Current state and practical recommendations on reproductive mental health: A narrative review

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Emotional disorders (EDs) are highly prevalent during the reproductive period, including pregnancy, postpartum and women undergoing fertility treatments. International guidelines are increasingly suggesting the need to evaluate, prevent and treat EDs in those women. The main aim of this narrative review is to summarize current practice in the field of EDs management during fertility treatments, pregnancy and the postpartum and to propose a new technology-based model of care that help to provide psychological care to all women who are in these periods. Four different databases (Pubmed, Scopus, Science Direct, Web of Science) were consulted. Selected keywords were related with infertility, pregnancy, postpartum, EDs, assessment, prevention, treatment and technologies. We identified 1603 studies and 43 were included in this review. According to these studies, different face-to-face protocols already exist to manage EDs in women undergoing fertility treatments, pregnant or at the postpartum. We noticed an increased interest in developing technology-based solutions to overcome the limitations of traditional mental healthcare services. However, we also detected some issues in the use of technologies (i.e., increased attention to the postpartum or the lack of transdiagnostic approaches). Our results evidenced that there is still a need to develop modern, well-designed, and conceptually-relevant ICT-based programs to be used in women undergoing fertility treatments, pregnant or at the postpartum.

Keywords: perinatal women's mental health; pregnancy, postpartum, infertility; emotional disorders; psychological programs; face-to-face barriers; eHealth.

Introduction

The reproductive period comprises the years in which women can become pregnant and give birth, which ranges approximately from 15 to 49 years of age (World Health Organization [WHO] 2006). During this period of the vital cycle, some women may feel the desire to become mothers and thus begin planning to become pregnant. Contrary to what was socially accepted, this transition to motherhood is not always as smoothly as believed and many women face multiple physical and psychological challenges while seeking to become pregnant and during the perinatal period(Devi Ramalingam, Kumar Sampath, and Priya Amirtham 2021). In the next lines, we will describe some of the most frequent challenges that women experience when attempting to become pregnant, as well as on difficulties that may arise during the perinatal period, that is, during pregnancy and in the first year during the postpartum.

Women' challenges when trying to conceive: infertility and fertility treatments

While 84% of women get pregnant during the first year of unprotected sexual relationships (NHS-UK 2018), other women face multiple difficulties when trying to conceive. Infertility, understood as the inability to get pregnant after 12 months of unprotected sexual intercourse, affects approximately 8-12% of couples worldwide (Vander Borght and Wyns 2018). After the diagnosis of infertility, women usually start Assisted Reproductive Treatments (ART). Although these treatments offer the possibility to achieve pregnancy, fertility treatments also imply high emotional, physical, and economic burden (Chow, Cheung, and Cheung 2016). The most common challenges of ART have been found in sexual function, marital and social relationships, and emotional well-being (Chow, Cheung, and Cheung 2016; Kiani et al. 2021; Sater et al. 2022). Thus, experiencing anxiety and depressive disorders, also known as emotional

disorders (EDs; Bullis et al., 2019), during ART is therefore highly frequent (Kiani et al. 2021).

Recent studies have found positive associations between anxiety and depressive symptoms during ART, as well as sexual dysfunction, sleep disturbances, and, ultimately, ART discontinuation (Sater et al. 2022). This discontinuation with ART is associated with important economic losses, both for the healthcare system and for the women (van Eekelen et al. 2020).

International organizations have recently claimed the importance of providing psychological care during ART. For example, the European Society of Human Reproduction and Embryology (ESHRE Psychology and Counselling Guideline Development Group 2015) recommends that professionals assess behavioral, social, emotional, and cognitive needs of women under this treatment. Once the assessment is performed, the ESHRE recommends to provide women with information about lifestyle behaviors, ART procedures, as well as offering additional psychosocial care to women at risk of relational-social distress or negative emotional reactions.

Women' challenges during the perinatal period: pregnancy and the postpartum

In addition to this critical experience that can arise when trying to conceive, pregnancy and postpartum periods can also be associated with important challenges in the women. In particular, EDs are the most frequent mental illness during pregnancy and the postpartum. It is estimated that 29.2% and 24.4% of women suffer anxiety symptoms during pregnancy and in the postpartum, respectively (Nielsen-Scott et al. 2022). Additionally, around 9% and 19% of women have depressive symptoms during pregnancy and the postpartum (Woody et al. 2017). Also alarmingly, recent studies point to a rising prevalence of comorbid perinatal depressive and anxiety symptoms in recent past years (Cena et al. 2021).

Women who suffer EDs during the perinatal period and do not receive adequate support are at greater risk of presenting low self-esteem, decreased quality of life, relationship problems, addictive behaviors (i.e., smoking), suicidal ideation, excessive gestational weight gain, adverse birth outcomes, difficulties in motherhood role and mother-infant relationship (Dadi et al., 2022; Ozdemir & Ozcan, 2023; Slomian et al., 2019). In terms of child development, different meta-analytic studies have reported that, when not addressed, maternal EDs are associated with development problems in their offspring in socioemotional, behavioral, cognitive, language, and motor domains (Martucci et al. 2021; Slomian et al. 2019). All these negative consequences have also an important economic impact for society derived from healthcare utilization and medical expenditures, but also sick leaves (Pollack et al. 2022).

In this scenario, some of the most relevant international guidelines in the field of perinatal healthcare recommend that all perinatal women should be monitored on their emotional state (i.e., EDs) and their risk factors during pregnancy and the postpartum (at least during the first year after delivery). Regarding prevention and treatment of EDs during the perinatal period, international guidelines recommended to provide early stepped-care interventions based on manualized psychosocial protocols (i.e., Cognitive-Behavioral Therapy, CBT), including self-help, face-to-face, telephone, or e-mental health interventions according to the specific needs of the mother (Highet and the Expert Working Group and Expert Subcommittees 2023; National Institute for Health and Clinical Excellence [NICE] 2020; Research Innovation and Sustainable Pan-European Network in Peripartum Depression Disorders [RISEUP-PPD] 2023).

To sum up, according to institutional guidelines women undergoing ART and women during pregnancy and the postpartum should be longitudinally checked on their mental well-being and should be referred to the most convenient healthcare service

when emotional problems are detected. However, it is also important to note that health services that attend women undergoing ART and women in the perinatal period sometimes failed to address these guidelines, probably due to the lack of material and human resources to implement these assessment and intervention programs. During the last decades there has been an increased use of technologies (Andersson 2018) to support health services with limited resources. The use of Information and Communication Technologies (ICTs) and, more specifically, e-Health and m-Health has emerged as a cost-effective and reliable solution to overcome the limitations of face-to-face services (Denecke, Schmid, and Nüssli 2022; White et al. 2022). ICTs may help to provide more available and accessible evidence-based evaluations and treatments by reducing logistic barriers (i.e., traveling to the consultation or combining visits with child care), reducing costs, and saving the patients' and the professionals' time (Andersson and Titov 2014; Kerst, Zielasek, and Gaebel 2020; Przeworski and Newman 2012). It also has the potential to reduce the stigma associated with mental health issues (increased anonymity and privacy), reduce missing data, provide automatic feedback to patients and therapists, and help therapists in decision making (Andersson and Titov 2014; Kerst, Zielasek, and Gaebel 2020; Przeworski and Newman 2012).

The main aim of this narrative review is to analyze current practices to manage EDs in women undergoing fertility treatments and women who are pregnant or at the postpartum. Four main questions are addressed in the present work: (1) What are the current practices that are being implemented to manage EDs in women undergoing ART? (2) What are the current practices that are being implemented to address EDs during pregnancy and the postpartum period? (3) What are some of the barriers that limit our ability to adequately monitor and provide effective psychological interventions during ART and the perinatal period? (4) How are technologies being used in the

context of mental health for women undergoing ART and women in the perinatal period? By answering these questions, we aim to propose a new model of care based on ICTs that facilitates the evaluation and prevention of EDs in women in the reproductive period, particularly women who are undergoing ART, those who are pregnant, and women in the postpartum.

Material and methods

A Scale for the Assessment of Narrative Review Articles (SANRA; Baethge et al., 2019), which indicates the standards of high-quality narrative reviews, was followed to report the results of the present work (Appendix 1).

Literature search

Different databases were consulted on May 09, 2023 to search for articles published on the topic of reproductive mental health. Specifically, Pubmed, Scopus, Science Direct, and Web of Science were consulted. No systematic searches were conducted, however, as can be consulted in table 1, different keywords were selected to conduct searches in the aforementioned databases. As showed in table 1, keywords varied according to the topics on interest. For instance, we searched for articles with a focus on specific themes: face-to-face programs for the assessment, prevention, and treatment of EDs during the perinatal period, as well as women undergoing ART; barriers of face-to-face systems of care; use of technologies for mental health purposes; and use of technologies to manage EDs in women who receive ART, are pregnant or are at the postpartum.

[Table 1]

Literature selection

Article selection was based on date of publication, prioritizing articles published in the past 5-10 years to better understand current practices in this field.. Preferably, systematic reviews and meta-analyses were consulted. If meta-analyses or systematic reviews were not available for a specific topic, single studies were consulted and summarized. The main exclusion criteria were: (i) the study do not include women undergoing fertility treatments, pregnant or postpartum women, or (ii) the study do not discuss barriers to access to mental health services by women during ART or during the perinatal period, or (iii) the study do not provide information about how technology-based psychological programs were used in women undergoing ART, pregnant or at the postpartum.

Results

After conducting the searches in the databases, we identified 1603 studies. Of those, 944 were duplicates and therefore excluded so a total of 659 studies were screened. After the assessment of all potential studies to be included in this narrative review, 43 were selected for synthesis (Figure 1). Given the non-systematic approach of this review, we do not registered reasons for excluding each article, but authors prioritized the inclusion of articles addressing the topic of interest for this review according to the four main study questions and articles preferable being published during the last 5-10 years.

[Figure 1]

The information consulted in this narrative review has been summarized in 4 categories corresponding to the four main questions proposed in this review.

What are the current practices that are being implemented to manage EDs in women undergoing ART?

Assessment programs: According to our results, during the past decades, there has been an increased interest in developing and validating psychosocial instruments to be applied during screening of women undergoing ART (Pedro et al. 2016). Mental health screening protocols and studies that evaluate the utility and feasibility of implementation research in human reproduction units, however, are still rare. To the best of our knowledge, only one research team in The Netherlands has explored the feasibility of conducting screening of emotional risk factors before ART. The study by Van Dongen (2012) evaluated the implementation of a screening program using the SCREENIVF instrument and explored uptake rates and participants' satisfaction. They found that around 80% of patients completed the screening questionnaire and between 30-33% of them were at risk of emotional problems. Regarding satisfaction, 90% of the participants reported that the screening was useful and considered that time consumption was not excessive (Appendix 2).

Treatment programs: Contrary to the aforementioned scarcity of screening programs, systematic reviews and meta-analyses have showed that numerous psychological interventions are already available and have been found to be effective to improve mental health during ART. As reported in appendix 2, it is well documented that CBT, training in coping skills, and mind-body interventions (including relaxation, mindfulness, and healthy behaviors) can improve anxiety, depression, stress, perceived social support, and marital satisfaction during ART (Chow, Cheung, and Cheung 2016; Chu et al. 2017; Gaitzsch et al. 2020; Masoumi et al. 2019; Zhou et al. 2021). Importantly for cost purposes, this has also been effectively tested in group format (Warne, Oxlad, and Best 2022). Regarding format and length of such group formats, it

has been suggested that better and more credible results are found when group treatments last 6-12 weeks (Chow, Cheung, and Cheung 2016; Chu et al. 2017; Clifton and Domar 2022).

What are the current practices that are being implemented to manage EDs during the perinatal period?

Assessment programs: Different efforts have been conducted to develop assessment protocols that allow the identification of EDs during the perinatal period. Appendix 3 summarizes the results obtained in recent systematic reviews (Bhat et al. 2022; Míguez and Vázquez 2021; Waqas et al. 2022). According to our results, assessments are more often provided at the postpartum compared to pregnancy, the Edinburg Postnatal Depression Scale (Cox, Holdenand, and Sagovsky 1987) is the most widely used instrument but preferred cutoffs are unclear, risk factors for EDs are explored separately in small subsets without a comprehensive analysis of this phenomenon. In relation to follow-up there are difficulties in the referral and follow-up of women with a positive diagnose of ED, which reflects the difficulties in the provision of continuity of care.
Preventive and treatment programs: Regarding psychological programs, recent meta-analyses revealed that several interventions to prevent and treat depressive symptoms during the perinatal period exist (Cuijpers et al. 2021; Li et al. 2022; Yasuma et al. 2020) both in individual and group format (Branquinho et al. 2021; Cuijpers et al. 2021; Prom et al. 2022; Shortis, Warrington, and Whittaker 2020). CBT seems to be an effective treatment to address depressive symptoms in the short and the long term (Branquinho et al. 2021; Cuijpers et al. 2021; Li et al. 2022; Shortis, Warrington, and Whittaker 2020). Results also indicate that preventive programs are rare compared to treatment interventions once the formal emotional problem already exists (Li et al. 2022).

Consistent with the problems raised with screening programs, treatment programs during the perinatal period also tend to focus on isolated pregnancy or postpartum periods (Appendix 3) (i.e., Cuijpers et al. 2021; Huang et al. 2020; Li et al. 2022). In addition, the interventions provided have been very diverse in terms of duration, components included, and number of participants, and generally ignore the transdiagnostic nature of EDs (Prom et al. 2022).

What are the barriers that limit our ability to provide effective psychological programs to women during ART and the perinatal period?

While different psychosocial programs already exist to be used during the reproductive period, women do not usually ask about mental health services when having difficulties to become pregnant and during the perinatal period. Consequently, intervention programs are not available for many women (Gavin et al. 2015; Pasch et al. 2016). In the light of the most relevant scientific evidence (Huppelschoten, de Bruin, and Kremer 2019; Jones 2019; Waqas et al. 2022; Xue et al. 2020; Zhu et al. 2022), barriers to access to mental care during the reproductive period include individual (i.e., lack of time, difficulties in transportation), as well as professional (i.e., inadequate knowledge and skills training), organizational/political (i.e., lack of human resources, complex referral pathways), and social/cultural factors (i.e., mental health stigma) (see Appendix 4).

As can be observed, most of these barriers are the consequence of an excessive focus on traditional face-to-face care, which is expensive in terms of personal, economic, and material resources. Due to the aforementioned barriers to access to mental care, in the last decades there has been an increased interest in the development of new models of care that could help reduce the burden of face-to-face psychological programs and

facilitate the dissemination of more cost-effective, evidence-based protocols (da Fonseca et al. 2021). Research has revealed that Internet-based psychological interventions, especially those based on CBT, could be at least as effective as face-to-face programs and are more cost-effective (Andersson 2018; Andersson et al. 2019). Nowadays, Internet-based programs have reached different physical and mental health conditions (Denecke, Schmid, and Nüssli 2022; White et al. 2022), including mental care during ART, pregnancy or the postpartum (Sparidaens et al. 2021; Yunus et al. 2022).

How are we using technologies to support mental health in women undergoing ART and women in the perinatal period?

The use of ICTs in the context of infertility and the perinatal period, has increased exponentially in the past years (Appendix 5) especially during the postpartum. An increasing body of research suggests that Internet-based interventions are effective and acceptable in the treatment of perinatal anxiety and depression (Hussain-Shamsy et al. 2020; Loughnan et al. 2019; Roman, Constantin, and Bostan 2020; Yunus et al. 2022), even in a blended format combining face-to-face and self-applied, online sessions (Branquinho, Canavarro, and Fonseca 2021; Evans et al. 2022).

In the field of fertility treatments, the amount of research is far more limited. For instance, web and mobile-based interventions have been used to monitor the patients' treatment trajectory and provide lifestyle advices during ART (Sparidaens et al. 2021) or to provide obstetric information during ART (Timmers et al. 2021). Although high satisfaction with these platforms is usually high, these technology-based solutions were not designed to address participants' mental health. Nevertheless, some studies have used web-based interventions to reduce stress during ART (Sexton et al. 2010) while others have developed mobile apps to provide mindfulness-based interventions (Boedt

et al. 2022) or to favor positive reappraisal coping when waiting for the results of fertility treatments (Schick et al. 2019).

Discussion

Researchers and several national and international organizations have made important efforts to demonstrate that many women suffer EDs when they are receiving ART, are pregnant or in the postpartum (Clifton and Domar 2022; ESHRE Psychology and Counselling Guideline Development Group 2015; National Institute for Health and Clinical Excellence [NICE] 2020). This work has been developed as an attempt to identify current practices in the management of EDs during these periods and to propose more affordable approaches to care.

In the light of the most recent literature, enormous efforts have been made to develop assessment, preventive, and treatment protocols that might serve to screen and address EDs during ART and the perinatal period (Bhat et al. 2022; Clifton and Domar 2022; Li et al. 2022). A number of milestones have been reached in the improvement of healthcare programs for women who seek to become pregnant but face difficulties and ask for ART, as well as during pregnancy and in the postpartum. However, these protocols hardly meet clinical guidelines, as they are mainly focused on the postpartum, do not draw from a biopsychosocial approach to EDs, and do not usually consider preventive efforts (Cuijpers et al. 2021; Huang et al. 2020; Li et al. 2022; Prom et al. 2022).

Additional limitations inherent to traditional face-to-face models of care have also raised as contributors to the difficulties in the access to mental healthcare (Waqas et al. 2022; Zhu et al. 2022). Preliminary results found that the Internet could be a useful tool to prevent and treat depressive symptoms in women who are undergoing ART or

are in the perinatal period. However, important challenges still need to be addressed. First, studies need to address the problem of comorbidity between anxiety and depressive symptoms (Cena et al. 2021), which means moving from a disorder-specific treatment approach to a transdiagnostic conceptualization of interventions for EDs during ART and the perinatal period (Martínez-Borba et al. 2022). Second, interventions do not offer continuity of care with longitudinal programs that cover preconception, especially ART, pregnancy, and postpartum periods and they generally focus on the postpartum (Hussain-Shamsy et al. 2020; Loughnan et al. 2019). Third, a consensus about the optimal number of sessions, their duration, and the amount of support that multidisciplinary treatments should incorporate is still missing in both studies including women undergoing ART and women in the perinatal period (see appendix 5). Finally, current programs are very heterogeneous in terms of the content included, the ICT platform used, and the homework provided, to name some examples (Clifton and Domar 2022; Gaitzsch et al. 2020). In the light of these results, there is a need to develop modern, well-designed, and conceptually-relevant ICT-based programs to be used during ART and the perinatal period, particularly in women with fertility problems.

Despite the amount of knowledge exposed in the previous section, we should also acknowledge some limitations in the present work that may limit the generalization, comparability, and interpretation of findings. First, this is a narrative review, which means that no formal systematic review has been conducted. Although systematic reviews and meta-analyses are the gold standard in review studies, in our work we pretend to overview a wide range of issues found in the context of both women undergoing ART and women who were pregnant or at the postpartum. We consider that this is a very broad objective that could be better achieved throughout a narrative

review. Second, we focused on the challenges faced by a subset of women during the reproductive period, namely women undergoing ART, as well as pregnant and postpartum women. Thus, studies focused on women who are at a preconception planning or women who face especially hard situations, such as recurrent miscarriages, or unplanned pregnancy have not been included in this review but clearly face important challenges for the emotional well-being. Additionally, we have focused on women undergoing ART and perinatal women, but it is also well known that, in both cases, the partner, if it is the case, can also experience emotional disorders associated to the challenges imposed by ART and motherhood/fatherhood. In our review we have not explained how psychological assessment, preventive and treatment programs are being implemented in partners but there is no doubt that future efforts should be conducted to include the partner in those programs.

Despite these limitations, the results derived from the present work may have some relevant clinical implications for healthcare providers who work in the field of reproductive mental health, as well as for policy makers. In particular, a new model of care is proposed in Figure 2. According to our proposal, women should be assessed across the whole reproductive period, which in our study included women undergoing ART and perinatal women. Regarding the former, the literature suggests that anxiety and depressive symptoms, social support, stress, coping skills, self-esteem, and personality should be included in early assessment programs (Grupo de Interés en Psicología. Sociedad Española de Fertilidad 2009). In relation to the timing of assessments, it would be preferable that the assessments of EDs started before women begin ART and they should remain active longitudinally during the course of ART (prior to and after each fertility treatment) and maintained even during pregnancy in the case that women get pregnant after ART. In the case of perinatal women, we propose

that all women who become pregnant should be screened about the presence of EDs and their risk factors (e.g., personal and familiar antecedents of EDs, previous perinatal EDs, personality factors, affective ambivalence; Martínez-Borba et al., 2020; Voltas et al., 2021). Timing of these assessments should start early at pregnancy and should be maintained at least during the first year after delivery.

[Figure 2]

To facilitate the aforementioned longitudinal monitoring of women, we suggest that psychological assessments should be offered as a part of women health care at health institutions. The routine and universal inclusion of such protocols could facilitate that women did not feel judged as "bad mothers" or as weak persons, thus reducing mental health stigma during these periods. Comprehensive, but short assessment protocols should be developed to reduce the burden of psychological longitudinal assessments. It would be reasonable to select only the most relevant protective and risk factors to be included in assessment protocols, as indicated in the current review. Additionally, given the limited resources that are available in healthcare services that attend women receiving ART and perinatal women (i.e., reduced number of mental health professionals, lack of time, etc.) professionals could benefit from using technologies to conduct these longitudinal psychological assessments. Thus, women can respond to some questionnaires by their own and then professional can revise and discuss the results with women in order to refer them to the most convenient service. Once early assessments have been carried out, women should then be derived to the most convenient psychological intervention according to the results of the assessments. Women with negative screening results could benefit from online universal preventive programs. Given the non-clinical characteristics of these samples, we propose the use of a mobile application to provide preventive psychological care. Implementing these

preventive psychological interventions as a part of reproductive care could bring important benefits to the health system. To name an example, if universal preventive programs were offered, 50% of potential cases of perinatal depression could be prevented and the remaining 50% of women who developed depressive symptoms could be treated (Muñoz et al. 2021; Muñoz 2001). By doing this, prevalence and negative consequences of depression could be notably reduced (Muñoz et al. 2021). With regards to women with positive screening results, they should be offered a treatment program according to their personal characteristics and needs (i.e., personalized therapy). We propose a stepped care model approach. Our proposal is that low-risk women should be referred to completely online or blended interventions (i.e., combined automated and online sessions with some therapist-guidance; Wentzel et al., 2016) according to their schedules and preferences. Contrary to this, high-risk women could benefit from face-to-face interventions, preferably group-based to reduce costs and to benefit from the positive aspects of group therapy (e.g., social support and vicarious learning). As we previously exposed, longitudinal assessments should be conducted prior the treatment starts to determine what intervention, if any, should receive the women. Additionally, we propose that longitudinal assessments are also maintained over the course of psychological programs as they can help to determine whether psychological intervention have worked for a particular women and can be stopped or if treatment should remain over time (i.e., pregnant women can initiate a psychological program during the gestational period and continue it in the postpartum when they do not find a relief of symptoms or if symptoms worsen).

To facilitate these group programs, we propose the use of transdiagnostic protocols as an alternative to symptoms-focused interventions because of the multiple advantages they offer. Transdiagnostic interventions, such as the Unified Protocol,

allows to address psychological comorbid conditions (Barlow, Allen, and Choate 2016), which are highly prevalent in women undergoing ART and during the perinatal period. Additionally, transdiagnostic treatments result in a more cost-effectiveness solution because it reduces therapist training to a single protocol as opposed to multiple protocols for specific disorders and facilitates the dissemination of evidence-based psychological treatments by including several individuals in the same session (Barlow, Allen, and Choate 2016).

Conclusion

Women's' mental health during ART and during the perinatal period needs to be urgently addressed. The results obtained in this research represent a contribution to the field of mental health in those women, not only by adding evidence-based knowledge in this field, but also by proposing a new model of care that could be useful for clinical practice and for policy-making.

During the past decades, EDs during ART and the perinatal period have been more and more visible. Nowadays, it is well-know that we need to address these psychological problems and develop new models of care that allow the overt expression of suffering by all women and facilitate their mental care when needed. We encourage researchers, clinicians, and policy makers to work towards the development and implementation of modern e-Health and m-Health solutions that help to disseminate assessment and intervention protocols that could be integrated in routine reproductive healthcare services.

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Appendix 1. Scale for the quality assessment of narrative review articles (SANRA; Baethge et al., 2019).

Item		Description	Page Nº
1	Justification of the article's importance for the readership	The manuscript outlines the clinical problem and highlights unanswered questions or evidence gaps	3-6
2	Statement of concrete aims or formulation of questions	Propose one or more specific aims or questions which will dealt with or topics which will be reviewed	5-6
3	Description of the literature search	The narrative review is transparent about the sources of information on which the text is based	6
4	Referencing	Key statement should be backed by references in all or almost all cases	7-12
5	Scientific reasoning	The narrative review should present evidence for key arguments (i.e., mention study design).	7-12
6	Appropriate presentation of data	This items describes the correct presentation of data central to the article's argument	7-12, appendices 2-4

Appendix 2. Characteristics of included studies regarding the study question number 1 (EDs management during ART).

Assessment or EDs during ART (original studies)	
Author	**Main outcomes**
Pedro, 2016	N=293, Denmark. Aim: compare the psychometric properties of three infertility-specific measures to assess: Impact of infertility on Personal, Social and Marital domains (COMPI-FPSS), infertility-related stress (Fertility Problem Inventory, FPI), and quality of life (FertiQol). Results: All scales presented good reliability indexes. After modifications in the factorial structure an acceptable fit was obtained for the three measures. The significant and strong associations found between the three measures supported the convergent validity of the measures. All measures seem to discriminate between patients with and without depressive symptoms. The FertiQol seems to be the best instrument to discriminate patients with anxiety.
Van Dongen, 2012	N= 304, Netherlands. Aim: assess the uptake rate of SCREENIVF (measure to identify women at risk for emotional maladjustment before IVF/ICSI treatment), analyze characteristics of non-respondents and reasons for non-response. Result: SCREENIVF uptake rate at first assessment was 78% (33% participants identified at risk), a year later the uptake rate was 80% (30% participants identified at risk). There were no differences in uptake rate for men and women. There were more female than male at risk (p<.001). Reasons for non-response included no need for psychological help (41%) or forgot to complete the screening (19%). Non-responders had had an IVF treatment more often and had non-Dutch ethnic background. Respondent were more likely to be childless compared with non-respondents. 90% participants consider the screening was useful, 95% reported that SCREENIVF was not unpleasant, they consider it was not too long, 93% of respondents agree with the result of the screening.
Intervention to manage EDs during ART (review studies)	
Chow, 2016	N=12 (intervention studies=7; review studies=5). Aim: to review the effectiveness of psychosocial interventions to improve well-being in infertile couples. Study design: RCT=6; pre-post=1. Intervention: CBT, psychosocial interventions with coping skills training and mind-body interventions improved depressive symptoms, anxiety, stress and social support. Results: information provision, relaxation training and cognitive-behavioral counselling did not achieve significant improvements in well-being. Other recommended modules included: positive thinking, communication skills, coping skills and problem solving techniques. Format: individual and group formats could be useful but it seems that more credible results were noted for group format. Duration: 6-12 weeks of duration seems to be the most effective while interventions ≤5 sessions did not play effects on mental health.
Chu, 2017	N=34. Aim: to investigate the efficacy of non-pharmacological interventions as adjuvant therapy for couples experiencing undergoing ART. Content: RCT focused on psychological interventions or acupuncture improved anxiety. Format: group interventions reduced anxiety and depressive levels but individual did not.

Gaitzsch, 2020	N=12. Aim: to examine the effects of mind-body interventions on psychological state of women/couples undergoing ART. Study design: RCT=4; Non RCT= 4; uncontrolled=4. Intervention: mindfulness-based=10; yoga=2. Duration: 4-24 sessions of 2-3 hours, 1-3 months. Format: most studies used group format. Results: Seven studies found a small to large effect size for anxiety reduction. Four studies found a reduction in depressive symptoms. Two studies found a reduction on marital satisfaction.
Masoumi, 2019	N=52. Aim: to review the psychological outcomes of studies that applied psychosocial interventions to treat anxiety in infertile populations. Intervention: CBT=7; mind/body=3; other interventions=14 (i.e., problem focused, counselling, relaxation). Format: group=22; individual=1; individual/couple=1. Results: Most interventions based on CBT and mind/body intervention showed positive results in the reduction of anxiety levels.
Zhou, 2020	N=29 RCT. Aim: to explore the effects of psychological interventions on psychological outcomes of infertile patients. Intervention: CBT=10; mind/body=2; other=16. Results: Psychotherapy was associated with a significant reduction in social function, depression and anxiety. Psychotherapy did not lead to more dropouts than placebo groups.
Warne, 2022	N=30. Aim: to analyze the effectiveness of group psychological interventions in improving psychological outcomes in women undergoing fertility treatment. Sample: 2752 participants (1279=group; 1473=comparison). Results: Participants in group programs reduced depression, anxiety, fertility stress and marital dissatisfaction (p<.001). No improvement was observed in quality of life (p=.379).
Clifton, 2022	Literature review. Aim: to summarize interventions and support that can help individuals and couples to reach reproductive goals. Duration: longer programs (> 6 sessions) may alleviate some aspects of infertility-related distress. Contents: programs which include more than one evidence-based skill (i.e., mind/body programs, cognitive-behavioral) have showed good result in reducing fertility distress, depressive and anxiety symptoms. Format: group programs seems to be more effective. Less than half of patients referred for outpatient mental health care make an appointment. Evidence-based self-administered interventions (i.e., self-help books, smartphone applications, web-based programs) may increase access to care.

Note: RCT: Randomized Controlled Trial; CBT: cognitive Behavioral Therapy; ART: Assisted Reproductive Techniques.

Appendix 3. Characteristics of included studies regarding the study question number 2 (EDs management during the perinatal period).

Screening of EDs during the perinatal period (systematic reviews)	
Author	**Main outcomes**
Bhat, 2022	N=47. Aim: to explore community-based screening programs for perinatal depression and anxiety. Time: only postpartum (42.6%), only pregnancy or not specified (25.5%), pregnancy and postpartum (31.9%). Instrument: EDPS (76.5%, cut-off 9-13) HADS (2%), GAD (2%). Follow-up: 36.17 of studies provided referrals but non reported referral completion rates.
Miguez, 2021	N=29. Aim: to identify the risk factors for antenatal depression. Time: any gestational age (51%), third trimester (34.48%), first trimester (13.79%). Instrument: EPDS (55.17%, different cut-off points), clinical interview (6.9%). Risk factors included: sociodemographic (i.e., age, educational level, socioeconomic and employment status, marital status), obstetrics (i.e., pregnancy planning, parity, previous obstetric history, physical symptoms), psychological (i.e., history of depression, anxiety and stress, perceived social support).
Waqas, 2022	N=9. Aim: to explore whether screening of mental health disorders during the perinatal period improve perinatal maternal outcomes. Time: postpartum (67%), antenatal (33%). Instrument: EPDS (78%), PHQ-9 (11%), BDI (11%), clinical interview (44%), STAI (33%), Quality of life, Short Form (33%), adverse events (22%). Follow-up: two studies identify the relevance of treatment provision after the screening, one study found that a small proportion of participants remained in active treatment in primary care.
Interventions to management of EDs during the perinatal period (systematic reviews)	
Cuijpers, 2021	N=43 RCT. Aim: to explore the efficacy of psychological treatments for perinatal depression. Time: pregnancy (41.86%), postpartum (55.82%), perinatal (2.32%). Intervention: CBT (55.82), interpersonal (16.28%), counselling (16.28%), other therapies (23.25%). Format: individual (55.81%), group (34.88%), online (6.98%), mixed (16.28%). Duration: 6-12 sessions (83.72%), < 6 sessions (13.95%), >12 sessions (13.95%). Results: the mean effect size of comparison of psychotherapy with a control group was g=0.67. Effects remained significant at 6-12 months' follow-up. High heterogeneity was found between the studies. An improvement on social support, anxiety, parental and marital stress was also noted.
Li, 2022	N=77. Aim: to explore the effectiveness of CBT for perinatal depression, anxiety and stress. Time: pregnancy (53.16%), postpartum (41.77%), perinatal (5.06%). Purpose of intervention: selective prevention (12.66%) indicated prevention (10.13%), treatment (78.48%). Duration 1-15 sessions. Results: Compared with control groups, CBT improved depressive and anxiety symptoms and stress in the short and in the long term.
Yasuma, 2020	N=18. Aim: to examine the effect of antenatal psychological interventions on the prevention of perinatal depression. Time: pregnancy (16.67%), postpartum (61.10%), perinatal (22.22%). Intervention: CBT (55.56%), mindfulness (11.11%), ITP (11.11%), psychoeducation (22.22%). Duration: 2-44 sessions, from 10 to 180 minutes. A significant effect of intervention for universal

	prevention on antenatal and postnatal depression was found. There was high heterogeneity in the studies.
Branquinho, 2021	N=7. Aim: review of systematic reviews to explore the effectiveness of psychological interventions to improve perinatal depression outcomes. Time: postpartum (42.86%), pregnancy (12.28%), perinatal (42.86%). Intervention: BA (57.14%), IPT (28.57%). Format: Internet-based (71.43%), individual/group (28.57%). Duration: 1-16 sessions, 2-15 weeks. Results: Psychological interventions are effective in the reduction of depressive symptoms in the short (4 weeks) and in the long term (12 months). Reduction in anxiety was also found in 4 reviews. CBT was the most effective intervention in the reduction of depressive symptoms. All delivery formats were found to be effective.
Shortis, 2020	N=5 RCT. Aim: to determine whether randomized controlled trials based on CBT interventions can reduce antenatal depression. Format: online (20%), individual (40%), group (40%). Duration: 7-12 sessions, 1-2 hours. Results: A significant reduction in depressive and anxiety symptoms was found after implementing CBT interventions.
Huang, 2020	N=10. Aim: to assess the effect of peer support intervention on preventing and treating perinatal depression. Time: pregnancy (50%), postpartum (50%). Format: face-to-face (50%), telephone-based (10%), mixed (40%). Duration: 3 weeks-10 months, from 20 to 120 minutes. Results: Depression scores were lower in the intervention group compared with controls.
Prom, 2022	N=20. Aim: to test the efficacy of interventions focused on maternal depression and anxiety. Time: pregnancy (50%), postpartum (25%), perinatal (25%). Format: individual (70%), groups (20%), mixed (10%). Duration: 1-16 session, 3 weeks to 11 months. Psychological problem addressed: depression (60%), anxiety (15%), both (25%). Intervention: psychotherapies (40%), psychoeducation (20%), mind/body (20%), stepped care (10%), multicomponent (5%; pharmacotherapy, non-specialist training). Nearly all studies showed significant improvement in the short term in depression and anxiety in the intervention group compared with controls. Exercise intervention showed no reduction in depression.

Note: EDPS: Edinburg Postnatal Depression Scale; HADS: Hospital anxiety Depression Scale; GAD: Generalized Anxiety Disorder Scale; PHQ: Patient Health Questionnaire; BDI: Beck Depression Inventory; STAI: State-Trait Anxiety Scale; IPT: Interpersonal Therapy; BA: Behavioral activation.

Appendix 4. Characteristics of included studies regarding the study question number 3 (Barriers to access to the healthcare system and to mental health services during ART and in the perinatal period).

Author	Main outcomes (Original and review studies)
Huppelschoten, 2019	Original study Aim: provide online advice for infertile populations. Barriers to provide face-to-face daily clinical care: time pressure, lack of continuity of care, high costs in hospital settings, long-distance travel.
Jones, 2019	Systematic review (N=19) Aim: identify barriers and facilitators of help seeking for depression in perinatal women. Social barriers: stigma, experiencing emotions such as shame, guilt and embarrassment, fear of taking medications or losing parental rights, lack of knowledge about perinatal depression, lack of trust in clinicians, lack of social support and lack of self-efficacy. Instrumental barriers: inadequate health insurance coverage, lack of childcare, time issues, transportation issues. Structural barriers: lack of information about services, issues with professionals ability to provide interventions, lack of culturally responsive care.
Waqas, 2022	Systematic review (N=9) Aim: explore whether screening programs for perinatal mental health disorders improve mother mental health and infant outcomes. Barriers: one study found that professionals attitudes and difficulties in seeking posterior treatment from general practice can act as a barrier when screening programs are implemented.
Xue, 2020	Systematic review (N=41) Aim: explore the uptake rates after the perinatal depression screening and explore reasons for not engaging in psychological interventions after the screening. Barriers to access to psychological treatment after the screening program: lack of time, believing they were relief from mood symptoms, the stigma associated with psychiatric treatments, normalization of depressive symptoms, preference for home visits against specialized services, negative attitudes in professionals.
Zhu, 2022	Systematic review (N=17) Aim: explore factors that can impact the implementation of perinatal depression interventions. Barriers: normalization of depressive symptoms by women, stigma, fear of losing maternal rights, lack of services and human resources, lack of time, professionals prioritizing physical health, ethnicity and literacy differences, lack of professionals knowledge and training, lack of clear referral paths, transportation difficulties, scheduling difficulties, domestic demands, professionals being unresponsive or unsupportive.

Appendix 5. Characteristics of included studies regarding study question number 4 (Use of technologies in reproductive mental health).

ICT-based interventions during the perinatal period (reviews and original studies)	
Hussain-Shamsy, 2020	N=26. Aim: scoping review to explore the use of mHealth tools (screening, prevention and treatment) to support women with perinatal depression or anxiety. Time: pregnancy (32%), postpartum (45%), perinatal (14%), unclear (9%). Purpose of intervention: prevention (45%), screening (27%), treatment (27%). Intervention: CBT (9%), mindfulness (4%), tracking movement (9%), exercise (4%), multiple strategies (50%), psychoeducation with other strategies (41%). Outcome: depression (54%), anxiety (4%), both (41%). Results: positive impact on mental health (70%), long-term outcomes (18%).
Martínez-Borba, 2019	N=10. Aim: systematic review to explore the use of technologies for perinatal depression screening. Time: pregnancy (20%), postpartum (80%). Format: telephone calls (40%), interactive voice response (20%), web pages (30%), tablet application (10%). Measure: EPDS (80%), PDSS (20%), Whooley questions (10%), clinical interview (10%). Diverse cut-offs were selected.
Loughnan, 2019	N=7. Aim: systematic review to examine the effect of internet-based interventions on perinatal anxiety and depression symptoms. Time: pregnancy (28.57%), postpartum (71.43%). Outcome: depression (85.71%), fear of childbirth (14.30%), no study explored comorbidity. Intervention: CBT (71.43%), BA (28.53%). Results: Significant reduction in depression both during pregnancy and at postpartum. Participant satisfaction was positive but adherence rates varied from 5% to 87%.
Yunus, 2022	N=7. Aim: systematic review to test the efficacy and acceptability of digitalized CBT programs during pregnancy. Outcome: depression (85.71%), anxiety (71.43%). Duration: 4 weeks to 11.5 months. Results: Participants in CBT groups showed a reduction in antenatal depressive symptoms. High satisfaction with the intervention was found but attrition rates were high, especially for unguided interventions (22.1-46.5% drop outs).
Branquinho, 2021	N=235. Aim: original study which aims to evaluate the preferences and acceptability of blended psychological programs to address postpartum depressive symptoms. Results: Participants considered blended intervention useful and acceptable. According to women reports blended format present more advantages than disadvantages. Participants characteristics that favor increased useful of blended interventions are: being married, employed, with younger babies and less severe depression. Participants preferred equal distribution between online and face-to-face sessions. Face-to-face sessions are preferred to last 45-60 minutes while online sessions are preferred to be 30-45 length.
Evans, 2022	N=17.

	Aim: systematic review to analyze remotely delivered programs to address anxiety during pregnancy. Intervention: CBT (63%), mindfulness (13%), psychoeducation and problem solving (25%). Duration: 2 to 30 weeks Format: 62% included contact with therapist. Results: CBT interventions showed a reduction in anxiety levels. It seems that better results are found when women maintain regular participation enhanced by regular contact with therapist or peer support. Positive feedback was obtained by participants (satisfaction with the program, usefulness, recommendation to others, etc.).
ICT-based interventions during ART (original studies)	
Sexton, 2010	N=53. Aim: original study to develop and test a web-based intervention to reduce psychological stress in fertility patients. Intervention: 5 CBT modules. Format: web-based intervention. Results: General stress was reduced after the intervention (p=.048). However, no significant reductions were found in specific fertility-related distress (p>.050).
Sparidaens., 2021	N=9. Aim: original study to design, develop and evaluate a web-based app for couples undergoing fertility treatment. Format: web-based app. Functionalities of the app: consult infertility treatment trajectory, take notes, care provider contact, peers' forum, lifestyle advice. Results: High scores were obtained related to usability, understandability of information, usefulness of functionalities and privacy. Some recommendations about how to improve app functionalities (i.e., forum, login, usability) were provided by participants.
Boedt, 2022	N= 60, Belgium. Aim: protocol study which aims to explore the effect of a mindfulness intervention provided though an app to improve emotional distress and quality of life in couples experiencing infertility. Format: mobile app. Content: 6 mindfulness-based modules of 45 minutes. Outcomes: fertility-related quality of life, depression, anxiety and stress.
Schick, 2019	N= 226, Germany. Aim: protocol study to analyze the improvement in psychosocial suffering in couples waiting to star fertility treatments. Format: mobile app. Content: 13 daily text messages based on positive psychology (e.g., positive adjustment technique and cognitive distraction). Outcomes: ScreenIVF (includes the assessment of anxiety, depression, social support, cognitions about infertility, helplessness and acceptance.
Timmers, 2021	N=54, Netherlands. Aim: original study to evaluate the utility of a mobile application to support participants undergoing fertility treatment. Format: mobile app. Intervention: obstetric information according to fertility treatment stage (i.e., hormone medication side effects, preparation for oocyte puncture, etc.). Patients in the intervention group reported higher understanding of the information about different elements of the treatment although differences were not maintained over time.

Note: EPDS: Edinburgh Postnatal Depression Scale; PDSS: Postpartum Depression Screening Scale.

Table 1. Search terms according to the four study questions.

Study question	Keywords
1. What are the current practices that are being implemented to manage EDs in women undergoing ART?	Assessment, prevention, treatment, intervention, psychological, psychosocial, emotional disorders, anxiety, depression, infertility, ART, fertility, assisted reproduction, inseminations, in vitro, reproductive.
2. How do treatment protocols tend to address EDs during the perinatal period?	Assessment, prevention, treatment, intervention, psychological, psychosocial, emotional disorders, anxiety, depression, pregnant, postpartum, prenatal, postnatal, perinatal.
3. What are some of the barriers that limit our ability to adequately monitor and provide effective interventions during the reproductive period?	Barriers, limitations, face-to-face, psychological, infertility, perinatal, pregnancy, postpartum, health care system, personal factors, professional barriers.
4. How are technologies being used in the context of reproductive mental health?	Technologies, applications, Internet, telephone, screening, prevention, treatment, psychological, infertility, reproduction, inseminations, in vitro, perinatal, pregnancy, postpartum, prenatal, postpartum.

Table captions

Table 1. Search terms according to the four study questions.

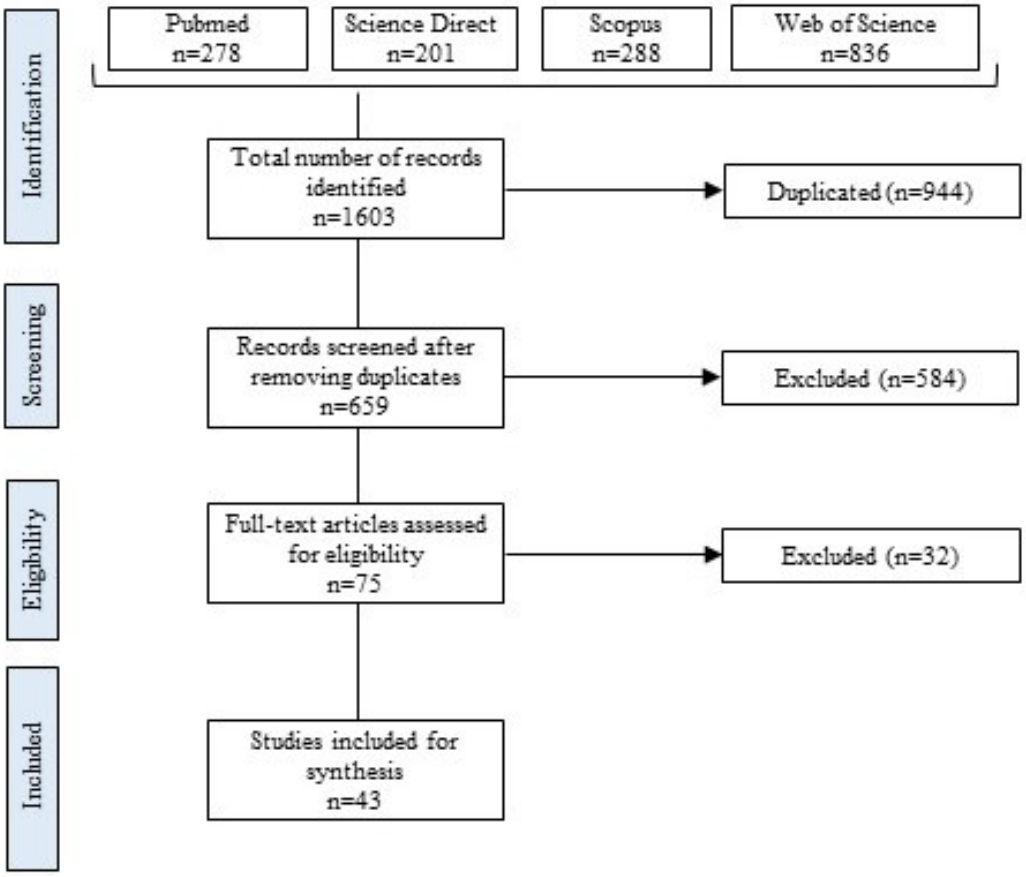

Figure 1. Flow diagram of included studies.

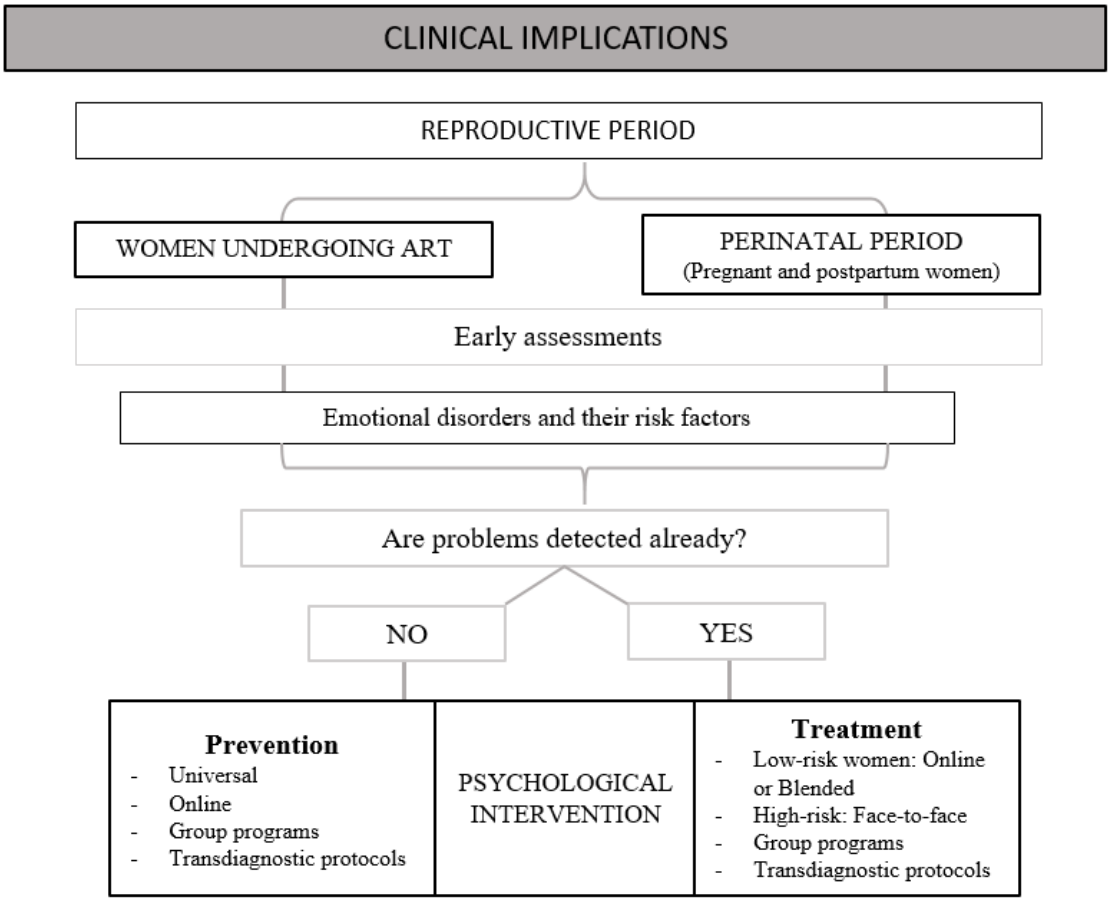

Figure 2. A newly proposed model of mental health care during fertility treatments and the perinatal period.

Figure captions

Figure 1. Flow diagram of included studies.

Figure 2: A newly proposed model of mental health care during fertility treatments and the perinatal period.