ORIGINAL RESEARCH ARTICLE

The effect of mindfulness meditation nursing on the outcomes of in vitro fertilization–embryo transfer

DOI: 10.29063/ajrh2026/v30i4.7

*Xiuyun Chen and Lei Ding**

Department of Obstetrics and Gynecology, Affiliated Maternity and Child Health Care Hospital of Nantong University,Nantong.226001,Jiangsu,China

***For Correspondence:** Email: *13306290309@163.com;* Phone: +86-513-59008088

Abstract

This study investigated the impact of mindfulness meditation (MM) nursing on outcomes of in vitro fertilization–embryo transfer (IVF-ET). A total of 100 infertile patients undergoing IVF-ET were randomly assigned to either a conventional care group or an MM group, with 50 patients in each. While both groups received routine nursing, the MM group received additional MM-based nursing interventions. Compared to the conventional group, the MM group showed significantly lower postoperative pain scores (VAS) and better psychological outcomes, as evidenced by improvements in anxiety (SAS), depression (SDS), sleep quality (PSQI), and overall quality of life (WHO-QOL-BREF) (all P<0.001). Moreover, the MM group had higher numbers of punctured follicles and retrieved oocytes (P<0.001), more embryos transferred on day 3 post-retrieval (P=0.047), and a higher pregnancy rate (P=0.045). These findings suggest that incorporating MM into nursing care during IVF-ET can effectively reduce psychological stress, enhance well-being, and improve clinical outcomes. *(Afr J Reprod Health 2026; 30 [4]: 73-82).*

Keywords: in vitro fertilization–embryo transfer; mindfulness; nursing; infertility

Résumé

Cette étude a examiné l'impact des soins infirmiers intégrant la méditation de pleine conscience (Mindfulness Meditation, MM) sur les résultats de la fécondation in vitro avec transfert d'embryons (FIV-TE). Un total de 100 patientes infertiles ayant recours à la FIV-TE ont été réparties aléatoirement en deux groupes : un groupe recevant les soins infirmiers conventionnels et un groupe MM, comprenant chacune 50 patientes. Tandis que les deux groupes ont bénéficié des soins classiques, le groupe MM a en plus reçu des interventions infirmières basées sur la pleine conscience. Comparé au groupe conventionnel, le groupe MM a présenté des scores significativement plus bas de douleur postopératoire (VAS) ainsi que de meilleurs résultats psychologiques, notamment une diminution de l'anxiété (SAS), de la dépression (SDS), une amélioration de la qualité du sommeil (PSQI) et de la qualité de vie globale (WHO-QOL-BREF) (tous P<0.001). De plus, le groupe MM a présenté un nombre plus élevé de follicules ponctionnés et d'ovocytes recueillis (P<0.001), davantage d'embryons transférés au troisième jour après la ponction (P=0.047), ainsi qu'un taux de grossesse plus élevé (P=0.045). Ces résultats suggèrent que l'intégration de la méditation de pleine conscience dans les soins infirmiers en FIV-TE peut réduire efficacement le stress psychologique, améliorer le bien-être et optimiser les résultats cliniques. *(Afr J Reprod Health 2026; 30 [4]: 73-82).*

Mots-clés: fécondation in vitro avec transfert d'embryons ; pleine conscience ; soins infirmiers ; infertilité

Introduction

Infertility is a state of reduced reproductive ability, referring to a couple who have had regular unprotected intercourse for at least 12 months without achieving pregnancy[1]. The prevalence of infertility varies in different countries. In high-income countries, the prevalence of infertility is reported to be between 3.5% and 16.7%, while in low-income countries, it ranges from 6.9% to 9.3%[2]. Infertility has become a global issue affecting the reproductive health of women worldwide. Assisted Reproductive Technology (ART) is considered one of the most effective methods for treating infertility. The birth of in vitro fertilization and embryo transfer (IVF-ET) is one of the significant breakthroughs in 20th-century medicine. IVF-ET is an assisted reproductive technology aimed at helping couples who are unable to conceive naturally due to various reasons to achieve their fertility goals. The IVF-ET technique mainly includes the following steps: medication-induced ovulation stimulation, collection of mature oocytes from the female

ovaries using a fine needle guided by ultrasound, sperm extraction, fertilization, embryo culture, embryo transfer, and pregnancy testing[3,4]

IVF-ET technology, as the main approach in treating infertility, offers hope for countless patients to conceive and have children. However, this technique does not guarantee a 100% success rate, and only about one-third of patients achieve live births[5]. Most patients experience failures even after undergoing one or several IVF-ET treatments. Women also have to endure physical injuries such as complications and psychological distress like anxiety during the treatment process.

The main stages of IVF-ET include oocyte retrieval, imaging of the ovaries through vaginal ultrasound, and aspiration of the follicles using a puncture needle. Although it is a minimally invasive procedure, factors such as the insertion of a speculum and cervical traction unavoidably cause certain trauma to the human body, leading to pain and subsequently triggering physiological and psychological stress reactions. This can result in difficulties in retrieving oocytes, decreased oocyte retrieval rate, ovarian torsion, pelvic organ lacerations, and increased surgical risks and difficulties.[6,7]

The literature review by Hu et al. indicates that acupuncture therapy can improve the outcomes of IVF-ET[8]. Research by Wu et al. demonstrates that psychological interventions may potentially enhance the outcomes of IVF-ET[9]. Therefore, it is essential to strengthen perioperative nursing intervention for patients and improve their comfort level during medical treatment.Mindfulness meditation (MM) is a practice of psychological training that deeply observes oneself, the interaction between one's inner world and the external world, seeking truth, liberation, and wisdom.

It is a practice that has significant benefits to physical and mental health, helping people better focus on themselves, regulate emotions, and improve quality of life. It has gradually gained attention and application in clinical nursing work[10-13]. This study aimed to explore the effect of MM nursing on the outcomes of IVF-ET.

Methods

Patients

From January 2020 to October 2021, 130 infertile patients who underwent IVF-ET treatment at the Reproduction Medicine Center of Affiliated Maternity and Child Health Care Hospital of Nantong University were studied. According to the inclusion and exclusion criteria, a total of 100 participants were ultimately enrolled. The 100 patients were randomly divided into conventional group (50 cases) and MM group (50 cases) according to the random number table method. There was no statistical significance in the comparison of general data between the two groups ($P > 0.05$), as shown in Table-1,2. All patients were followed up until 28 days after transplantation, with no lost cases.

Inclusion criteria

Conform to the indications for IVF-ET outlined in the "Management Measures of Assisted Reproductive Technology for Humans"[14]; Patients with secondary infertility due to tubal factor; Patients who receive IVF-ET treatment for the first time; No history of fertility or induced abortion; The number of follicles on the day of oocyte retrieval is ≥3; Normal mental and conscious state, smooth communication [were assessed by Mental Status Examination (MSE)][15]; Fertilization rate greater than 70%; Embryo quality of Grade B or above; Successful embryo transfer.

The exclusion criteria

Contraindications for IVF-ET[14];Poor ovarian response; High position of the ovaries;Acute reproductive tract infection or difficulties in oocyte retrieval due to contraindications; Mental disorders. Out of the 130 patients, 8 had poor ovarian response, 4 had high ovarian position, 3 had fertilization rate lower than 70%, 4 had embryo quality of Grade C, 2 had not successful embryo transfer, and 9 had acute reproductive tract infections or contraindications leading to difficulties in oocyte retrieval.

Table 1: Patients' general information

Variables	Total (n = 100)	conventional group (n = 50)	MM group (n = 50)	Statistic	*P*
The number of follicles before procedure	10.54 ± 4.31	10.38 ± 4.21	10.70 ± 4.45	t=-0.37	0.713
Age (year)	32.00 (30.00, 34.00)	32.00 (30.00, 34.75)	31.50 (29.00, 34.00)	Z=-0.67	0.504
BMI	23.40 (20.80, 26.00)	23.45 (21.35, 25.90)	23.40 (20.40, 26.00)	Z=-0.54	0.588
AMH (ng/ml)	5.30 (3.38, 7.12)	5.35 (3.50, 7.10)	4.80 (2.92, 7.83)	Z=-0.55	0.581
Years of marriage (year)	3.00 (2.00, 4.00)	2.00 (2.00, 4.00)	3.00 (2.00, 5.00)	Z=-1.31	0.189
Educational Level					
junior high school	13 (13.00)	7 (14.00)	6 (12.00)	$\chi2$=0.20	0.924
high school	38 (38.00)	18 (36.00)	20 (40.00)		
University	49 (49.00)	25 (50.00)	24 (48.00)		
Smoking				$\chi2$=0.10	0.749
Yes	11 (11.00)	5 (10.00)	6 (12.00)		
No	89 (89.00)	45 (90.00)	44 (88.00)		

Note: AMH: Anti-Müllerian Hormone; BMI: Body Mass Index; MM: mindfulness meditation.

Table 2: Male partner general information

Variables	Total (n = 100)	conventional (n = 50)	MM (n = 50)	Statistic	*P*
Age	30.69 ± 5.58	31.24 ± 5.11	30.14 ± 6.02	t=0.99	0.327
BMI	22.30 ± 4.54	22.85 ± 4.15	21.76 ± 4.87	t=1.21	0.228
Smoking				$\chi2$=0.17	0.683
Yes	40 (40.00)	19 (38.00)	21 (42.00)		
no	60 (60.00)	31 (62.00)	29 (58.00)		
Total progressive motile sperm count after purification ($\times10^6$)	41.08 (30.78, 56.90)	36.48 (21.63, 51.50)	45.50 (33.66, 62.00)	Z=-1.77	0.077

Note: BMI: Body Mass Index; MM: mindfulness meditation.

All patients signed a written informed consent form before the operation.

Nursing methods

The conventional group received regular nursing measures such as health education on a regular basis. The MM group received MM nursing based on: distributing relevant materials on MM to patients, introducing related concepts, explaining implementation methods, informing patients about the importance of MM, achieving patient understanding and support, and improving treatment compliance.MM nursing procedure: A quiet, comfortable, and distraction-free environment was identified for meditation. A

comfortable sitting or lying posture was chosen, maintaining a relaxed body and a conscious mind. The patients were requested to focus attention on their breath.The sensations of breathing were noticed, inclusding the process of inhaling and exhaling, and the rhythm of breath of the patients. When the thoughts wander, the patients wre gently requested to re-focus on their breath. As they deepened the practice, they were requested to expand their awareness to include bodily sensations, surrounding sounds, and emotional changes. They were asked to maintain a non-judgmental attitude, simply observing without reacting. When their meditation times ended, they did not abruptly rise or stop breathing. They slowly opened their eyes, and felt their surroundings and physical state.

MM nursing started one month before the IVF-ET procedure and continued until treatment was completed. It included a daily 60-minute self-training session and a weekly 60-minute group training session. No changes in the training plan took place during the perioperative period. The location of the group training session was chosen indoors or outdoors depending on the weather. The location for self-training was chosen freely by individuals. For self-training, nursing staff used mobile applications to supervise and guide the patients. All nurses involved in nursing care had obtained Mindfulness Meditation Teacher Certificates. All patients during the oocyte retrieval process were administered intravenous anesthesia.

Observed indicators

Pain assessment: Immediately after oocyte retrieval and 1 hour after the procedure, the visual analogue scale (VAS)[16] was used to assess the patient's pain level. The total score ranges from 0 to 10, with higher scores indicating more severe pain.Anxiety and depression status assessment: Before and after nursing interventions, the Self-Rating Anxiety Scale (SAS)[17] and the Self-Rating Depression Scale (SDS)[17] wereused to assess the patient's psychological status. Higher scores indicated higher levels of anxiety and depression.Quality of life evaluation: Before and after nursing interventions, the World Health Organization Quality of Life-BREF (WHO-QOL-BREF)[18] was applied to evaluate the quality of life. The WHO-QOL-BREF questionnaire included four domains: psychological, physical, social relationships, and environmental. Higher scores indicate a better quality of life.

Sleep quality assessment: Before and after nursing interventions, the Pittsburgh Sleep Quality Index (PSQI)[19] was applied to evaluate the sleep quality. PSQI included 7 items, with each item rated on a scale of 0 to 3. The total score ranged from 0 to 21, with higher scores indicating poorer sleep quality.IVF-ET outcome evaluation: This included the number of punctured follicles, the actual number of retrieved oocytes, the number of embryos transferred on the third day after oocyte retrieval, and the pregnancy rate.

Statistical analysis

The Kolmogorov-Smirnova test was used to test the normality of the measurement data obtained in this study. If the data followed a normal distribution, they were presented as (mean ± SD). Independent samples t-test or Pairwise t-test was used for between-group comparisons. If the data did not follow a normal distribution, they were presented as median (P_{25}, P_{75}). Between-group comparisons were conducted using the Mann-Whitney U test or Wilcoxon Rank-Sum Test. The count data is represented as n (%), and the comparison between groups is conducted using the chi-square test. The statistical analysis was performed using SPSS 21.0 software. A significance level of $P<0.05$ was considered statistically significant.

Ethical considerations

This study was approved by the Ethics Committee of Affiliated Maternity and Child Health Care Hospital of Nantong University (Y2020075, 9/3/2020).

Results

Comparison of pain levels between two groups of patients

The VAS scores of the MM group, both immediately after the oocyte retrieval procedure and 1-hour post-procedure, were significantly lower than those of the conventional group.

Table 3: Comparison of pain levels between two groups of patients

	n	VAS scores immediately after procedure	1-hour post-procedure
Total	100	5.00 (4.00, 6.00)	4.00 (3.00, 4.00)
conventional group	50	6.00 (6.00, 7.00)	4.00 (4.00, 5.00)
MM group	50	4.00 (4.00, 5.00)	3.00 (3.00, 3.00)
Z		-8.59	-8.35
P		<0.001	<0.001

MM: mindfulness meditation; VAS: visual analogue scale

Table 4: Comparison of anxiety and depression status between two groups of patients

Variables		Total (n = 100)	conventional group(n = 50)	MM group (n = 50)	Statistic	*P*
SAS	Before interventions	55.00 (54.00, 57.00)	55.00 (54.00, 57.00)	56.00 (55.00, 57.00)	Z=-1.04	0.298
	After interventions	41.50 (36.75, 49.00)	49.00 (48.00, 50.00)*	36.50 (36.00, 37.75)*	Z=-8.66	<.001
SDS	Before interventions	59.00 (56.00, 61.00)	59.00 (56.25, 60.00)	58.50 (56.00, 61.75)	Z=-0.04	0.970
	After interventions,	47.00 (44.00, 51.00)	51.00 (48.25, 53.00)*	44.00 (43.00, 45.00)*	Z=-8.65	<.001

MM: mindfulness meditation; SAS: Self-Rating Anxiety Scale; SDS: Self-Rating Depression Scale. * vs.Before interventions, P<0.01.

There was a significant difference between the two groups (P<0.001). The results were showed in Table-3. MM nursing reduced the pain levels of patients.

Comparison of anxiety and depression status between two groups of patients

There was no significant difference between the two groups of patients in SAS and SDS scores before nursing intervention (P>0.05). After nursing intervention, the SAS and SDS scores of both patient groups showed a significant decreased (P<0.001), and the MM group showed better scores than the conventional group (P<0.001). The results were showed in Table-4. MM nursing reduced the anxiety and depression status of patients.

Comparison of quality of life between two groups of patients

There was no significant difference between the two groups of patients in psychological, physical, social relationships, and environmental scores of WHO-QOL-BREF before nursing intervention (P>0.05). After nursing intervention, the psychological, physical, social relationships, and environmental scores of WHO-QOL-BREF of both patient groups showed a significant increased (P<0.001), and the MM group showed better scores than the conventional group (P<0.001). The results were showed in Table-5. MM nursing enhanced the quality of life of patients.

Comparison of sleep quality between two groups of patients

There was no significant difference between the two groups of patients in PSQI scores before nursing intervention (P>0.05). After nursing intervention, the PSQI scores of both patient groups showed a significant decreased(P<0.001), and the MM group showed better scores than the conventional group in PSQI (P<0.001). The results were showed in Table-6. MM nursing enhanced the sleep quality of patients.

Table 5: Comparison of quality of life between two groups of patients

Variables		Total (n = 100)	Conventional group (n = 50)	MM group (n = 50)	Statistic	*P*
Psychological	Before Interventions	14.00 (12.75, 15.00)	14.00 (11.25, 15.00)	14.00 (13.00, 14.00)	Z=-0.17	0.869
	After Interventions	16.00 (14.00, 18.00)	14.00 (14.00, 16.00)*	17.00 (17.00, 19.00) *	Z=-6.57	<.001
Physical	Before Interventions	12.00 (12.00, 13.25)	12.00 (12.00, 13.00)	12.00 (12.00, 13.75)	Z=-0.20	0.842
	After Interventions	14.50 (13.00, 16.00)	13.00 (12.00, 14.00) *	16.00 (15.00, 17.00) *	Z=-6.97	<.001
Social Relationships	Before Interventions	14.00 (13.00, 15.00)	14.00 (13.00, 15.00)	14.00 (13.00, 15.00)	Z=-0.28	0.778
	After Interventions	16.00 (15.00, 17.25)	15.00 (14.00, 16.00) *	17.00 (16.00, 18.00) *	Z=-5.26	<.001
Environmental	Before Interventions	16.00 (14.00, 17.00)	16.00 (14.00, 17.00)	15.50 (14.00, 17.00)	Z=-0.23	0.818
	After Interventions	18.00 (17.00, 20.00)	17.00 (15.25, 18.00) *	19.00 (18.00, 21.00) *	Z=-5.05	<.001

* vs.Before interventions, P<0.01.

Table 6: Comparison of sleep quality between two groups of patients

Variables		Total (n = 100)	conventional (n = 50)	MM (n = 50)	Statistic	P
PSQI	Before interventions	18.00 (16.00, 18.25)	18.00 (17.00, 19.00)	17.00 (15.00, 18.00)	Z=-1.91	0.056
	After interventions	9.50 (8.00, 12.00)	12.00 (11.00, 13.00)*	8.00 (7.00, 9.00)*	Z=-8.62	<.001

* vs.Before interventions, P<0.01.

Table7: Comparison of IVF-ET outcomes between two groups of patients

Variables	Total (n = 100)	conventional group (n = 0)	MM group (n = 50)	Statistic	*P*
Number Of Punctured Follicles	10.15 ± 4.50	8.64 ± 4.25	11.66 ± 4.27	t=-3.55	<.001
Actual Number Of Retrieved Oocytes	8.00 (5.75, 11.00)	6.50 (4.00, 9.75)	9.00 (7.00, 12.00)	Z=-3.72	<.001
Number Of Embryos Transferred On The Third Day After Oocyte Retrieval	1.00 (1.00, 2.00)	1.00 (1.00, 2.00)	2.00 (1.00, 2.00)	Z=-1.99	0.047
Pregnancy				χ^2=4.03	0.045
no	46 (46.00)	28 (56.00)	18 (36.00)		
yes	54 (54.00)	22 (44.00)	32 (64.00)		

Comparison of IVF-ET outcomes between two groups of patients

The number of punctured follicles (P<0.001), the actual number of retrieved oocytes (P<0.01), the number of embryos transferred on the third day after oocyte retrieval (P=0.047), and the pregnancy rate (P=0.045) in the MM group were all significantly higher than those in the conventional group.

The results were showed in Table 7. MM nursing enhanced the IVF-ET outcomes.

Discussion

Patients who undergo IVF-ET for assisted reproduction are often long-term infertile, suffering both physically and mentally. They bear the dual burden of physical and emotional pain. These patients often lack psychological preparation and sufficient understanding of their condition, which can lead to various negative psychological emotions. They also face repeated medical visits and failures, which causes psychological stress, increased sensitivity to pain, and decreased pain tolerance, ultimately impacting the implementation and prognosis of IVF-ET[20-22]. Clinical studies have shown that anxiety and depression are common negative psychological emotions in infertile women. Furthermore, the complex and lengthy process of IVF-ET treatment significantly increases psychological discomfort and stress, affecting treatment outcomes[23,24]. Therefore, it is imperative to improve the psychological state and management of pain stimuli in patients during IVF-ET treatment. A multidisciplinary team, including physicians, psychologists, anesthetist and nurses, should collaborate to conduct targeted psychological assessments and interventions for patients, strengthen pain management, and help alleviate anxiety, depression, and other negative emotions, thereby improving the success rate of pregnancy. Research by Chen et al. suggests that psychotherapy based on the dual ABCX model can effectively alleviate depression, anxiety, sleep disorders, and elevated cortisol levels during the IVF-ET treatment cycle[25]. The literature review by Li et al. indicates that patients receiving intervention from professional psychologists are more likely to become pregnant during IVF-ET treatment.[26]

MM is a practice of psychological training that originated from ancient Buddhism and Hinduism. However, it is not limited to these two religions but rather a widely practiced method in various cultures and communities. The core of MM is to teach individuals to slow down their thoughts, let go of negative emotions, and achieve inner calmness. It emphasizes complete focus on the "present moment" by acknowledging and accepting one's thoughts, feelings, and sensations without judgment, for the purpose of achieving inner peace and clarity[27,28]. The practice of MM includes conscious awareness, which involves deepening attention to what one is currently doing. This awareness is not the usual vague "knowing," but a conscious and profound attention to the ongoing experience. MM has significant effects. It can make people feel calm and joyful, enhance their resilience to stress, and significantly improve sleep quality. Furthermore, it helps individuals focus more on their own and others' positive aspects, thereby enhancing happiness and satisfaction[29,30].

In terms of emotional regulation, MM helps individuals better regulate their emotions by being aware of and accepting their current emotional experiences, reducing anxiety and tension. In terms of cognitive function, MM positively affects cognitive function by improving concentration and awareness, thereby enhancing mental focus[31]. MM has a wide range of applications in clinical nursing practice. Its application in patient care can help patients manage pain and stress, enhance self-care and self-acceptance abilities, improve communication and understanding, and promote recovery and self-management. Nurses can provide guidance and support in MM to help patients have a better experience and outcomes in their disease treatment and nursing process[32-35].

In this study, the VAS scores showed MM nursing reduced the pain levels of patients both immediately after the oocyte retrieval procedure and 1-hour post-procedure. This indicates that MM can help patients reduce the perception of pain and cope with the distress caused by pain. By cultivating patients' awareness and acceptance of pain, they can better manage pain and adopt relaxation and coping strategies to alleviate pain. The results of comparison of anxiety and depression status between two groups of patients showed MM nursing reduced the anxiety and depression status of patients. This indicates that MM can help patients become aware of and accept their current emotions and thoughts, and adopt appropriate coping strategies such as deep breathing and relaxation training to reduce stress and anxiety, and improve emotional stability. In addition, we also compared the WHO-QOL-BREF and PSQI scores of the two groups, and the results indicated that MM nursing can significantly improve patients' quality

of life and sleep quality. The results of comparison of IVF-ET outcomes between two groups of patients showed, the number of punctured follicles, the actual number of retrieved oocytes, the number of embryos transferred on the third day after oocyte retrieval, and the pregnancy rate in the MM group were all significantly higher than those in the conventional group. This indicates that MM nursing enhanced the IVF-ET outcomes.

Strengths and limitations

The incorporation of MM into nursing care during IVF-ET represents a novel approach. The findings suggest that this intervention can effectively reduce psychological stress and enhance clinical outcomes, potentially offering a valuable addition to conventional care. However, the study included only 100 participants, which is a relatively small sample size. This may limit the generalizability of the findings. Subsequently, we will conduct multicenter studies with large samples

Conclusion

In conclusion, the results of this study indicate that MM nursing can significantly reduce patients' psychological stress, improve their quality of life, and effectively enhance the treatment outcomes of IVF-ET.

Conflict of interests

The authors declare that they have no conflict of interest.

Funding

None.

Consent for publication

All patients had given informed consent.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Acknowledgments

The authors would like to express their sincere gratitude to the staff of the Department of Obstetrics and Gynecology at the Affiliated Maternity and Child Health Care Hospital of Nantong University for their invaluable assistance throughout the study

References

1. Leone Roberti Maggiore U, Chiappa V, Ceccaroni M, Roviglione G, Savelli L, Ferrero S, Raspagliesi F and Spanò Bascio L. Epidemiology of infertility in women with endometriosis. *Best Pract Res Clin Obstet Gynaecol*. 2024 Feb;92:102454. doi: 10.1016/j.bpobgyn.2023.102454.
2. Boivin J, Bunting L, Collins JA and Nygren KG. International estimates of infertility prevalence and treatment-seeking: potential need and demand for infertility medical care. *Hum Reprod*. Jun 2007;22(6):1506-12. doi:10.1093/humrep/dem046
3. Xu M, Zhu M and Zheng C. Effects of acupuncture on pregnancy outcomes in women undergoing in vitro fertilization: an updated systematic review and meta-analysis. *Archives of Gynecology and Obstetrics*. 2023;309(3):775-788. doi:10.1007/s00404-023-07142-1
4. Zhu F, Zhao B, Wu J, Yin S, Ma T, Li Z, Zhu X, Wang T, Yang B and Che D. Effect of transcutaneous electrical acupoint stimulation on pregnancy outcomes in women with *in vitro* fertilization-embryo transfer: A systematic review and meta-analysis. Front Cell Dev Biol. 2022 Dec 12;10:1068894. doi: 10.3389/fcell.2022.1068894.
5. Zhang CM, Zhang H, Yang R, Chen LX, Liu P, Li R, Qiao J and Wang Y. The Reproductive Outcome of Women with Hypogonadotropic Hypogonadism in IVF. *Front Endocrinol (Lausanne)*. 2022 Jun 6;13:850126. doi: 10.3389/fendo.2022.850126.
6. Wang YQ, Yin TL, Xu WM, Qi QR, Wang XC and Yang J. Reproductive outcomes in women with prior cesarean section undergoing in vitro fertilization: A retrospective case-control study. *J Huazhong Univ Sci Technolog Med Sci*. Dec 2017;37(6):922-927. doi:10.1007/s11596-017-1828-3
7. Liu LY, Tian ZL, Zhu FT, Yang H, Xiao F, Wang RR, Chen L, Xiao ZY, Yu SY, Liang FR, Hu WH, Yang J. Systematic Review and Meta-Analysis of Acupuncture for Pain Management in Women Undergoing Transvaginal Oocyte Retrieval. *J Pain Res*. 2021 Sep 9;14:2833-2849. doi: 10.2147/JPR.S319923.
8. Hu XY, Xiu WC, Shi LJ, Jiao RM, Tian ZY, Hu XY, Ming TY, Gang WJ, Jing XH. Acupuncture for in vitro fertilization-embryo transfer: an overview of systematic reviews. *Zhongguo Zhen Jiu*. 2023 Nov

12;43(11):1315-1323. English, Chinese. doi: 10.13703/j.0255-2930.20221124-k0006.
9. Wu L, Sun L, Wang J, Sun Y, Zhang X, Huang Y, Lu Y, Cao F. Psychological distress among women undergoing *in vitro* fertilization-embryo transfer: A cross-sectional and longitudinal network analysis. *Front Psychol.* 2023 Jan 5;13:1095365. doi: 10.3389/fpsyg.2022.1095365.
10. Green AA and Kinchen EV. The Effects of Mindfulness Meditation on Stress and Burnout in Nurses. *J Holist Nurs*. Dec 2021;39(4):356-368. doi:10.1177/08980101211015818
11. Rusch HL, Rosario M, Levison LM, Olivera A, Livingston WS, Wu T and Gill JM. The effect of mindfulness meditation on sleep quality: a systematic review and meta-analysis of randomized controlled trials. *Ann N Y Acad Sci*. 2019 Jun;1445(1):5-16. doi: 10.1111/nyas.13996.
12. Gok Metin Z, Karadas C, Izgu N, Ozdemir L and Demirci U. Effects of progressive muscle relaxation and mindfulness meditation on fatigue, coping styles, and quality of life in early breast cancer patients: An assessor blinded, three-arm, randomized controlled trial. *Eur J Oncol Nurs*. Oct 2019;42:116-125. doi:10.1016/j.ejon.2019.09.003
13. Cherkin DC, Sherman KJ, Balderson BH, Cook AJ, Anderson ML, Hawkes RJ, Hansen KE and Turner JA. Effect of Mindfulness-Based Stress Reduction vs Cognitive Behavioral Therapy or Usual Care on Back Pain and Functional Limitations in Adults With Chronic Low Back Pain: A Randomized Clinical Trial. *JAMA*. 2016 Mar 22-29;315(12):1240-9. doi: 10.1001/jama.2016.2323.
14. Management Measures of Assisted Reproductive Technology for Humans. *Journal of Reproductive Medicine*. 2001;10(4):3. doi:CNKI:SUN:SZYX.0.2001-04-017
15. Chou MC, Yang YH and Liu CK. [Mental status examination]. *Acta Neurol Taiwan*. Mar 2007;16(1):41-9.
16. Sung YT and Wu JS. The Visual Analogue Scale for Rating, Ranking and Paired-Comparison (VAS-RRP): A new technique for psychological measurement. *Behav Res Methods*. Aug 2018;50(4):1694-1715. doi:10.3758/s13428-018-1041-8
17. Yue T, Li Q, Wang R, Liu Z, Guo M, Bai F, Zhang Z, Wang W, Cheng Y, Wang H. Comparison of Hospital Anxiety and Depression Scale (HADS) and Zung Self-Rating Anxiety/Depression Scale (SAS/SDS) in Evaluating Anxiety and Depression in Patients with Psoriatic Arthritis. *Dermatology.* 2020;236(2):170-178. doi: 10.1159/000498848.
18. Sakthong P. Mapping World Health Organization Quality of Life-BREF Onto 5-Level EQ-5D in Thai Patients With Chronic Diseases. *Value Health*. Aug 2021;24(8):1089-1094. doi:10.1016/j.jval.2021.03.001
19. Zitser J, Allen IE, Falgàs N, Le MM, Neylan TC, Kramer JH and Walsh CM. Pittsburgh Sleep Quality Index (PSQI) responses are modulated by total sleep time and wake after sleep onset in healthy older adults. *PLoS One*. 2022 Jun 24;17(6):e0270095. doi: 10.1371/journal.pone.0270095.
20. Domar AD, Meshay I, Kelliher J, Alper M and Powers RD. The impact of acupuncture on in vitro fertilization outcome. *Fertil Steril*. Mar 2009;91(3):723-6. doi:10.1016/j.fertnstert.2008.01.018
21. Koumparou M, Bakas P, Pantos K, Economou M and Chrousos G. Stress management and In Vitro Fertilization (IVF): A pilot randomized controlled trial. *Psychiatriki*. Dec 20 2021;32(4):290-299. doi:10.22365/jpsych.2021.029
22. Bapayeva G, Aimagambetova G, Issanov A, Terzic S, Ukybassova T, Aldiyarova A, Utepova G, Daribay Z, Bekbossinova G, Balykov A, Laganà AS and Terzic M. The Effect of Stress, Anxiety and Depression on In Vitro Fertilization Outcome in Kazakhstani Public Clinical Setting: A Cross-Sectional Study. *J Clin Med*. 2021 Mar 1;10(5):937. doi: 10.3390/jcm10050937.
23. Zhou Y, Sun Z and Song J. Research progress on the impact of anxiety and depression on embryo transfer outcomes of in vitro fertilization. *Zhejiang Da Xue Xue Bao Yi Xue Ban*. Feb 25 2023;52(1):61-67. doi:10.3724/zdxbyxb-2022-0473
24. Matsota P, Kaminioti E and Kostopanagiotou G. Anesthesia Related Toxic Effects on In Vitro Fertilization Outcome: Burden of Proof. *Biomed Res Int*. 2015;2015:475362. doi:10.1155/2015/475362
25. Chen D, Wang A, Zhang W, Guo Y, Yao S, Chen X and Zhang J. Effectiveness of double ABCX-based psychotherapy for psychological distress among women undergoing in vitro fertilization-embryo transfer: a three-arm randomized controlled trial. *J Psychosom Obstet Gynaecol*. 2023 Dec;44(1):2278015. doi: 10.1080/0167482X.2023.2278015.
26. Li YQ, Shi Y, Xu C and Zhou H. Cognitive behavioural therapy improves pregnancy outcomes of in vitro fertilization-embryo transfer treatment: a systematic review and meta-analysis. *J Int Med Res*. Nov 2021;49(11):3000605211050798. doi:10.1177/03000605211050798
27. Tang YY, Holzel BK and Posner MI. The neuroscience of mindfulness meditation. *Nat Rev Neurosci*. Apr 2015;16(4):213-25. doi:10.1038/nrn3916
28. Wielgosz J, Goldberg SB, Kral TRA, Dunne JD and Davidson RJ. Mindfulness Meditation and Psychopathology. *Annu Rev Clin Psychol*. May 7 2019;15:285-316. doi:10.1146/annurev-clinpsy-021815-093423
29. Ramesh MG, Sathian B, Sinu E and Kiranmai SR. Efficacy of rajayoga meditation on positive thinking: an index for self-satisfaction and happiness in life. *J Clin Diagn Res*. Oct 2013;7(10):2265-2267. doi:10.7860/JCDR/2013/5889.3488
30. Mo X, Qin Q, Wu F, Li H, Tang Y, Cheng Q, Wen Y. Effects of Breathing Meditation Training on Sustained Attention Level, Mindfulness Attention

Awareness Level, and Mental State of Operating Room Nurses. *Am J Health Behav*. 2021 Nov 15;45(6):993-1001. doi: 10.5993/AJHB.45.6.4.

31. Whitfield T, Barnhofer T, Acabchuk R, Cohen A, Lee M, Schlosser M, Arenaza-Urquijo EM, Böttcher A, Britton W, Coll-Padros N, Collette F, Chételat G, Dautricourt S, Demnitz-King H, Dumais T, Klimecki O, Meiberth D, Moulinet I, Müller T, Parsons E, Sager L, Sannemann L, Scharf J, Schild AK, Touron E, Wirth M, Walker Z, Moitra E, Lutz A, Lazar SW, Vago D, Marchant NL. The Effect of Mindfulness-based Programs on Cognitive Function in Adults: A Systematic Review and Meta-analysis. *Neuropsychol Rev*. 2022 Sep;32(3):677-702. doi: 10.1007/s11065-021-09519-y.
32. Li J, Li C, Puts M, Wu YC, Lyu MM, Yuan B and Zhang JP. Effectiveness of mindfulness-based interventions on anxiety, depression, and fatigue in people with lung cancer: A systematic review and meta-analysis. *Int J Nurs Stud*. 2023 Apr;140:104447. doi: 10.1016/j.ijnurstu.2023.104447.
33. Hilton L, Hempel S, Ewing BA, Apaydin E, Xenakis L, Newberry S, Colaiaco B, Maher AR, Shanman RM, Sorbero ME, Maglione MA. Mindfulness Meditation for Chronic Pain: Systematic Review and Meta-analysis. *Ann Behav Med*. 2017 Apr;51(2):199-213. doi: 10.1007/s12160-016-9844-2.
34. Ponte Márquez PH, Feliu-Soler A, Solé-Villa MJ, Matas-Pericas L, Filella-Agullo D, Ruiz-Herrerias M, Soler-Ribaudi J, Roca-Cusachs Coll A and Arroyo-Díaz JA. Benefits of mindfulness meditation in reducing blood pressure and stress in patients with arterial hypertension. *J Hum Hypertens*. 2019 Mar;33(3):237-247. doi: 10.1038/s41371-018-0130-6.
35. Brandel MG, Lin C, Hennel D, Khazen O, Pilitsis JG and Ben-Haim S. Mindfulness Meditation in the Treatment of Chronic Pain. *Neurosurg Clin N Am*. Jul 2022;33(3):275-279. doi:10.1016/j.nec.2022.02.005..