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What are antenatal maternity care needs of women who conceived through fertility treatment?: a mixed methods systematic review

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ABSTRACT

Background: Existing research indicates that pregnant women who conceived through fertility treatment might experience more stress and anxiety compared to women who conceived spontaneously. Therefore, these women might have additional antenatal care needs.

Methods: A search for both quantitative and qualitative studies was performed in PubMed, PsycINFO, CINAHL and MEDLINE through May 2021, guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses checklist. 21 articles met the inclusion criteria. After methodological quality appraisal using the Mixed Methods Appraising Tool, 15 studies were included in the review.

Results: Analysis of the studies identified behavioral, relational/social, emotional, and cognitive needs and women's preference about maternity care. Women who conceived through fertility treatment reported lower social and physical functioning scores and elevated levels of anxiety and depression compared to women who conceived spontaneously. They reported difficulties adjusting to pregnancy and experienced a care gap between discharge from the fertility clinic and going to local maternity care services for their first consultation, and a care gap postpartum.

Conclusions: Women who conceived through fertility treatment have additional antenatal care needs. We recommend to offer these women more frequent check-ins, and to pay attention to the impact of their infertility and treatment on their pregnancy.

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Introduction

Subfertility is a global public health issue with many consequences for women and their partners that influences the probability of a subsequent pregnancy [1]. According to WHO [1], subfertility is "a disease of the reproductive system defined by the failure to achieve a pregnancy after 12 months or more of regular unprotected sexual intercourse". Maternity care providers should be aware of psychosocial aspects, next to medical aspects, of previous subfertility and fertility treatment and meet potential additional maternity care needs that subfertile women may have during the course of pregnancy. This can help them provide adequate individualized care for these women [2].

Fertility treatment has become a widely accepted method to enable pregnancy for subfertile couples [3]. Recent statistics indicate a steady increase in the number of women who conceive through Assisted Reproductive Technology (hereafter referred to as ART-women for the sake of brevity) in all parts of the world [4,5]. In the Netherlands, for example, the rate of pregnancies through ART increased from 2.9% in 2003 [6] to 3.5% in 2017 [7] and in Japan from 0.5% in 1996 to 5.5% in 2016 [8]. In the European countries Finland, Denmark, Czech Republic and Slovenia, more than 5% of all infants born in 2013 had been registered by an ART program [9].

It is often assumed that pregnancy after fertility treatment is gratifying and straightforward. However,

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as theorized by Bernstein in 1990, a history of subfertility and conception by means of fertility treatment might be associated with problems such as decreased maternal confidence, increased anxiety about losing the fetus and a delay in mother-infant attachment [10]. Subsequent research on the pregnancy experiences of women who conceived through fertility treatment reported results that confirm Bernstein's theory. The burden of both infertility and fertility treatment on quality of life is high, especially regarding professional and sexual life (e.g. negative impact on the quality of work, missing work during treatment, not having intercourse for several weeks or months) [11]. ART-women reported more stress during pregnancy, compared to women who conceived spontaneously (hereafter referred to as SC-women) [12,13]. Furthermore, ART-women reported higher antenatal depressive symptoms [14], had elevated levels of anxiety during pregnancy because of their fear of miscarriage [2,15,16], and had lower confidence compared to SC-women [9]. After undergoing ART women face the challenge of adjusting to parenthood from early pregnancy onwards [17], while suffering from anticipatory mourning and anxiety about the potential loss of a pregnancy or fetus. They can feel ambivalence over the transition from an identity as an infertile person to the identity of a pregnant women [17]. Both anxiety/stress during pregnancy and difficulties with the transition into parenthood do not only affect women but also fetal development as well long-term child development [18,19].

These findings imply that ART-women might have additional antenatal maternity care needs that maternity care providers, such as midwives, obstetrician/gynecologists and obstetric nurses, should take into consideration. Wilson and Leese [16] proposed that maternity care providers should be better informed about the psychosocial aspects of previous subfertility to be able to address possible contradicting feelings of ART-women concerning pregnancy. Furthermore, it might be necessary to offer more frequent appointments to ART-women to reduce their anxiety [16].

Individualized, supportive care is considered a core value in high quality maternity health care [20]. However, the specific support needs of ART-women might go unrecognized [21]. The European Society of Reproduction and Embryology (ESHRE) offers a guideline to individualize care for ART-women (Psychosocial care (eshre.eu)). The psychosocial needs of ART-women were classified by ESHRE [22, p. 7–8] according to four different categories: behavioral, relational and social, emotional, and cognitive, labeled as the BREC

needs. The ESHRE guideline provides information about the needs women and couples experience at each treatment stage before, during, and 1 year after treatment) and about how to detect and address these needs. This guideline [22,23] states that in general the needs of couples who achieve pregnancy with fertility treatment do not differ from the needs of couples who conceive spontaneously. No interventions were identified that address the behavioral, relational, emotional, and cognitive needs of women after successful fertility treatment.

The ESHRE guideline dates back to 2015 and focused more on getting pregnant than being pregnant and more on fertility staff in infertility care than maternity care providers. Furthermore, the guideline was merely based on quantitative evidence, and only one third of the recommendations were based on high-quality evidence [23,24]. As mentioned previously, ART-women might have additional antenatal maternity care needs. Therefore, the present study intends to provide an updated review of the available high-quality evidence of what antenatal maternity care needs of ART-women are.

Methods

Design

This study is a mixed methods literature systematic review of qualitative, quantitative and mixed methods studies. We follow the framework for conducting mixed methods systematic review of Harden [25], by mixing findings of different types of studies and different types of synthesis in one systematic review. This design was chosen because of its exploratory character and because it provides the full range of available evidence on antenatal care needs of ART-women [25]. The reporting of this systematic review was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist [26].

Search strategy

The librarian-assisted literature search was performed in PubMed, PsycINFO, CINAHL and MEDLINE for studies published prior to May 2019 and an update search for new studies until May 2021. The keywords "Pregnancy", "Pregnant women", "Reproductive techniques", "Assisted, Prenatal care", "Qualitative research" and "Midwifery" were used. The search terms were derived from PubMed (Medical Subject Headings/MeSH) and a combination of these terms was used to produce an appropriate electronic search

strategy. The PICO (Population, Intervention group, Comparison group and Outcome)-acronym was used to systematically analyze the research question (Table 1). The population of interest included women who conceived, meaning all pregnant women. The intervention group included women who conceived through fertility treatment. Conception through fertility treatment was defined as conception with the use of hormone treatments (Ovulation Induction), Intrauterine Insemination (IUI), and types of more invasive ART, such as Intracytoplasmic Sperm Injection (ICSI), *In Vitro* Fertilization (IVF), and sperm and ovum donation [27]. The comparison group included women who conceived spontaneously, meaning that they conceived without the use of Ovulation Induction, IUI or ART. The outcome was defined as antenatal care needs and more specifically the (additional) care or support that women who conceived through fertility treatment want to receive from maternity care providers. We apply the description of needs by [23, p. 2477]: “needs refer to conditions assumed necessary for women to have a healthy experience after successful fertility treatment. Needs can be behavioral (lifestyle, exercise, nutrition and compliance), relational/social (relationship with partner if there is one, family friends and larger network, and work), emotional (well-being, e.g. anxiety, depression and quality of life) and cognitive (concerns and knowledge).”

The PubMed search items were linked to the PICO-acronym (Table 1). For free search items that could be found in either the title or the abstract of an article, the field code [tiab] was used. The field code [MeSH], short for Medical Subject Headings, was used for

search items that had to be a subject of the article. Additionally, an asterisk (the *-symbol) was used to search for different variations of words at once. PsycINFO, CINAHL and MEDLINE handle different field codes for the search items. See [Supplementary File S1](#) for the search items for these databases.

Title and abstract screening

If multiple databases showed the same article after the search, the program Mendeley (Desktop version 1.19.4) was used to avoid duplications. Of the remaining articles, the titles and abstracts were assessed independently by two students LM and LK (i.e. two female student midwives) based on the inclusion and exclusion criteria as stated below. In case of disagreement about the inclusion of an article, the researchers discussed this until consensus was reached and the first author (CW, female psychologist researcher) was asked to assess the abstract. In case of disagreement, another researcher (JV, male consultant) was asked to assess the article.

Qualitative, quantitative or mixed method studies were included if they were written in English or Dutch, were based on human subjects, and addressed practical, psychosocial or emotional needs or pregnancy experiences of ART-women during the prenatal period. Studies were excluded if they concerned systematic reviews or meta-analyses, or were based on non-peer reviewed articles, unpublished dissertations or conference abstracts. In compliance with the ESHRE guideline, articles that solely focused on care needs on specific patient populations (e.g. patients using

Table 1. PICO and matching PubMed search items for a mixed methods literature review on antenatal care needs of women who conceived through fertility treatment.

PICO ^a	Research question	Specification	
Population	Women who conceived	Pregnant women.	Pregnancy [MeSH] ^b , Pregnant women [MeSH], Pregnant* [tiab], Gravidity [tiab] ^c
Intervention group	Fertility treatment	Conception with the use of hormone treatments and all types of ART.	Reproductive techniques, assisted [MeSH] ^d , Fertility treatment [tiab], In vitro fertilization [tiab], Ivf [tiab], Assisted conception [tiab], Assisted reproduct* [tiab], Intracytoplasmic Sperm Injections [tiab], Icsi [tiab], Artificial insemination* [tiab]
Comparison group	Spontaneously	Conception without the use of hormone treatments or ART.	Spontaneous pregnancy [tiab] ^e , Spontaneous conception [tiab] ^e
Outcome	Antenatal care needs	The (additional) care or support that women who conceived through fertility treatment want to receive from maternity caregivers.	Prenatal care [MeSH], Needs assessment [MeSH], Care [tiab], Need* [tiab], Needs [tiab], Support [tiab], Patient need* [tiab], Qualitative research [MeSH], Interviews as topic [MeSH], Surveys and questionnaires [MeSH], Qualitative [tiab], Interview* [tiab], Midwifery [MeSH], Maternity care [tiab], Midwi* [tiab]

^aPopulation, intervention group, comparison group, outcome.

^bMedical Subject Heading (MeSH): search item is the subject of articles.

^cTitle abstract (tiab): search item can be found in title or abstract of articles.

^d“Reproductive techniques, assisted [MeSH] contains all individual fertility treatments.

^eRemoved from the final search while this led to too many articles concerning spontaneous pregnancy.

third-party reproduction, lesbian couples), or on procedures like surrogacy or Pre-Implantation Genetic (PGD) diagnosis were also excluded.

Full text screening and methodological appraisal

The Mixed Methods Appraisal Tool (MMAT) 2018 was used to assess the methodological quality of included studies [28]. The MMAT is a checklist with questions to assess the methodological quality of qualitative, quantitative or mixed methods studies ([28]; Microsoft Word – MMAT_2018_criteria-manual_2018-08-08.docx (pbworks.com)). According to Crowe and Sheppard [29], the MMAT 2011 is the only tool to address the quality of mixed methods studies and its reliability and validity properties meet accepted standards. In 2018, the MMAT was further improved on content validity [30]. Evaluation of the MMAT has shown that agreement between reviewers was fair to perfect [31]. As recommended [28], the involved researchers LM and LK have discussed their understanding of the MMAT before the start of the assessment of the selected studies to warrant inter-observer and interobserver agreement.

After the title and abstract screening, the researchers LM and LK used the MMAT 2018 to independently assess the pre-selected remaining full articles. To determine the methodological quality of the articles that remained after the primary full text screening, the researchers independently provided a more detailed explanation of the rating of each MMAT criterion in the category of the studies' design. It was predetermined that if one of the answers on the two screenings questions ("Are there clear research questions?", "Do the collected data allow to address the research questions?") would be 'no' or 'can't tell', the paper was not considered an empirical study and would be excluded [28]. For each remaining article, five yes-no questions to appraise the methodological quality were answered. See [Supplementary File S4](#) for a detailed explanation of the MMAT criteria. If all the answers on these five questions would be "yes", the article would be included. If one of the answers on the five questions would be "can't tell", the article was discussed in order to reach consensus on whether or not to include this article. The independent explanations were compared and discussed by LM and LK. Thus, included studies were assessed as having good quality according to these MMAT criteria.

Data extraction

Firstly, the relevant findings of the articles that remained after the secondary full text screening were summarized

per article. Overlapping themes were found by comparing the summaries on recurring topics. Secondly, the themes were divided into subthemes. The articles that matched certain subthemes were linked to these subthemes and the results were described accordingly. It was predetermined that, if in case of heterogeneity no overlapping themes could be found, the results of these articles would be described separately.

Results

The literature search, as presented in [Figure 1](#) according to the PRISMA flowchart [26], led to 956 hits in PubMed, 48 hits in PsycINFO, 99 hits in CINAHL and 219 hits in MEDLINE. After removal of double articles using Mendeley, 1282 abstracts remained. After applying the pre-defined exclusion and inclusion criteria 42 abstracts were selected (See [Supplementary File S2](#)). Some of the reasons to exclude abstracts were that the focus of the article concerned pre-conceptional or postpartum care needs instead of on antenatal care needs, or that the main topic of the article was not related to fertility treatment.

After the primary full text screening, 21 articles were subjected to the secondary full text screening (including the MMAT criteria check). Seven articles were excluded, because they did not meet all MMAT criteria and had methodological limitations, e.g. the sample size, dropout, outcome data and confounding factors were not described in quantitative studies, or there was no efficient integration of different components of the study design of mixed method studies to answer our research question. Fifteen articles remained. See [Supplementary File S3](#) for an audit list with notes about the search and choices made, and [Supplementary File S4](#) for results of the methodological appraisal per selected article.

The background characteristics of the selected articles are summarized in [Table 2](#). These studies were conducted in: Taiwan (3 studies), Sweden (2 studies), Brazil, China, Finland, Great Britain, Greece, Iran, Italy, Spain, Turkey and the Netherlands (1 study). Among the 15 included studies, eight studies had a qualitative design and seven studies had a quantitative design.

Overlapping themes

The relevant findings of the 15 included articles were compared in order to determine overlapping themes in the antenatal maternity care needs of ART-women. The themes were identified according the ESHRE guideline classification: behavioral, relational and

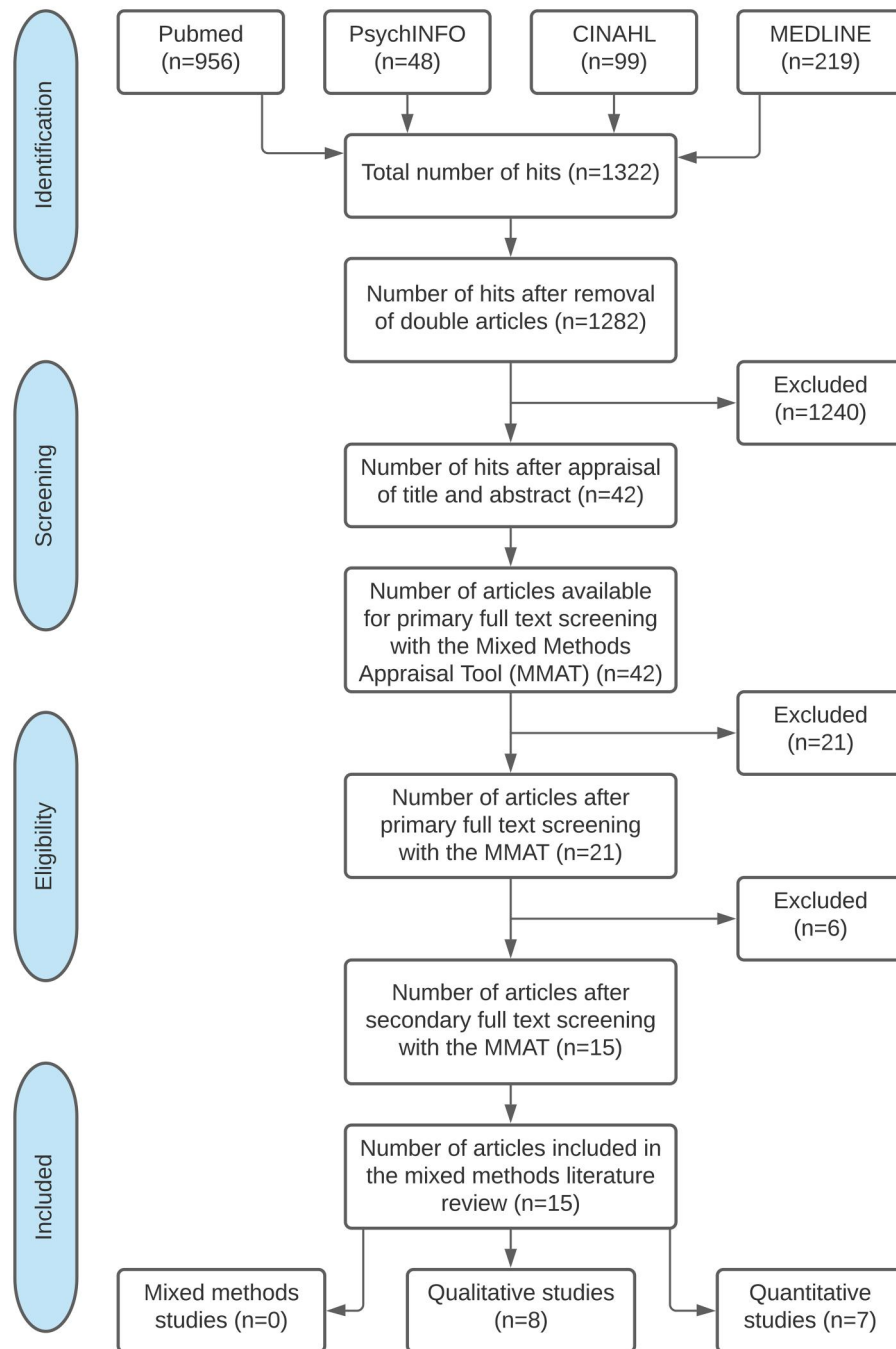


Figure 1. PRISMA flowchart.

social, emotional, and cognitive (BREC) needs, and the women's preferences about maternity care. Table 3 provides an overview of the themes that were addressed by the included articles.

Behavioral needs (lifestyle behavior, exercise, nutrition, and compliance)

ART-women expressed that they had quit their jobs in order to protect the fetus [32]. They would limit their physical activity [32,33], change their diet [32,33] and

avoid high-risk behavior [33]. ART-women were found to have significantly lower physical functioning scores than SC-women [34].

Relational/social needs (relationship with fetus, partner, family, friends and larger social network)

"Maternal-fetal attachment" (MFA) starts to develop as the pregnant woman begins to perceive and interact with the fetus and to form an emotional attachment to the unborn child [34]. Results concerning MFA were

Table 2. Background characteristics and relevant findings of 15 studies included in a mixed methods literature review on antenatal care needs of women who conceived through fertility treatment.

First author, year country of publication	Design	Objective	Research population	Research method	Relevant findings
Chen, 2011 Taiwan	Quantitative study, survey design	To describe the differences in Maternal-Fetal Attachment (MFA) and Maternal-Infant Attachment (MIA) among women who conceived spontaneously (SC-women) and women who conceived through fertility treatment (Artificial Reproductive Techniques (ART) women).	60 Pregnant ART-women and 65 pregnant SC -women.	Self-reported measures: Taiwanese MFA Scale during pregnancy and Taiwanese Maternal Attachment Inventory at one or two months postpartum.	Pregnant ART-women had higher perinatal MFA and MIA than SC-women.
Chen, 2019 China	Quantitative study cross-sectional design	To investigate the prevalence of depression in the third trimester of pregnancy and identify the related demographic risk factors.	29 ART & 744 SC (total 773) women in third trimester of pregnancy from three hospitals	Edinburgh Postnatal Depression Scale	ART was considered as a negative life event by that made them anxious by 90% of women who received it. ART (OR = 5.631) and adverse life events strongly predict antenatal depression. Participants revealed a complexity of reasons for anxiety, including concerns related to the risk of medical conditions. They also revealed that the ART process resulted in the narrowing of experiences related to feelings and practice of healthcare. They felt like they had 'no right' to complain.
Crespo, 2016 Spain	Qualitative study, grounded theory design	To assess the experiences of Spanish couples who conceived through fertility treatment (ART-couples) with a focus on their psychosocial needs after successful ART using the research question: 'What are the psychosocial needs of women and their partners following assisted reproductive treatment in the Spanish context?'	30 Women and 21 of their partners pregnant after ART.	Repeated rounds of individual, semi-structured, in-depth interviews at no specific time.	
De Pascalis, 2012 Italy	Quantitative study, cross-sectional analytic design	To investigate quality of life (QoL) among ART-couples compared to couples who conceived spontaneously (SC-couples).	57 Pregnant ART -couples and 58 pregnant SC-couples.	Short Form 36 (SF-36) to measure QoL at 22 and 32 weeks gestation.	ART-women had lower physical functioning scores than SC-women. ART-couples reported lower scores on role limitations tied to physical health, vitality, social functioning and physical well-being. ART-couples showed a decrease in social functioning. SC couples reported stable scores. ART-couples reported stability in mental well-being scales, whereas SC-couples showed an increase.
Dornelles, 2014 Brazil	Qualitative study, descriptive design	To explore women's fears during pregnancy following ART and to relate these fears to existing literature in order to examine how they compare with the fears expressed by SC-women.	19 Pregnant ART-women.	Semi-structured interviews during the third trimester of pregnancy.	As well as experiencing fears reported by SC-women, ART-women also experienced more context-specific fears. The most common fear was that of fetal death. Moreover, ART-women

(continued)

Table 2. Continued.

First author, year country of publication	Design	Objective	Research population	Research method	Relevant findings
French, 2015 Great Britain	Qualitative study, exploratory design	To explore the antenatal experiences of ART-women and their partners in order to assess if they have specific antenatal care needs that are not met.	12 pregnant ART-women and 8 male partners.	Individual, in-depth interviews at 28 weeks gestation.	focused primarily on maintaining the pregnancy, which may affect their engagement with mothering. Participants experienced early pregnancy following ART as an anxious time in which they fear pregnancy loss. They also experienced a 'care gap' between going to the ART clinic and having their first ultrasound, which caused more anxiety, and reported difficulty adjusting to pregnancy and planning for parenthood. Female participants were struggling to express their ambivalent feelings regarding pregnancy toward others.
Gourounti, 2013 Greece	Quantitative study, cross-sectional design	To examine the relationship between coping strategies, antenatal anxiety, pregnancy worries and depressive symptomatology.	163 Pregnant women, with gestational ages between 11 and 26 weeks.	Self-reported measures: Brief COPE, Cambridge Worry Scale, State-Trait Anxiety Inventory (STAI), and Center for Epidemiologic Studies-Depression Scale.	Women who conceived through In Vitro Fertilization (IVF-women) had higher levels of state anxiety and pregnancy worries than SC-women.
Hjelmstedt, 2003 Sweden	Quantitative study, prospective longitudinal design	To compare IVF and SC women and men regarding psychological variables and to study whether the IVF-couples' recalled infertility distress and the way they responded emotionally to the pregnancy are associated.	57 Pregnant IVF-women and 55 male partners and 43 pregnant SC women and 39 male partners.	Self-reported measures: Infertility Reaction Scale, Barnett scale, Karolinska Scales of Personality (KSP), STAI, Emotional Responses to Pregnancy Scale (ERPS) around 13 weeks gestation.	During early pregnancy, IVF-couples are more anxious about losing the pregnancy compared to SC-couples.
Hjelmstedt, 2006 Sweden	Quantitative study, longitudinal cohort design	To compare prenatal attachment among IVF-women and SC-women and to study relationships between attachment and psychosocial variables.	56 Pregnant IVF-women and 41 pregnant SC-women.	Self-reported measures: Prenatal Attachment Inventory (PAI), STAI, KSP, EPDS, Barnett Scale (marital relationship), ERPS at 26 and 36 weeks gestation.	Method of conception was not related to prenatal attachment, indicating that IVF-mothers are attached to their unborn children equally as SC-mothers.
Huang, 2019a Taiwan	Qualitative study, phenomenological design	To explore the experiences of pregnancy and transition to parenthood of first-time mothers following successful ART treatment.	12 Women who experienced pregnancy and gave live birth after ART.	Individual, in-depth semi-structured interviews at 8 to 18 weeks postpartum.	Participants felt different from SC-women. Pregnancy gave mixed feelings: excitement, joy, uncertainty, anxiety. As pregnancy progressed, intense anxieties increased and they felt under constant psychological pressure. Relying on their family's assistance and support worked well. They worried about the impact of ART on

(continued)

Table 2. Continued.

First author, year country of publication	Design	Objective	Research population	Research method	Relevant findings
Huang, 2019b Taiwan	Quantitative study, longitudinal design	To investigate changes over time in psychological health of ART-women during the trimesters of pregnancy and during the postpartum period.	158 pregnant ART-women	Web-based questionnaires-Edinburgh Postnatal Depression Scale, State Anxiety Inventory, Modified Maternal Fetal Attachment Scale, Maternity Social Support Scale, Pregnancy Stress Rating Scale, Intimate Bond Measure, and Parenting Stress Index. Data collection in trimesters of pregnancy and at 7–10 weeks postpartum.	their baby and own health. Participants ensured the health and safety of the fetus by quitting their jobs, reducing psychical activity and monitoring fetal movement constantly to maintain peace of mind. Psychological health (Anxiety and depression) was found to be poorest during the first trimester and at two-months postpartum. The most important predictors of change in psychological health during pregnancy and the postpartum period were antenatal stress and social support.
Lehto, 2019 Finland	Narrative qualitative study	To explore how women who experienced infertility and underwent fertility treatments constructed maternal identities after they successfully gave birth.	Twenty-six previously infertile Finnish women who later conceived after fertility treatment		Four different identity stories emerged from the data: Fractured Maternity, Pursuing Maternity, Learning Maternity, and Discovering Maternity. Infertility, its treatment, and childbirth were narrated as turning points in the participants' life courses, but the significance of these turning points for maternal identity varied across the four stories. Infertility and its treatment clearly left marks on our participants. Becoming a mother after years of infertility is not a straightforward process and does not follow the same pattern for everybody. Participants experienced paradoxical feelings: joy, fear, hope, uncertainty. They had doubts about being pregnant, were concerned about miscarriage and the health of the fetus. The uncertainties made that some women did not allow to start to feel attachment to their fetus. They also
Ranjbar, 2015 Iran	Qualitative study, phenomenological design	To explore how women make sense of assisted pregnancy in Iranian culture and context and to describe the meaning of pregnancy through ART.	12 Women who experienced pregnancy through ART.	Semi-structured, in-depth interviews at no specific time.	(continued)

Table 2. Continued.

First author, year country of publication	Design	Objective	Research population	Research method	Relevant findings
Sahin, 2020 Turkey	Qualitative study; descriptive design	To gain a more in-depth understanding of the processes in which infertility affected the kinds of psychological and social consequences they experienced.	11 Pregnant ART-women in the first or second trimester of pregnancy	Semi-structured, in-depth interview	demonstrated a variety of adjusting behaviors and felt uncomfortable talking about their pregnancies. The social experiences of women when they got pregnant were defined under the sub-themes "the meaning of motherhood and being a family," "feeling comfortable and valuable in society," and "facing difficulties during pregnancy." The women stated that they envied pregnant women during the treatment and that they wanted to get pregnant and experience these feelings. However, some participants stated that the pregnancy process was not as they thought or as they were told.
Warmelink, 2016 The Netherlands	Qualitative study; descriptive design	To explore the care needs of ART-women, using the research question: "What are the midwifery care needs during pregnancy of couples of women who have conceived as a result of fertility treatment?"	2 ART-couples and 7 individual ART-women.	Semi-structured, in-depth interviews at no specific time.	ART-couples had paradoxical feelings concerning their antenatal care needs because of the normalcy/non-normalcy of their pregnancies. Some couples said that midwives could have paid more attention to the impact of their ART history. Participants indicated the need for more psychosocial support as they were often anxious about the course of the pregnancy and found it difficult to communicate these feelings. They also wanted more frequent checkups and ultrasounds.

Assisted Reproduction Technology (ART).
 women who conceived through Assisted Reproduction Technology (ART-women).
In Vitro Fertilization (IVF).
 Maternal-fetal attachment (MFA).
 Maternal-Infant Attachment (MIA).
 Women who conceived spontaneously (SC-women).

Table 3. Themes and subthemes derived from 15 studies included in a mixed methods literature review on antenatal care needs of women who conceived through fertility treatment.

Theme	Subtheme	Related articles ^a
Behavioral needs	Lifestyle behavior, exercise, nutrition and compliance	De Pascalis 2012, Huang 2019a, Ranjbar 2015
Relational/social needs	Relationship with fetus (Maternal Fetal Attachment)	Chen 2011, Hjelmstedt 2006, Ranjbar 2015
	Relationship with partner, family, friends and larger social network	Crespo 2016, De Pascalis 2012, French 2015
Emotional needs	Adjustment to pregnancy, general well-being	De Pascalis 2012, French 2015, Huang 2019ab, Letho 2019, Ranjbar 2015, Sahin 2020, Warmelink 2016
	Anxiety, depression	Chen 2019, Crespo 2016, Dornelles 2014, French V, Gourounti 2013, Hjelmstedt 2003, Huang 2019ab, Ranjbar 2015, Warmelink 2016
Cognitive needs	Knowledge and concerns	Dornelles 2014, French 2014
Women's preferences about maternity care		Crespo 2016, French 2014, Ranjbar 2015, Warmelink 2016

^aOnly the first authors are listed.

inconsistent. A qualitative research pointed out that some ART-women did not allow themselves to start to feel attached to the fetus, because they felt uncertain about the pregnancy [33]. Similarly, another study reported that the level of MFA was not related to the method of conception [35]. Contrastingly, the study by [36] reported higher levels of MFA among ART-women compared to SC-women [36].

ART-women experienced difficulties in expressing their paradoxical feelings toward friends and family in fear of appearing ungrateful for their pregnancy [37,38]. ART-couples reported a decrease in social functioning, whilst SC-couples reported stable scores [34].

Emotional needs (adjustment to pregnancy, general well-being, anxiety and depression)

ART-women can experience difficulty adjusting to their newly pregnant state [38]. 'Infertility, treatment, and subsequent childbirth are significant turning points in the construction of maternal identity for ART-women [39]. Also, the experience of becoming a mother was often not in line with their expectations or "plans" [40] and for some ART-women this transition required more adaptation [39]. The ART-women can experience contradicting feelings after transitioning from subfertility to pregnancy. That is, three articles revealed that ART-women experienced a complexity of mixed feelings, such as excitement and joy versus uncertainty and fear [32,33,41].

One study found that ART-women reported stability in mental well-being, whereas SC-women reported an increase on mental well-being during the course of pregnancy until the moment of childbirth [34]. A qualitative study found that ART-women felt as if they were constantly under psychological pressure and that they were focused on fetal movement to maintain

peace of mind [32]. According to [42], the most important predictors of change in anxiety and depression during pregnancy and the postpartum period were antenatal stress and social support.

ART and adverse life events strongly predict antenatal depression [43]. Levels of anxiety and depression were found to be the highest during the first trimester and at two-months postpartum [42]. The included articles mentioned a number of reasons as to why ART-women experienced elevated levels of anxiety during their pregnancies. ART was considered as a negative life event and increased anxiety levels in 90% of the ART-women as reported by [43]. A number of studies reported that ART-women were anxious about the impact of ART on their fetus' [32,33,37] and own health [32,37]. Fear of pregnancy loss as a reason for elevated anxiety among ART-women [33,38,44], or anxiety about the course of pregnancy in general [41].

Compared to SC-women, ART-women had higher levels of state anxiety and pregnancy worries [45] and elevated levels of general anxiety during early pregnancy [44]. A qualitative study found that ART-women experienced more context-specific fears compared to SC-women, such as the fear of fetal death and miscarriage [46].

Cognitive needs (knowledge and concerns)

ART-women reported to focus primarily on maintaining the pregnancy and to avoid to think about birth and parenthood because they fear pregnancy loss [38,46].

Women's preferences about maternity care

Regarding additional antenatal care needs, ART-couples expressed that maternity care providers could

have paid more attention to the impact of their infertility and ART-history on the pregnancy [41]. As ART-women might not like to share their problem with relatives or people who are close to them, their privacy and confidentiality should be respected more in the prenatal visits [33]. Two included articles noted that ART-women experienced difficulties in expressing their paradoxical feelings toward care providers in fear of appearing ungrateful for their pregnancy [37,38].

Moreover, ART-women indicated the need for more psychosocial support and more routine checkups and ultrasounds [41]. Furthermore, ART-couples experienced a care gap between discharge from the ART clinic and going to local maternity services for their first ultrasound or consultation, which might trigger feelings of anxiety [38,41].

Discussion

Summary of findings

The aim of this study was to provide an updated review of the available evidence concerning antenatal care needs of ART-women. The 15 included articles overlap on the following themes: behavioral, relational/social, emotional, and cognitive needs, and the women's preferences about maternity care. Although the results of this study might not be applicable to all ART-women, the findings of our review highlight that ART-women might have additional antenatal care needs.

Comparison with existing literature

Our review stresses that during pregnancy, the needs and the preferences about maternity care of previously infertile women do seem to differ on some needs from those of women who conceived spontaneously. These findings are not in line with the ESHRE guideline [22,23] that states that in general the needs of couples who achieve pregnancy with fertility treatment do not differ from the needs of couples who conceive spontaneously. So far, this guideline does not recommend interventions that specifically address the behavioral, relational/social, emotional, and cognitive needs of pregnant women after successful fertility treatment.

Regarding behavioral needs, the results of our study indicate that the experience of pregnancy of ART-women can differ from that of SC-women. Before pregnancy, subfertility can be experienced as a traumatic life event and fertility treatment tends to involve significant physical and emotional commitment

[15,39]. It is plausible that the physical and emotional commitment during fertility treatment remains evident during a subsequent pregnancy [39] and affects ART-women's antepartum mental and physical condition [47]. ART-women might therefore adjust their behavior to achieve a possible positive influence on the course of pregnancy, by, e.g. limiting intensive physical activity, changing diets and avoiding high-risk behavior [32,33,46]. The demonstration of these adjusted behaviors was especially evident in the results of an Iranian [33] and a Taiwanese [32,42] study. Iran and Taiwan, like other countries, uphold patriarchal societies, with major emphasis on the duty of women to bear children [32,33,40,42,43]. This cultural aspect could attribute to the behavior of these women, as they want to fulfill their duty and overcome the social stigma surrounding subfertility and fertility treatment.

Regarding relational/social needs, the results of the present study on MFA in relation to fertility treatment are inconclusive. An earlier systematic review by [15] also reported contradicting results concerning the link between MFA and method of conception. The findings of a recent literature review suggested that levels of prenatal attachment of couples who conceived following ART were either similar to or even higher than in couples conceiving spontaneously [48]. The inconclusive findings might be attributable to the varied research designs and self-reported measures that have been employed in the included studies. Next, ART-women might tend to social isolation and this might result in poorer quality of life and well-being as compared to pregnant women conceiving spontaneously [49]. This suggests that ART-women may be in need of interventions to improve quality of life and well-being during pregnancy.

Regarding emotional needs, past infertility problems can lead to psychological stress that is not completely resolved. Furthermore, couples may also find pregnancy "the start of a dream", the "victory" or their only chance in the life after a long period of childlessness. Worrying about the consequences of such a "precious" pregnancy can also lead to increased levels of stress [13,50]. ART-women might also idealize pregnancy and parenthood [15,50] and feel that society expects them to feel grateful for their long-awaited pregnancy [41]. This could make them feel to have no entitlement to complain. Our study found elevated levels of pregnancy-related anxiety, mostly concerning the fear of fetal loss, to be a major theme in pregnancies after fertility treatment. Other literature reviews found similar results [2,15,16]. The fear of fetal loss could be explained by the fact that some studies

reported an association between increased medical risks for the baby and pregnancy through fertility treatment [46,51,52]. In contrast, other studies show that ART-mothers do not experience more anxiety or depression [53,49].

Strikingly, cognitive needs have not been depicted by earlier reviews of the literature. Regarding women's preference about maternity care, our study found that ART-women experienced a care gap between going to the fertility clinic and having their first ultrasound at local maternity services [38,41]. This finding was also reported previously by Allan and Finnerty [54] and Darwiche, et al. [55]. As suggested by Morgan [56], this experience might originate from transfer of care to a new health professional at local maternity services who is not part of the fertility treatment history. This might cause women to feel a sense of abandonment [56]. Therefore, care providers should be informed that women got pregnant via ART so that they can address this matter and ask women about emotional difficulties related to ART to allow these women to express their pregnancy-specific anxieties [2]. It is noteworthy that the studies that suggested the care gap were conducted in the United Kingdom and the Netherlands, where care is indeed transferred after successful fertility treatment [38,41] from the clinic to primary care. The experience of a care gap might not be applicable to women in countries where transfer of care does not take place. Maternity care providers should close the care gap, especially in the first trimester [42] following the transfer of care from the fertility clinic to local maternity services after successful fertility treatment [38,41] and postpartum [42] following the transfer to a Child health care center.

Strengths and limitations

A strong aspect of this study is that the systematic search was carried out based on four well-established databases, which increased the chance of finding relevant literature. The mixed-methods model enables us to integrate quantifiable data with more qualitative understanding from ART-women's lives. This integration helps determine not only possible interventions but also their appropriateness. Including diverse forms of evidence can increase the social validity and the relevance of systematic review for decisions makers [25].

Additionally, the article appraisal by means of the MMAT 2018 was independently performed by two researchers, which decreases the risk of inter-observer bias [28]. To our knowledge, this systematic literature

review is the first to use the MMAT 2018 for article appraisal on this topic. To give information about the quality of the included studies, a thorough presentation of the ratings of each criterion was provided and we excluded all studies not meeting one or more of the MMAT criteria. The strength of the used MMAT 2018 as compared to the former 2011 version is that the MMAT 2018 was further improved on content validity allowing a more specific assessment of the of the methodological quality of the articles included in the current study [30]. Another strong aspect of this study is that the eligibility criteria were clearly defined, which serves the repeatability of the research. Lastly, an audit trail was kept which provides insight into the reasons for inclusion and exclusion of articles.

Our systematic review also has several limitations. Cultural variations in perspectives on pregnancy possibly influence women's experiences of pregnancy after fertility treatment because of differences in maternity care systems, religion and the stigma surrounding fertility treatment [57]. Therefore, the cultural differences between or within the countries of publication of the included studies should be taken into account when interpreting the results. For follow-up research, it is therefore recommended to include the database EMBASE, search for grey literature, or "unpublished" studies and more explicit hand-searching for retrieval of reports that may have been dropped from the first search.

Another limitation is that different ART types might imply different antenatal care needs. In our study, all types of infertility treatments were addressed and the outcomes were not specific to a certain type of ART, e.g. IUI women might have other care needs than women who conceived through IVF. We have not included studies about third party reproduction (donated gametes, surrogacy, etc.). Our results cannot be generalized to this group of patients. We noticed that in several mixed methods studies that both the qualitative and quantitative parts are both described too briefly. Therefore, these studies were excluded from our review [e.g. 47,58].

Recommendations for policy, education, practice and research

Policy

As mentioned in the introduction, this study intended to provide updated evidence on the antenatal maternity care needs of ART-women. Our findings suggest that recommendations and guidelines for antenatal maternity care needs after successful ART treatment

should be updated including the respective parts (Chapter 4) of the ESHRE guideline developed in 2015. The results of our study indicate that the experience of pregnancy of ART-women can differ from that of SC-women. ART-women had difficulties adjusting to their pregnant state and might therefore demonstrate a complexity of adjusting behaviors to maintain the pregnancy. We recommend improving guidance of ART-women during the early pregnancy transition period by thoroughly educating them on the steps to come. As the need for an early ultrasound was also very apparent in our findings, we suggest planning the first ultrasound as soon as possible. Moreover, ART-women expressed the need for more appointments during their pregnancies and show poorer psychological health in the first trimester and postpartum [42]. Care providers could come to a mutual solution like more frequent telephone check-ins, or adapted care paths. The findings regarding MFA in relation to fertility treatment were inconclusive. In cases where the women has difficulty attaching to the fetus, appropriate counseling should be provided to them.

Based on our findings we propose that national guidelines for antenatal maternity of ART-women and the ESHRE guideline update their recommendations concerning the maternity care needs of pregnant women after fertility treatment to optimize and further individualize the maternity care for ART-women (Box 1 List of recommendations). Future ESHRE Guidelines may be developed to address the specificities of providing psychosocial care to specific patient groups, e.g. groups within an LBGQT+ background, or regarding particular topics.

Education

All results indicate the importance of maternity care providers being capable of providing additional support and care for ART-women to enable these women to achieve a satisfying experience in this new stage of their life. This is why care providers have to be well-informed about fertility treatment and its impact on both physical and psychosocial outcomes of ART-women and men across the perinatal period [59]. Therefore, it is recommended that the training of maternity care providers puts more emphasis on management of pregnancy after fertility treatment and provides students in maternity care with the social and communication tools to guide these pregnancies in the most optimal way.

Practice

Our results suggest the need for psychological and cognitive interventions to support ART-women in learning to cope with their pregnancy-specific anxiety and to develop optimism and the confidence of being able of maintaining pregnancy. Maternity care providers could do this by emphasizing practical interventions [22], like educational and social value of social support groups, antenatal classes, specialized Adaption Support Programs [60] or peer support [39], focusing on pregnancy and the transition to parenthood. To ease psychological pressure, group and family psychological counseling therapy or individual tailored or internet-based psychological interventions might help [39,42]. Moreover, maternity care providers could provide more opportunities for ART-women to discuss their anxiety or experienced gaps in care, by specifically inviting them to do so, and refer to mindfulness and anxiety reduction strategies. Our findings also indicate that their feelings about pregnancy can often be paradoxical and that they can have difficulty expressing these paradoxical feelings to others. To support ART-women in expressing their emotions, they need to have the feeling that they are being understood, accepted and listened to. We therefore advise care providers to emphatically recognize the paradoxical feelings of ART-women, respect the women's desires and inquire about their previous infertility history and specifically ask women what their needs are, for example in birth plans [61].

Research

More qualitative research is needed on how behavioral, relational and social, emotional, and cognitive (BREC) needs of women and men could be addressed by maternity care providers [22,62] pre-conceptional, antenatal as well as postpartum. Future pilot studies and randomized trials should examine the feasibility and clinical effectiveness of psychosocial interventions to improve psychosocial functioning of ART-women. For example, by measuring whether caregivers are experienced as being empathetic by ART-women and man or by measuring the feeling of being accepted. These are important aspects in order to improve the mental well-being of ART-women and men.

Conclusion

The aim of this mixed methods literature review was to update the evidence about the antenatal maternity care needs of ART-women. Analysis of the included studies identified behavioral, relational/social,

Box 1. List of recommendations[#]

What are the needs of pregnant women after fertility treatment?

Behavioral needs (lifestyle behavior, exercise, nutrition, and compliance)

Maternity care providers should be aware that women who conceived through Assisted Reproduction Technology (ART-women)

- have lower physical functioning scores compared to women who conceived spontaneously
- might quit their jobs in order to protect the fetus, limit their physical activity, and avoid high-risk behavior.

Relational/social needs (relationship with fetus, partner, family, friends and larger social network)

Maternity care providers should be aware that

- ART-women experience difficulties in expressing their paradoxical feelings toward friends and family in fear of appearing ungrateful for their pregnancy
- ART-couples report a decrease in social functioning, whilst couples who conceived spontaneously (SC-couples) reported stable scores.

Emotional needs (adjustment to pregnancy, general well-being, anxiety and depression)

Maternity care providers should be aware that

- ART-women can experience difficulty adjusting to their newly pregnant state and can experience contradicting feelings after transitioning from subfertility to pregnancy
- ART-women report stability in mental well-being, whereas SC-women reported an increase on mental well-being during the course of pregnancy until the moment of childbirth
- ART-women feel as if they are constantly under psychological pressure and that they focus on fetal movement to maintain peace of mind
- Social support and antenatal stress are major predictors of change in anxiety and depression during pregnancy and the postpartum period
- ART-women have higher levels of general anxiety during early pregnancy and more pregnancy-specific fears compared to SC-women, such as the fear of fetal death and miscarriage and anxiety about the course of pregnancy in general.

Cognitive needs (knowledge and concerns)

Maternity care providers should be aware that

- ART-women report to focus primarily on maintaining the pregnancy and to avoid to think about birth and parenthood because of the unpredictable course of the pregnancy.

How can maternity care providers detect or address the needs?

We recommend that maternity care providers

- offer ART-women the opportunity to discuss their worries about pregnancy and pay more attention to the impact of their infertility and ART-history on the pregnancy
- offer ART-women women more frequent telephone check-ins, routine checkups and ultrasounds or adapted care paths. Plan the first ultrasound as soon as possible
- offer ART-women guidance during the early pregnancy transition period by thoroughly educating them on the steps to come and to promote their adjustment to their pregnant state
- be aware that ART-women experience a care gap between discharge from the ART-clinic and going to local maternity care services and a care gap postpartum
- bridge the gap by means of new care guidelines and also facilitate the missing care at an organizational level.

[#]prepared in accordance with the ESHRE recommendations [17, p. 22–24].

emotional, and cognitive needs and women's preference about maternity care. Women who conceived through fertility treatment reported lower social and physical functioning scores and elevated levels of anxiety and depression compared to women who conceived spontaneously. The elevated levels of anxiety mainly stem from the fear of pregnancy loss. Results on MFA in ART-women are inconclusive. Some ART-women have difficulties adjusting to pregnancy and demonstrate adjusting behaviors. Moreover, some women experience paradoxical feelings regarding their pregnancies and find it difficult to express these feelings to others. The results of the included studies that did address the specific care needs of ART-women indicate that these women want maternity care providers

to pay more attention to their subfertility history. Moreover, the results suggest that ART-women need more psychosocial support and want more frequent routine checkups and ultrasounds. Lastly, we found that some women who are transferred from the fertility clinic to local maternity services experience a care gap between discharge from the clinic and having their first appointment or ultrasound at the local maternity services.

The most important recommendation following this study is that maternity care providers should acknowledge the full range of needs ART-women can experience. They should invite them to talk about their history in achieving pregnancy and to express their care needs. This will enable care providers to offer

ways of additional individualized support that suit the women's specific needs and are practicable, like antenatal classes, regular telephone check-ins or more frequent appointments. In the field of policy, we advise to use our findings in updating the ESHRE guideline and to incorporate the ESHRE recommendations into national care guidelines. Moreover, the education of maternity care providers should put more emphasis on providing students with the social tools needed to individualize care for ART-women. For research we recommend conducting more qualitative research into actual care needs of ART-women and their partners to expand the evidence-based knowledge on this topic.

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Ethical approval

For this systematic review we used publicly accessible documents as evidence. We did not collect deeply personal, sensitive or confidential information from participants. Therefore, we did not seek an institutional ethics approval.

Author contributions

CW conceptualized the study. LK and LM conducted the searches and selected the studies together and abstracted the data independently. Disagreements between LK and LM were resolved through discussion with CW. All authors contributed to the reviewed draft version of the manuscript and approved the final version.

Disclosure statement

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► Current knowledge on the subject

- The European Society of Reproduction and Embryology (ESHRE) states that in general the needs of couples who achieve pregnancy through Assisted Reproductive Technology (ART) do not differ from the needs of couples who conceive spontaneously.
- Women who conceived through ART might experience more stress and anxiety during pregnancy compared to women who conceived spontaneously, and might have additional behavioral, relational/social, emotional, and cognitive needs and additional preferences about maternity care.

► What this study adds.

- Our mixed methods systematic review gives the following recommendations for maternity care providers: offer ART-women the opportunity to discuss their worries about pregnancy and pay more attention to the impact of their infertility and ART-history on the pregnancy; offer ART-women women more frequent telephone check-ins, adapted care plans, routine checkups and ultrasounds; plan the first ultrasound as soon as possible; be aware that ART-women might experience a care gap between discharge from the ART-clinic and going to local maternity care services and bridge this gap by means of new care guidelines.