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REVIEW ARTICLE

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Comparing infertility-related stress, coping, and quality of life among assisted reproductive technology and non-assisted reproductive technology treatments

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ABSTRACT

Women who undergo assisted reproductive technology (ART) treatments experience infertility-related stress and have low quality of life (QOL). However, there is limited understanding of infertility-related stress, coping, or QOL among women who undergo non-ART treatments. The purpose of this study was to examine infertility-related stress, coping, and QOL among women who undergo ART and non-ART infertility treatments. Using a descriptive correlational cross-sectional design, we recruited 200 women who underwent infertility treatments. Participants completed the Copenhagen Multi-centre Psychosocial Infertility (COMPI) Fertility Problem Stress Scale, COMPI Coping Styles Scale, Fertility Quality of Life tool, and a demographic infertility survey. Data analysis included descriptive statistics, independent t-test, chi-square, and hierarchical multiple regression. Women who underwent non-ART had more personal stress, used more active-avoidance coping, and had lower emotional, social, and treatment environment QOL compared to those in ART treatment. Women who underwent ART treatments used more meaning-based coping but had lower treatment tolerability QOL. Stress and coping contribute to core QOL differently among infertility treatment groups. Both treatment groups report low satisfaction with emotional services. Regardless of the treatment type, women who undergo infertility treatments may need care to address their psychological health.

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Introduction

Women who experience infertility, the inability to conceive or carry a pregnancy to term after a year of unprotected sexual intercourse (Centers for Disease Control, 2021), have rated the experience as one of the most stressful life events consistent with parental death or partner infidelity (Matsubayashi et al., 2004), or chronic conditions, such as cancer (Cousineau & Domar, 2007). In the United States (U.S.), one-third of Americans report having used or knowing someone who has used infertility treatments (Livingston, 2018). For most individuals, infertility treatments include surgical or medical management by correcting structural defects within the reproductive system or using medications to enhance or induce ovulation. The use of assisted reproductive technology (ART), such as in-vitro fertilisation (IVF), has increased by 39% between 2007-2016 (Centers for Disease Control and Prevention, American Society for Reproductive Medicine, & Society for Assistive Reproductive Technology, 2018). Most ART treatments occur in women between the age of 30–39 (European Society of Human Reproduction and Embryology, 2022).

For women, infertility treatments often involve planning and determining optimal timing of treatments, medications, monitoring, intercourse, or other procedures related to their menstrual cycle. The cognitive rumination in planning these activities, combined with the potential for life disruptions in undergoing treatments, may lead to negative psychological consequences in women with infertility. The infertility experience encompasses multiple sources of stress, including personal, marital, and social stress (Aflakseir & Zarei, 2013; Schmidt, 2006), and the stress of infertility treatments (Greil et al., 2011; Pasch et al., 2012). To manage infertility-related stress, individuals use coping strategies to regulate emotions of the infertility experience, problem-solve, or add meaning to the experience based on beliefs or values (Schmidt, 2006). Often higher infertility-related stress is associated with use of

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avoidance-coping strategies (Aflakseir & Zarei, 2013; Gourounti et al., 2012; Schmidt, 2006) and lower quality of life (QOL) (Hubens et al., 2018; Li et al., 2019; Ngai & Loke, 2022).

In previous research, infertility-related stress, coping, and QOL in women with infertility primarily included those who underwent ART treatments, such as IVF, egg retrievals and transfers, and embryo transfers. It is known that QOL is impaired among women with infertility (Aduloju et al., 2018; Bakhtiyar et al., 2019; Ngai & Loke, 2022) and women in ART treatments (Chachamovich et al., 2010; Kahyaoglu Sut & Balkanli Kaplan, 2015). However, few studies consider QOL in U.S. women with infertility or women who undergo non-ART treatments, such as surgical management of infertility or medical management with medications to stimulate or induce ovulation with timed intercourse or intrauterine inseminations. Treatment differences may lead to greater psychological distress in those who undergo ART treatments due to the intensity and costs of treatment (Katz et al., 2011). However, infertility-related stress, coping, and quality of life among U.S. women who undergo non-ART treatments are unknown, which is significant because most women who receive infertility treatments are four times more likely to receive non-ART treatments (Schieve et al., 2009), and only 1-2% of women who undergo infertility treatments will undergo ART treatments (Katz et al., 2011). Therefore, there is a substantial knowledge gap in understanding the psychological distress and well-being of women who undergo non-ART treatments. Awtani et al. (2017) found no statistically significant differences in infertility-related stress levels between Indian couples who underwent IVF and those who underwent intrauterine inseminations, which is considered a type of non-ART treatment. Aarts et al. (2011) considered differences in Dutch women's anxiety, depressive symptoms, and QOL scores among women who underwent ART and non-ART treatments and found no statistically significant differences in anxiety, depressive symptoms, or QOL scores. Contrary, Wdowiak et al. (2021) found that Polish women who received non-ART treatments reported lower QOL scores than those receiving ART treatments. The lack of statistical significance in stress, anxiety, depressive symptoms, and contradicting findings of QOL in women who undergo ART and non-ART treatments may imply QOL for all women who undergo infertility treatments is impaired regardless of treatment types, though further studies are needed especially among women in the U.S. Therefore, the purpose of our study was to examine infertility-related stress, coping, and QOL among U.S. women who undergo ART and non-ART treatments. Although there is some evidence that stress and QOL are similar in women undergoing different infertility treatments, we hypothesise that the prediction of QOL in each treatment group (ART and non-ART), controlling for the effects of treatment differences and coping strategies, will result in differences in the type of infertility-related stress in predicting QOL.

Materials and methods

Design and setting

We used a quantitative descriptive correlational cross-sectional study design to investigate our study objectives. This paper presents a third research aim of our original study which examined infertility-related stress, hair cortisol, coping, and QOL in women living in the United States (Swift et al., 2021). Briefly, between March and May 2019 (Phase 1), and between July and September 2019 (Phase 2), we used Facebook to recruit participants from the United States, where 77% of women consider themselves 'users' of Facebook and 70% of adults between the ages of 18–49 years consider themselves users (Pew Research Center, 2021).

Sample

Participants included women between the ages of 18–55 living in the United States who self-reported an infertility diagnosis, underwent infertility treatments within the past six months to reflect a recent treatment status, and were able to speak and read English. Using a power analysis for correlations, assuming a power = 0.80, $\alpha = 0.05$, the targeted sample size was $N = 194$.

Measurements

We used the Copenhagen Multi-Centre Psychosocial Infertility (COMPI) Fertility Problem Stress Scale (COMPI-FPSS) to measure infertility-related stress. The COMPI-FPSS is a 9-item Likert scale that measures three dimensions of infertility-related stress, specifically personal, marital, and social. Originally developed as a 14-item tool (Schmidt, 2006), Sobral et al. (2017) shortened and revalidated the tool to include 3 items per subscale, with response choices ranging 1-4 from 'not at all' to 'a great deal', or 1-5 from 'strongly disagree' to 'strongly agree' (Sobral et al., 2017). Higher scores indicate greater stress. In this study, Cronbach's alpha estimates for each subscale were 0.67 (personal), 0.74 (marital), and 0.69 (social).

We administered the COMPI-Coping Styles Scale (CSS) to measure the use of coping styles within the infertility experience. The COMPI-CSS is a 19-item Likert scale with 4 subscales, including active-avoidance (4 items), active-confronting (7 items), passive-avoidance (3 items), and meaning-based coping (5 items). Response choices range 1-4 from 'not used' to 'used a great deal' (Schmidt, 2006). In this study, Cronbach's alpha estimates for each subscale were 0.66 (active-avoidance), 0.77 (active-confronting), 0.70 (passive-avoidance), and 0.75 (meaning-based).

We measured QOL using the Fertility Quality of Life tool (FertiQoL), which is a 36-item Likert scale specifically developed and validated in the infertility population. It includes 4 core subscales of QOL including emotional (6 items), mind/body (6 items), relational (6 items), social (6 items), a QOL treatment module (10 items), and 2 items that are not scored. The treatment QOL module includes an environment QOL subscale (6 items) that evaluates the effect of accessibility and quality of infertility treatments have on QOL, and a tolerability QOL subscale (4 items) that evaluates the effect physical and mental symptoms of infertility treatments have on QOL. Scores in each subscale are converted into a 0–100-point scale, and averaged for a total QOL score, with higher scores indicating greater QOL (Boivin et al., 2011). In this study, Cronbach's alpha estimates for each subscale were 0.84 (emotional), 0.80 (mind/body), 0.82 (relational), 0.71 (social), and 0.89 (core total), 0.79 (treatment environment), and 0.79 (treatment tolerability).

Lastly, we obtained demographic and situational data through participant self-report, including the type of infertility (primary, secondary, or unknown), current infertility treatment, pregnancy loss, age, race, ethnicity, marital status, education, average household income, infertility insurance coverage, and state of residence.

Procedure

The University and Medical Centre Institutional Review Board at East Carolina University reviewed and approved the study. Data were collected through an online survey, using the REDCap survey application to build and manage the survey (Harris et al., 2009). Participants completed a letter of consent to participate in the study prior to the start of the survey.

We developed a public Facebook page that included our study information and an embedded link to the secure online survey. We recruited participants through convenience and snowball sampling by sending administrators of infertility-related Facebook pages or groups a script describing the study, and a link to the Facebook study page and survey through Facebook Messenger. We asked administrators to share the study page or the survey link to their respective page or support group. Facebook users could also share our Facebook page or survey link with other users.

Statistical analysis

Data were analysed using SPSS version 24 (IBM Corp., 2016). Participants who underwent IVF or other forms of ART, such as frozen embryo transfers, were coded as ART treatments, and those who underwent any other surgical or medical treatments were coded as non-ART treatments. We conducted descriptive statistics using means, standard deviations, frequencies, and percentages to describe the sample. We used independent-samples t-test to compare mean differences between type of infertility treatments and COMPI-FPSS, COMPI-CSS, and FertiQoL scores, and the η^2 statistic to describe the strength of the statistical test of mean differences. We used hierarchical multiple regression to examine how strongly infertility stress predicted a statistically significant amount of variance in core quality of life after controlling for infertility treatment environment and treatment tolerability (step 1), and active-avoidance coping and mind-body coping (step 2) separately in the ART and non-ART groups. Individual treatment items were examined by comparing the percentage of item responses of 'extreme to moderate', 'very satisfied or satisfied', or 'always or quite often' in the non-ART and ART groups.

Results

We obtained 500 survey responses and 230 of these participants met the inclusion criteria. Reasons for exclusion included not completing the screening items ($n = 61$), no infertility diagnosis ($n = 25$), not living in the United States ($n = 33$), not receiving infertility treatments ($n = 147$), biologically male ($n = 3$), and over the age of 55 ($n = 1$). After excluding missing data, our sample size was $N = 200$ for this study. Demographic results of the ART and non-ART treatment groups are presented in Table 1. Participants resided in 36 U.S. states. Most of the participants in both treatment groups were non-Hispanic or non-Latino, White, married, and had similar education, household income, and fertility insurance coverage.

Table 1. Demographic characteristics of ART and non-ART study participants.

	ART		Non-ART		
Characteristic	n	%	n	%	*p*
Ethnicity					0.829
Non-Hispanic or Latino	79	81.4	86	83.5	
Hispanic or Latino	6	6.2	7	6.8	
Other	12	12.4	10	9.7	
Education					0.209
Some college or less	4	4.1	10	9.7	
Technical/associate degree	20	20.6	25	24.3	
Baccalaureate degree or higher	73	75.3	68	66.0	
Marital status					0.663
Married	92	94.8	100	97.1	
Committed relationship	4	4.1	2	1.9	
Divorced/separated	1	1.0	1	1.0	
Household yearly income (U.S. dollars)					0.235
<50,000	7	7.4	12	11.7	
51,000 – 100,000	36	37.9	48	46.6	
101,000 – 150,000	27	28.4	26	25.2	
>150,000	25	26.3	17	16.5	
Fertility insurance coverage					0.479
Full coverage	7	7.2	4	3.9	
Partial coverage	48	49.5	48	47.1	
No coverage	42	43.3	50	49.0	
Infertility type					0.028
Primary	71	73.2	60	58.3	
Secondary	22	22.7	41	39.8	
Unknown/unsure	4	4.1	2	1.9	
Pregnancy loss					0.063
Yes	44	45.4	54	52.4	
No	51	52.6	41	39.8	
Unsure	2	2.1	8	7.8	
Age years: M (SD)	33.0 (4.2)		31.6 (4.0)		0.016

Note. ART = assisted reproductive technology. Non-ART = infertility treatment other than assisted reproductive technology. Non-ART n = 103; ART n = 97.

ART treatment participants had significantly more primary infertility, had slightly fewer participants that experienced pregnancy loss, and were slightly older (M = 33.0 vs 31.5) compared to those in non-ART treatments.

Table 2 presents the mean comparisons of the study variables between the ART and non-ART participants. There were no significant differences in marital or social stress between the treatment groups, while personal stress was significantly higher in the non-ART group. Non-ART participants used significantly more active-avoidance coping than ART participants, while ART participants used significantly more meaning-based coping. Emotional, social, and core QOL were significantly higher in the ART group. Treatment environment QOL was higher in the ART participants and treatment tolerability QOL was higher in the non-ART participants.

Table 2. COMPI fertility problem stress scales, coping scales, and fertility quality of life between ART (n = 97) and non-ART (n = 103) groups.

	ART		Non-ART				
Variable	M	SD	M	SD	t	*p*	η^2
COMPI-FPSS							
Personal stress	10.9	1.8	11.3	1.5	1.96	0.012*	0.02
Marital stress	8.3	2.5	8.8	2.5	1.48	0.139	0.01
Social stress	7.0	2.2	7.1	2.3	0.49	0.623	0.00
COMPI-CSS							
Active-avoidance coping	10.2	2.9	11.3	2.7	2.69	0.008*	0.04
Active-confronting coping	15.1	3.9	14.8	4.7	0.62	0.536	0.00
Passive-avoidance coping	9.3	2.2	9.6	2.3	0.85	0.397	0.00
Meaning-based coping	11.5	3.2	10.5	3.6	1.98	0.049*	0.02
FertiQoL							
Emotional	35.4	19.3	28.8	17.9	2.53	0.012*	0.03
Mind/body	44.1	21.6	43.0	17.2	0.40	0.687	0.00
Relational	65.7	20.2	64.4	19.9	0.48	0.632	0.00
Social	51.0	18.7	42.1	18.6	3.38	0.001*	0.06
Core total	49.1	15.3	44.5	13.8	2.19	0.030*	0.02
Treatment FertiQoL							
Treatment environment	63.0	19.5	56.6	18.9	2.37	0.019*	0.03
Treatment tolerability	44.3	21.3	50.0	21.7	1.86	0.064	0.02

*$p < 0.05$.

Table 3 presents the results of the hierarchical regression in explaining variability in core QOL separately for the ART and non-ART groups. At step 1, the two treatment control variables, treatment environment and treatment tolerability, were added creating model 1. These two control variables accounted for 21% of the variance in core QOL for the ART group and 29% of the variance in core QOL in the non-ART group. Treatment tolerability made a unique and statistically significant contribution in the ART group, while both treatment environment and treatment tolerability made significant contribution in the non-ART group.

At step 2, active-avoidance coping and meaning-based coping were added with the two treatment control variables, creating model 2. The addition of the new control variables accounted for 26% of the variance in core QOL in the ART group and for 18% in the non-ART group. All four of the control variables accounted for 47% of the variance in core QOL in both treatment groups.

At step 3, the addition of the three-stress variables to the four control variables at step 2, creating model 3, added an additional 16% improvement in explaining core QOL in the ART group, and a 19% improvement in the non-ART group. The final model containing all seven predictor variables accounted for 63% of core QOL variability in the ART group and 66% of the variance in the non-ART group. The variables making statistically significant unique contributions to explaining core QOL when controlling for the variance explained by the all the other variables in the equation for the ART group, in order of importance,

Table 3. Hierarchical regression results for core quality of life (n = 200).

	ART			Non-ART		
Variable	β	R^2	ΔR^2	β	R^2	ΔR^2
Step 1 (Creating Model 1)		0.21	0.21***		0.29	0.29***
Treatment environment	0.14			0.23**		
Treatment tolerability	0.42***			0.46***		
Step 2 (Creating Model 2)		0.47	0.26***		0.47	0.18***
Treatment environment	0.05			0.15		
Treatment tolerability	0.32***			0.35***		
Active-avoidance coping	−0.44***			−0.33***		
Meaning-based coping	0.24**			0.32***		
Step 3 (Creating Model 3)		0.63	0.16***		0.66	0.19***
Treatment environment	−0.04			0.10		
Treatment tolerability	0.21**			0.20**		
Active-avoidance coping	−0.34***			−0.19**		
Meaning-based coping	0.11			0.21**		
Personal stress	−0.14			−0.33***		
Marital stress	−0.23**			−0.24**		
Social stress	−0.24**			−0.10		

**p < 0.01. ***p < 0.001.

Table 4. Percentage of fertility quality of life treatment scale items among non-ART and ART groups.

Scale Item	ART %	Non-ART %	Response
Treatment environment			
Fertility medical services available	90	79	Quite Often-Always
Staff understands what you go through	71	65	Moderate-Extreme
Services available to address emotional needs	23	17	Satisfied-Very Satisfied
Satisfied with surgical/medical treatments	77	83	Satisfied-Very Satisfied
Satisfied with quality of treatment information	58	49	Satisfied-Very Satisfied
Satisfied with interactions with medical staff	70	56	Satisfied-Very Satisfied
Treatment tolerability			
Treatment negatively affects mood	75	79	Quite Often-Always
Complicated dealing with treatments	67	57	Moderate-Extreme
Bothered by treatment on daily/work activities	69	59	Moderate-Extreme
Bothered by physical side effects of treatment	71	71	Moderate-Extreme

included active-avoidance coping (β = −0.34), social stress (β = −0.24), marital stress (β = −0.23), and treatment tolerability (β = −0.21). For the non-ART group, the significant unique predictors in order of importance were personal stress (β = −0.33), marital stress (β = −0.24), meaning-based coping (β = 0.21), treatment tolerability (β = −0.20), and active-avoidance coping (β = −0.19).

Table 4 presents the percent of positive/negative responses for each item in the treatment environment and treatment tolerability QOL subscales for the ART and non-ART groups. For the treatment environment, ART participants reported higher satisfaction than non-ART participants on services available, staff understanding of infertility, treatment information, and interactions with staff. Over 70% of participants in both groups were satisfied with their treatments; however, less than 25% were satisfied with services available to address their emotional needs. In treatment tolerability, most participants in both groups reported their treatments were complicated and affected their daily activities. Over 70% of the participants in both groups reported that their treatments affected their mood and that they were bothered by physical side effects.

Discussion

Our study is one of few that considered the psychological health of women undergoing non-ART treatments, which is surprising given that most women who undergo infertility treatments are not receiving ART treatments (Katz et al., 2011; Schieve et al., 2009). We found that infertility-related stress among women who underwent non-ART treatments was greater in dimension of personal stress than those who underwent ART treatments, with no significant differences in social or marital stress between the two groups. However, we found that marital and social stress were statistically significant and unique predictors of QOL in the ART treatment group, while personal and marital stress were significant unique predictors of QOL in the non-ART treatment group, after controlling for treatment differences and coping strategies. These finding suggests the experience of infertility and infertility treatments were similarly stressful regardless their

treatment type, though stress may affect the QOL of women differently based on their treatment type. Personality traits may play a role in the stress and coping behaviours of women with infertility (Darolia & Ghosh, 2022). For example, alexithymia, defined as the inability to recognise and express emotions, was associated with lower QOL in a sample of Italian women who underwent ART treatments (Renzi et al., 2020). Alexithymia affects emotional regulation and expression, which could explain stress and coping differences and low QOL among women in our study. Further, the social or cultural pressure for parenthood may escalate with the duration of infertility (Wiweko et al., 2017), increasing the likelihood of undergoing ART after unsuccessful non-ART treatments and leading to variations in QOL.

We also found women receiving non-ART treatments used more active-avoidance coping, less meaning-based coping, and had lower social and treatment environment QOL than women who underwent ART treatments. These findings indicate that women who underwent non-ART treatments have less adaptive coping strategies, have more negative emotions such as resentment, sadness, or depression, feel more isolated, and perceive less satisfaction and quality of care than women who underwent ART treatments. Women in our study who underwent ART treatments also used more meaning-based coping strategies, which is associated with lower levels of stress and higher QOL in other studies (Aflakseir & Zarei, 2013; Casu et al., 2018). Although meaning-based coping did not make a significant contribution to explaining QOL for those who underwent ART after controlling for the other explanatory variables in our study, meaning-based coping was significantly related to increased QOL in those who underwent non-ART treatments. For both treatment groups, treatment tolerability was a significant predictor for core QOL, highlighting that both types of treatment produce physical and mental side effects that influence QOL.

A surprising finding was that almost 80% of the women in both treatment groups felt they were not provided sufficient emotional and mental health services to meet their needs. Infertility-related stress contributes to poorer coping strategies and lower QOL (Cheng et al., 2018; Gourounti et al., 2012). Psychological interventions, such as counselling and mindfulness, can help decrease infertility-related stress, decrease maladaptive coping, and improve QOL (Li et al., 2016; Yazdani et al., 2017). Additionally, psychological interventions have been found to improve pregnancy rates (Frederiksen, 2015). Therefore, providers should prioritise mental health among women who undergo infertility treatments and ensure mental health services are robust enough to meet needs of women with infertility.

Women who underwent ART in our study generally indicated more satisfaction with services and care compared to those who underwent non-ART treatments, consistent with other studies that found couples receiving ART treatments were more satisfied with patient-centred care (Huppelschoten et al., 2013; van Empel et al., 2011). Perhaps providers discuss ART treatment options in greater depth, since these treatments are often more costly and invasive compared to non-ART treatments. Further, many fertility treatment clinics offer additional resources, such as acupuncture, mind/body programmes, and support groups. Providers should fully discuss treatment options and other patient concerns with women who undergo non-ART treatments and consider additional resources as a component of care for women who undergo non-ART treatments.

The cost of fertility treatments could be a contributing factor to infertility-related stress and QOL among women in the U.S. Women undergoing infertility treatment in the U.S. often pay out-of-pocket since insurance typically does not cover the high costs of infertility-related treatment (RESOLVE, 2021). Further studies are needed to examine the effect of treatment cost burden on infertility-related stress and QOL.

There are several limitations to our study, including the non-longitudinal cross-sectional design which does not allow for evaluation of causality. Selection bias may be present because of the Facebook recruitment strategy and may affect generalisability of the findings; however, participants in this study resided in 36 U.S. states and the demographic attributes of this study sample were like those who undergo ART and non-ART treatments (Kessler et al., 2013). Two subscales in the COMPI-FPSS and one in the COMPI-CSS had lower Cronbach's alpha scores and may need revision for use among U.S. women. We also did not collect data from the participant's partner or as a couple dyad, or treatment outcomes, which may have provided additional insight of infertility-related stress and QOL scores.

In conclusion, our findings contribute to the understanding of infertility-related stress, coping strategies, and QOL among women who undergo ART and non-ART treatments. We found more personal stress in women who underwent non-ART treatments compared to women in ART treatments; however, stress may affect the QOL of women differently based on

their treatment type. Women who underwent non-ART treatments used more active-avoidance coping and had lower social and treatment environment QOL, whereas women who underwent ART treatment more likely used meaning-based coping but had lower treatment tolerability QOL. Further, women reported a lack of emotional support services regardless of treatment type. Our findings demonstrate the need to offer psychological support to all women who undergo infertility treatments and for future studies to include women who undergo non-ART treatments.

Disclosure statement

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