and stress was evaluated using the DASS-21 questionnaire in both couples. Statistical analysis was performed using the plug-in application PROCESS macro for SPSS and AMOS software.

Results The results showed that couple collaboration was correlated with the level of depression, anxiety, and stress. Moreover, depression, anxiety, and stress levels were correlated with well-being during infertility. The direct and indirect effect of couple collaboration on the depression level was significant; however, the direct effect of couple collaboration on the level of anxiety and stress was not significant, and the effect of couple collaboration on these indicators was mediated by well-being during infertility. The fit index of the equation modelling showed a good fit of the relationship path between the variables of couple collaboration, well-being during infertility, and psychological indicators (CMIN = 4.196, p = 0.260).

Conclusion The results of this study show that the specific conditions of participating in ART may affect the direct effects of couple interaction on an infertile couple's levels of anxiety and stress. These results suggest that in order to develop mental health programs for infertile couples, strategies based on couple collaboration that are associated with higher well-being during infertility should be developed and presented.

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Plain English Summary

Social problems related to infertility are associated with a significant psychological burden for the involved men and women. Previous studies have shown the positive effects of couple interactions on the psychological health of these couples. However, the specific conditions of participating in assisted reproductive treatments (ART) might influence the effect of couple collaboration. Therefore, the present study aimed to evaluate the relationship between couple collaboration, well-being during infertility, and the psychological indicators of infertile couples undergoing fertility treatment. This cross-sectional study was conducted on 200 ART volunteer couples. Couple collaboration, well-being during infertility and the level of depression, anxiety, and stress were evaluated using validated questionnaires. The results showed that the direct and indirect effect of couple collaboration on the depression level was significant; however, the direct effect of couple collaboration on the level of anxiety and stress was not significant, and the effect of couple collaboration on these indicators was mediated by well-being during infertility. The results of this study show that the specific conditions of participating in ART may affect the direct effects of couple interaction on an infertile couple's levels of anxiety and stress. These results suggest that in order to develop mental health programs for infertile couples, strategies based on couple collaboration that are associated with higher well-being during infertility should be developed and presented.

Keywords Assisted reproductive treatments, Infertility, Coping, Depression, Anxiety, Stress

Background

Infertility, with a prevalence of 15% in the world, challenges affected couples' various aspects of physical, mental, and social health [1]. The need for drug treatment, and in some cases, the use of assisted reproductive Techniques (ART), tolerating its side effects, and hesitating the treatment's success increases the psychological burden of the disease in infertile couples. In some cases [2], it leads to an identity crisis [3] and tolerance of stigma [4]. Enduring the burden of treatment and its psychosocial consequences reduces the quality of married life [5] and may have negative impacts on couples' relationships.

Studies have shown that the possibility of domestic violence and marital conflicts, as issues that can reduce the perception of social support, increases among infertile couples [6, 7].

Investigating the psychological aspects of infertility has shown that infertile couples suffer from psychological disorders such as depression, anxiety, and stress more than the general population [4, 8]. These psychological disorders are more common in infertile couples who need ART to have children [9] (Braverman). In addition, the high stress of treatment of ART volunteer couples increases the need for the spouse's companionship and expansive support and reduces the couple's well-being level [10](Bagade). Well-being is defined as a combination of feeling good, functioning well, and having control over life [11] and is a construct with a broad concept that includes various physical, emotional, psychological, and social dimensions [12].

In a study, the mediating role of well-being in the effect of psychological interventions using media on the level of depression and anxiety has been reported [13].

When individuals find themselves in situations where their sense of well-being decreases, they attempt to modify their negative emotions by addressing them [14]. Confronted with an infertility crisis, and in order to adapt to the upcoming conditions, each partner chooses strategies that may affect the other partner's mental health [15].

Infertility is a couple's problem and affects their interactions as much as each couple's coping method can affect the other's mental health. For this reason and to clarify couples' coping with crises, interactive models such as the Systemic-Transactional Model have been introduced. In explaining the stress management process, this model emphasizes the impact of one party's conditions on the other's behavior and couple coping [16]. In general, couple collaboration refers to an attitude toward stress as an interpersonal phenomenon. According to this view, one partner's stress affects his/her spouse; consequently, dealing with that is also a dual issue [17](Falconier).

In this regard, a study showed an inverse correlation between infertile couples' relationship and their anxiety and depression. Moreover, this study reported that anxiety and depression predict the level of well-being in men and women, respectively [18]. A study has shown that well-being mediates the effect of some psychological interventions on depression and anxiety [19].

It is believed that infertile couples' supportive social interaction is associated with reduced stress levels and psychosocial well-being [20]. However, in social situations where cultural norms are sought by complex emotions in infertile couples [21], the relationship between infertile couple's interactions and feeling good might be affected.

Infertility is a multidimensional problem in married life that can affect well-being in different aspects and

complicate the relationship between couples' social interactions and mental health [4]; as a result, the feeling of being good despite infertility may interfere with couples' relationships and their interactions and affect their mental health.

Therefore, designing mental health intervention programs for infertile couples requires the identification of the relationships between the perception of well-being during infertility, couple interactions, and psychological health. Accordingly, the aim of the present study was to determine the relationship between a couple's collaboration, well-being, and the psychological health of infertile couples undergoing assisted reproductive treatment.

Methods

This cross-sectional study was conducted with the approval of the Ethical Committee of Isfahan University of Medical Sciences from June 2022 to July 2023 in Isfahan, Iran. The participants were 200 ART-candidate couples who were referred to the Fertility and Infertility Center to receive ovulation stimulation drugs.

The inclusion criteria included monogamy, having no children, no use of donated gametes and surrogate mothers, and no major psychological diseases, such as schizophrenia and psychosis. Only couples who were willing to participate in the study were included. Sampling was performed using the convenient method among eligible couples. It was explained to the invited couples that their non-participation in the study would have no effect on their treatment and care. After obtaining informed consent and recording background characteristics, using the depression questionnaire, couples' levels of depression, anxiety, and stress as indicators of psychological health, as well as their well-being during infertility and collaboration, were evaluated.

Measuring scale

The level of depression, anxiety, and stress as psychological indicators were measured using the valid 21-item DASS scale, which is scored on a Likert scale from 0 to 3 and includes the options of not at all (0), very little (1), to some extent (2) and very much (3) [22]. The validity of this scale for the Iranian population has already been investigated and confirmed [23].

Well-being during infertility and the couple's collaboration

Well-being during infertility (12 items) and couple's collaboration (8 items) were evaluated using a researcher-made questionnaire. These questionnaires were designed based on a qualitative study and on a 5-point Likert scale (0–4), including Never (0), Rarely (1), Sometimes (2), Often (3), and Always (4). The face and content validity of the initial version of both questionnaires were evaluated using the opinions of 10 experts in psychology (3 experts), psychiatry (2 experts), psychiatric nursing (2 experts), and reproductive health (3 experts) and confirmed by applying their opinions. Moreover, the content validity of the questionnaire was evaluated and confirmed by evaluating the content validity ratio (CVR) and content validity index (CVI). In a pilot study on 15 couples eligible for the research, the internal reliability of the well-being during infertility and couple's collaboration questionnaires was confirmed with Cronbach's alpha of 0.79 and 0.75. After repeating the questionnaire completion by the participants in two weeks, the repeatability of the questionnaire was evaluated by assessing the ICC coefficient, and the reliability of the questionnaires was confirmed with coefficients of 0.85 and 0.78. Sample questions of the questionnaire of well-being during infertility included "We try to think that we are a different couple for having children, not an imperfect couple" and of couple's collaboration "We support each other to create happiness for each other" [24].

Research data were analyzed using SPSS version 19 and AMOS software. The statistical method used included linear regression by adjusting the results for possible confounding factors, including age, education level, and infertility. Furthermore, Pearson's statistical test was used to identify variables that were correlated with each other and could be included in the regression model. To evaluate the direct and indirect effect of the factors under investigation as well as their interactive effect on each other, the logged-in Macro Process application and to evaluate the fit of the conceptual model obtained based on the research, AMOS version 19 were used. The CMIN index was considered a criterion to confirm the fitness of the assumed model. This index is a Chi-square test that compares the tested model (assumed model) and independent model to the saturated model [25]. A significance level greater than 0.05 was considered as the acceptance criterion for the fit of the structural model.

Results

Out of 223 couples invited to the study, 200 couples (400 individuals) participated in the study. The background characteristics of the participants, as well as the mean psychological indicators, well-being during infertility, and the couple's collaboration, are presented in Table 1. The results showed that, regarding education level, the participants were mostly high school graduates. Most of the women were housewives, and female infertility was the most frequent. In addition, there was a direct and significant correlation between well-being during infertility score ($r = 0.89$; $p < 0.0001$) and couple's collaboration ($r = 0.38$; $p = 0.004$) among women and men.

Table 1 Characterizes of the participants and main variables

	Mean (SD) or Number (%)
Age (mean)	
Women	34.66 (5.4)
Men	37.6 (5.9)
Education level in women (%)	
High school or lower	23 (11.5)
Diploma	82 (41.0)
Bachelor's degree & higher	95 (47.7)
Education level in men (%)	
High school or lower	41 (20.5)
Diploma	92 (46.0)
Bachelor's degree & higher	67 (33.5)
Employed (%)	
Women	90 (45.0)
Men	186 (93.0)
Cause of infertility (%)	
Female infertility	99 (48.8)
Male infertility	78 (38.4)
Unexplained	26 (12.8)
Depression	
Women	18.20 (11.40)
Men	13.25 (9.22)
Anxiety	
Women	9.86 (9.63)
Men	6.81 (6.88)
Stress	
Women	17.32 (10.38)
Men	11.63 (8.31)
Collaboration	
Women	17.32 (4.93)
Men	18.97 (6.20)
Wellbeing	
Women	29.43 (9.23)
Men	29.79 (8.39)

SD standard deviation

The results of evaluating the relationships between variables after adjusting the results for age, education level, and infertility factors are presented in Table 2. The results showed that independent of age, education level, and gender, the relationship between the level of depression, anxiety, and stress with couple's collaboration was negative and significant (Table 2, Model 1); however, this relationship was not independent of the level of well-being during infertility (Table 2, Model 2).

The results showed that the total effect and the direct effect of well-being during infertility on the level of depression, anxiety, and stress were inverse and significant. However, couple's collaboration did not mediate the indirect effect of well-being during infertility on psychological indicators of anxiety and stress (Table 3, Path 1).

The analysis of the path of the couple's collaboration effect on psychological indicators with the mediation of well-being during infertility showed that the direct and indirect effect of the couple's collaboration on their depression level was inverse and significant; however, the couple's collaboration had an effect on couples' level of anxiety and stress only through the effect on well-being during infertility (indirect effect) (Table 3, Path 2). Besides, the results showed that the couple's collaboration effect on well-being during infertility and couple's collaboration on the level of depression ($F=15.53$, $P=0.0001$), anxiety ($F=28.94$, $P<0.0001$), and stress ($F=17.17$, $P<0.0001$) was significant.

The fit index of the model (Fig. 1) showed the good fit of the relationship path between the variables of couple's collaboration, well-being during infertility, and psychological indicators ($CMIN=4.196$, $p=0.260$). The regression weight of the studied variables is shown in Table 4. The results showed that the model had a good fit for women ($CMIN=2.678$, $p=0.262$) and men ($CMIN=1.339$, $p=0.261$) separately.

Discussion

The aim of this study was to determine the relationship between well-being during infertility, couple's collaboration, and psychological indicators of infertile couples who were candidates for ART and analyze its structural model. The results showed that a couple's collaboration was correlated with depression, anxiety, and stress levels by having an effect on well-being during infertility.

The first finding of the study showed that well-being during infertility was dependent on the couple's collaboration. This finding confirms the results of a study indicating that marital compatibility was related to quality of life [26]. The relationship between marital coping and marital adjustment [13, 27] in infertile couples is also documented.

This finding of the present study shows that collaboration helps couples to be able to deal with other aspects of life despite infertility and to experience the feeling of being good despite the absence of the child. This finding is in line with the results of the study which showed that spousal support was related to the reduction of infertility stress through reducing the rejection of the childless lifestyle and meaning-based coping [28].

Another finding of the study showed that the infertile couples' levels of depression, anxiety and stress were negatively related to well-being during infertility. The relationship between quality of life and psychological distress has been previously reported [29]. Moreover, in line with the results of the present study, previous studies showed

Table 2 Relations between psychologic health, couples' collaboration and wellbeing (Number: 200)

Models	Variables	Depression				Anxiety				Stress			
		Beta	Sig	CI 95%		Beta	Sig	CI 95%		Beta	Sig	CI 95%	
				Lower	Upper			Lower	Upper			Lower	Upper
Model I	Age	−0.13	0.001	−0.36	−0.09	−0.14	0.03	−0.26	−0.01	−0.29	< .0001	−0.42	−0.16
	Educational level	−0.11	0.005	−2.69	−0.49	−1.36	0.01	−2.39	−0.33	−1.42	0.010	−2.51	−.34
	Be woman	0.13	0.001	1.14	4.28	1.75	0.02	0.28	3.23	3.63	< 0.0001	2.09	5.18
	Female infertility	0.04	ns	−1.62	3.12	0.26	ns	−1.96	2.49	0.83	ns	−1.51	3.16
	Male Infertility	0.05	ns	−1.37	3.41	−0.30	ns	−2.55	1.947	0.89	ns	−1.49	3.22
	Collaboration	−0.63	< 0.0001	−1.33	−1.05	−0.74	< 0.0001	−0.87	−0.60	−0.93	< 0.0001	−1.07	−0.79
Model II	Age	−0.14	0.02	−0.26	−0.03	−0.08	ns	−0.19	0.04	−0.22	< 0.0001	−0.34	−0.10
	Educational level	−0.68	ns	−1.67	0.29	−0.71	ns	−1.68	0.26	−0.66	ns	−1.65	0.34
	Be woman	4.27	< 0.0001	2.87	5.67	2.89	< 0.0001	1.49	4.28	4.96	< 0.0001	3.54	6.39
	Female infertility	−0.06	ns	−2.14	2.01	−0.33	ns	−2.40	1.74	0.13	ns	−1.99	2.25
	Male Infertility	0.68	ns	−1.42	2.77	−0.55	ns	−2.63	1.53	0.58	ns	−1.56	2.71
	Collaboration	−0.07	ns	−0.31	0.16	0.08	ns	−0.16	0.31	0.02	ns	−0.22	0.26
	Wellbeing	−0.85	< 0.0001	−1.00	−0.70	−0.62	< 0.0001	−0.77	−0.47	−0.73	< 0.0001	−0.88	−0.57

CI Confidence interval, *Sig* significant

Table 3 Total, direct and indirect effects of the wellbeing / couples' collaboration on couples' psychologic health (Number: 200)

Path way	Variables			Total effects				Direct effects				Indirect effects		
				Effect	Sig	95% CI		Effect	Sig	95% CI		PE	95% CI	
						Lower	Upper			Lower	Upper		Lower	Upper
	Wellbeing	Collaboration	Depression	−0.92	0.0001	−0.99	−0.84	0.77	0.0001	−0.92	−0.62	−0.14	−0.27	−0.01
1	Wellbeing	Collaboration	Anxiety	−0.60	0.0001	−0.67	−0.52	0.57	0.0001	−0.72	−0.42	−0.03	−0.15	0.10
	Wellbeing	Collaboration	Stress	−0.75	0.0001	−0.82	−0.66	−0.64	0.0001	−0.80	−0.48	−0.01	−0.03	0.01
	Collaboration	Wellbeing	Depression	−1.30	0.0001	−1.43	−1.16	−0.25	0.04	−0.49	−0.01	−1.05	−1.23	−0.86
2	Collaboration	Wellbeing	Anxiety	−0.82	0.0001	−0.94	−0.63	−0.04	ns	−0.28	0.18	−0.77	−0.97	−0.58
	Collaboration	Wellbeing	Stress	−1.06	0.0001	−1.19	−0.92	−0.19	ns	−0.44	0.06	−0.86	−1.07	−0.66

CI Confidence interval, *Sig* significant, *PE* Point Estimate

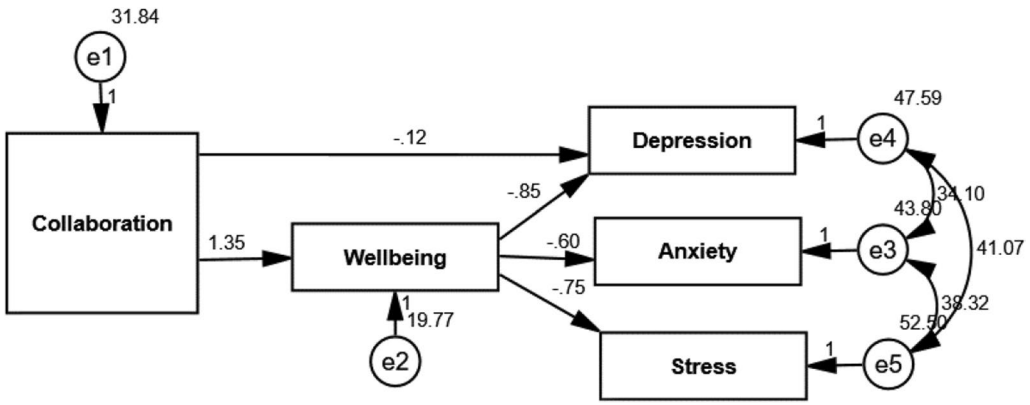

Fig. 1 Conceptual model of the relations between couples' collaboration, wellbeing and psychologic indicators

Table 4 Regression Weights (Default model)

			Estimate	Critical ratio	Sig
Wellbeing	<--	Collaboration	1.346	34.126	< 0.0001
Depression	<--	Wellbeing	−0.915	−12.563	< 0.0001
Anxiety	<--	Wellbeing	−0.668	−0.23.237	< 0.0001
Stress	<--	Wellbeing	−0.748	−18.157	< 0.0001
Depression	<--	Collaboration	−0.124	−1.861	0.063

Sig significant

the relationship between coping and dual adjustment and the level of depression, anxiety, and stress in infertile couples [30–32]. The positive effects of couple interaction on reducing the despair of infertile couples [33] have also been reported.

One study showed that, through its effect on reducing the rejection of a childless lifestyle and meaning-based coping, spousal support was related to the reduction of infertility stress [28]. Li et al. reported that in infertile couples, women's mental health was related to social anxiety through the mediation of marital adjustment [34]. These reports indicate the importance of dual interactions of infertile couples with each other and its impact on their mental health.

In this regard and to complement the results of other studies [28, 33, 34], the results of the present study showed that the effect of couple's collaboration in infertile couples under ART on the level of anxiety and stress was applied only indirectly and through the mediation of well-being during infertility. Unlike the level of anxiety and stress, the couple's collaboration had a negative effect on depression both directly and indirectly affecting well-being during infertility.

This study finding can be explained by considering the distinct conditions of infertile couples who entered the ART process. The difference in the participation of each couple in the ART process and the difference in each individual's concerns upon starting the treatment [35, 36] are conditions that may overshadow the effect of the couple's collaboration on mental health. Studies have shown that while men are more concerned about the financial costs of ART, the duration of treatment [29], and the complications of ovulation stimulation in their wives [37], the main reason for treatment stress in women was social concerns and worries about life without children [38]. These differences may reduce mutual understanding [39] in infertile couples. It has been reported that infertile couples who enter the treatment process face Alexithymia or, in other words, the inability to express their feelings, which reduces their quality of life [40].

These findings show that the relationship between infertile couples can reduce the anxiety and stress of couples when the feeling of being good in the current situation is strengthened. Consequently, in order to improve well-being during infertility and mental health, it is necessary to design intervention programs based on couple interaction by identifying mediating factors related to the well-being of infertile couples undergoing ART.

Another finding of the study showed that, unlike anxiety and stress, which were not directly affected by a couple's collaboration, depression was directly affected by a couple's collaboration by the mediation of well-being during infertility. The difference in the effect of couple interaction on depression, anxiety, and stress might be due to the factors that cause each of these psychological indicators. Although depression, anxiety, and stress are often related to each other, the factors directly affecting them are not similar. Reports suggest that unlike depression [41], anxiety levels increase when entering assisted reproductive treatment [37].

These results show that couple's collaboration in infertile couples undergoing ART can directly moderate couples' levels of depression; however, in order to control these couples' anxiety and stress, it is necessary to search for solutions in the context of couple's collaboration that are associated with increasing well-being during infertility. Although the results of this study have been confirmed using the evaluation of structural equations, in interpreting the results, it is necessary to take into account the limitations of the study. The first and most important limitation of the present study was its cross-sectional nature. In this type of study, it is not possible to determine the priority of each variable. Therefore, presenting a causal pathway between a couple's collaboration, well-being during infertility, and psychological health is limited.

Although the study was conducted in the infertility treatment center, which was a referral center and patients from other provinces of Iran were also referred to it, the results cannot be generalized to different Iranian ethnic groups. In addition, in this study, the changes in the couple's collaboration and indicators of depression, anxiety, and stress could not be evaluated in order to be able to consider the effect of the specific conditions of starting ART on each factor. Therefore, the study results are not generalizable for infertile couples who have not yet started the ART process.

The results of this study showed that the couple's collaboration and well-being during infertility was followed by a reduction in the level of depression, anxiety, and stress. However, the effect of the couple's collaboration on the level of anxiety and stress of ART couples was applied through the mediation of well-being during infertility. These results suggest the necessity of identifying

mediating factors affecting well-being during infertility in order to develop mental health promotion programs for ART couples. It is also suggested that, in the counseling programs of couples who are candidates for ART, the necessity of their couple interaction should be emphasized.

Abbreviations

ART	Assisted reproductive treatments
DASS	Depression, anxiety, stress scale
AMOS	Analysis of moment structures

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Author contributions
M.R, A.K and Z.S were involved in study conception and design. M.R, A.K, S.M and Z.S wrote the first draft of the manuscript. A.K and Z.S. involved in data collection supervising and responsible for coordinating the study. A.K and M.R involved in data analysis. S.M, A.K and Z.S involved in writing and editing the manuscript. All authors read and approved the final version of the manuscript.

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Availability of data and materials
The data are, available from the authors upon reasonable request and with the permission of Isfahan University of Medical Sciences (https://mui.ac.ir).

Declarations

Ethics approval and consent for participation
Ethical approval for this study has been obtained by the ethics committee affiliated with Isfahan University of Medical Sciences, Isfahan, Iran. (IR.MUI.NUREMA.REC.1400.019). All the procedures to the participants were in accordance with the ethical standards of the Isfahan University of Medical Sciences.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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