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A Systematic Review of Anxiety during Pregnancy in the Period of the COVID-19 Pandemic

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Abstract

Background: Pregnant women experience significant anxiety and stress, even under normal conditions, and anxiety is the most common psychological disorder during pregnancy. As different mental aspects of the COVID-19 pandemic breakout and its psychological consequences at the individual and social levels are neglected, the present study presents a systematic review of pregnant women's anxiety level during the event.

Methods: The present study was conducted in the time range of 01/09/2019-01/06/2020. The study involved searching the MEDLINE in PubMed, SCOPUS, PubPsych, and google scholar databases. Two researchers independently searched the databases and screened the data, and evaluated their quality. After final screening and eliminating the duplicate and irrelevant items, twelve cross-sectional articles were finally included in the study.

Results: The participants were divided into two groups of COVID-19 positive and negative patients. The available information and guides in parallel to reassurance through social media, healthcare professionals, and primary care were the reasons that led to low anxiety scores. The second group's higher anxiety score referred to concerns about the transfer of the disease, house quarantine, inadequate pregnancy care, first delivery, age, low weight during pregnancy, low income, living space, and public use places and transportation.

Conclusion: Increasing mothers' awareness about Coronavirus transmission, risk factors and providing online advice on prenatal care via mobile phones and the internet can reduce their anxiety and stress. It is also suggested that the medical team reassure mothers, provide the child delivery services, and the subsequent care services in the houses wherever these services are required.

Key Words: Anxiety, COVID-19, pregnancy.

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1- INTRODUCTION

The SARS-COV2 (COVID-19) disease, as the most massive pandemic in the century, has a secret nature with more *severe infectious phenotypes* than similar respiratory infections. It is a fast-spreading disease (1) so that the World Health Organization (WHO) referred to it as a *public health emergency of international concern* on 30 of January 2020, a serious incidence that has endangered public health at the international level (2).

During pandemics, most scientists, experts, and managers in health affairs focus on biological hazards, pathophysiology, preventive measures, and treatment. The psychological aspects and mental consequences are ignored at the individual and social levels (3, 4).

There is much evidence to support the considerable effect of pandemics on mental health in the general populations. The studies on the past pandemics (e.g., SARS and MERS) also show a clear connection between the incidence of pandemics and experiencing anxiety, concern, Post-traumatic stress disorder (PTSD) and even suicide (5-8). Recent studies during the COVID-19 pandemic have also reported harmful stress (73.4%), depression (50.7%), general anxiety (44.7%) and sleeplessness (36.1%) (9) and psychological effects in more than half of the population under study and reported moderate to high anxiety in one third of the population (10). Immunological changes in the pregnant women for maternal immune adaptation to fetus increases mothers' sensitivity to infectious diseases (11) and the epidemiological evidence in the past pandemics confirm this claim (12). This can be true about the COVID-19 as well.

As a vulnerable group of the population, pregnant women experience high anxiety and stress even under normal conditions (13) and anxiety is the most common psychological disorder during this period (14, 15).

Pregnant women's anxiety is mainly concerned with getting a disease, the effects of the disease on the fetus and the consequences of pregnancy, the effects of social isolation on reduced support for the mother from the family and friends, financial turmoil in the family, changes of the prenatal care from face-to-face visits to phone contacts and reduced turns of care (16-18).

Hence, pregnant women are among the vulnerable groups susceptible to infectious diseases including the COVID-19 (19, 20), and they are more seriously affected psychologically by the pandemic conditions compared to the general population (16-18). However, less attention is paid to them (3, 4) and given the vital role of psychological factors in the success of the health strategies (communications, vaccination, anti-virus treatment, health measures and social distancing) in management of the epidemics and pandemics (21), the present study attempts to determine the status of anxiety in pregnant women during the COVID-19 breakout in the framework of a systematic review.

2- METHOD

2-1. Review question

Does anxiety increase during pregnancy during the COVID-19 pandemic breakout?

2-2. Searches

Electronic bibliographic databases from 01/09/2019 to 01/06/2020, like MEDLINE in PubMed, SCOPUS, and pubPsych, were searched for this study. Finally, other databases (e.g., conference papers, key journals, …) were also reviewed for gray literature. The search strategy was using the following key terms and phrases:

"Anxiety", "Social Anxiety", "General Anxiety", AND "Pregnancy", "Gestation", "pregnant", "partum" OR "prepartum" OR "prenatal" OR "partus" OR "prelabour" OR "maternal" OR "Pregnancy Trimester" , "Perinatal " AND "COVID19", "SARS-CoV-2 infection", "coronavirus disease 2019", "2019-nCoV disease" AND "catastrophic event" , epidemic "pandemic" OR "novel coronavirus infection". The languages used for searching were English and other languages.

2-3. participants

The population of the study consisted of all pregnant women during the COVID-19 pandemic. Measures used for assessing the anxiety during pregnancy included the Generalized Anxiety Score(GAD-7), the Health Anxiety questionnaire, the Spielberger State Anxiety Index (STAI)(Form Y), eight items tapping the respondents COVID-19-related anxiety, Trait Anxiety Inventory (STAI), Edinburgh Postnatal Depression Scale (EPDS): [items 3, 4 and 5 in EPDS (EPDS-3A) represent the anxiety dimension], The PROMIS Anxiety 7-item short form, The Beck Depression Inventory (BDI), The Beck Anxiety Inventory (BAI), hospital anxiety and depression scale (HADS), and Pregnancy-related anxiety questionnaire. Also, pregnant women themselves were divided into two gropes of COVID-19 positive and negative. A real-time polymerase chain reaction (RT-PCR) was used for COVID-19 detection.

2-4. Types of study to be included and excluded

Inclusion criteria: Cross-sectional studies focusing on anxiety evaluation during pregnancy.

Exclusion criteria: Studies focusing on other target groups or other psychological states.

2-5. Data extraction (selection and coding)

Full-text articles were sought and examined using the eligibility criteria. Extracted information included: author, year of publication, participants, sample size, age, measures, and findings. The authors were contacted if additional information was required. The review was done according to PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines.

2-6) Risk of bias (quality) assessment: Quality assessment was done using a STROBE modified quality assessment checklist (22) in three categories (Low, Moderate, High). Two independent reviewers filled the checklist of each study. The corresponding author and the first author assessed all the studies which met inclusion criteria for the review. Any discrepancies between the raters were discussed until a consensus was reached. The third reviewer assessed any differences. Data on the prevalence and severity of anxiety were extracted from the articles.

2-7) Dissemination: A manuscript was prepared for submission to a peer-reviewed journal.

3- RESULTS

3-1. Included studies

During the advanced search, 1987 studies were primarily identified. After eliminating the unrelated and duplicate studies, the articles based on the PRISM guideline were screened by title and abstract, screening the full text. Finally, nine articles were considered eligible for the systematic review (**Fig. 1**). The results of the risk of bias (quality) assessment are presented in **Table 1**.

PRISMA 2009 Flow Diagram (23)

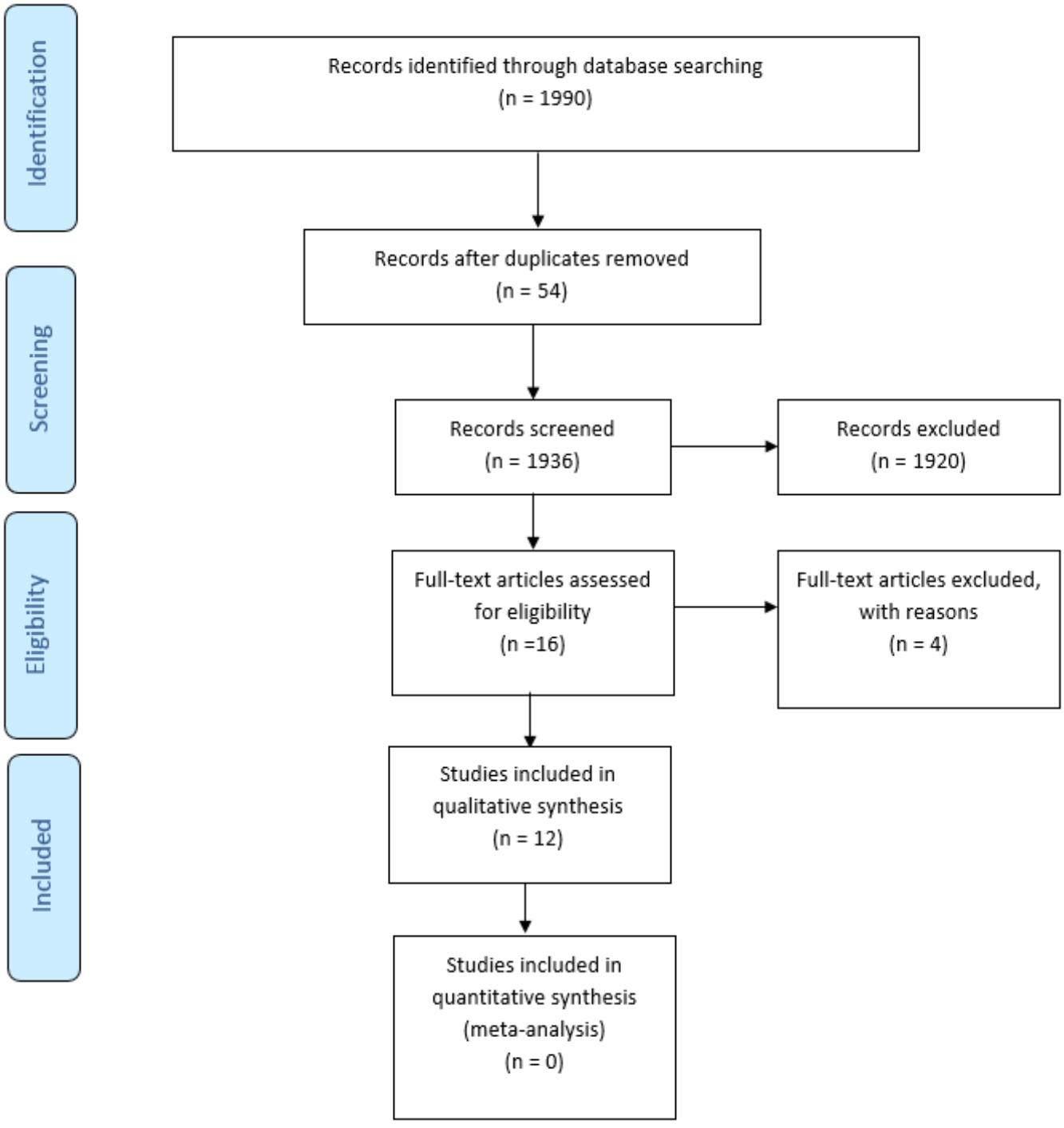

Fig. 1: Literature search and review flowchart for selection of primary studies

Table-1: quality assessment (risk of bias) with STROBE checklist

	1	2	3	4	5	6	7	8	9	10	11	12	Total Quality status
Saadati N et al. (25)	H*	H	H	H	L**	M***	H	L	L	H	H	M	M
Dogklis T et al. (32)	M	H	H	H	H	H	H	H	H	H	H	H	H
Hossain N et al. (26)	M	H	H	L	H	H	H	H	H	H	H	H	H
Corbett GA et al.(24)	M	M	H	L	H	H	H	H	H	H	H	H	M
Taubman O et al. (27)	M	H	L	M	H	H	H	H	H	H	H	H	H
Saccone G et al. (28)	M	H	H	H	H	H	H	H	H	H	H	M	H
Wu, Y et al. (29)	H	H	L	H	H	H	H	H	H	M	H	H	H
Kotabagi P et al. (30)	M	M	M	H	M	H	H	H	M	H	H	H	M
Lebel C et al. (31)	M	M	H	H	H	H	H	H	H	H	H	H	H
Yanting Wu et al. (32)	H	H	H	H	H	H	H	H	H	H	H	H	H
Durankuş Fet al. (33)	M	H	M	L	L	M	H	H	M	M	H	M	M
Kahyaoglu Sut H et al. (34)	H	M	H	M	H	H	H	H	H	H	H	H	H

* H: High
** L: Low
*** M: moderate

1) Indicates the study's design and Provides an informative abstract.
2) Explains the scientific background and mentions specific objectives.
3) Presents key elements of the study design.
4) Describes the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection.
5) Gives the eligibility criteria, the sources and methods of sample selection.
6) Clearly defines all outcomes, exposures, predictors, potential confounders, and effect modifiers. Gives diagnostic criteria, if applicable.
7) For each variable of interest, gives sources of data and details of methods of assessment (measurement, …).
8) Describes all statistical and analytical methods taking into account the sampling strategy.
9) Reports the number of individuals at each stage of the study e.g. numbers potentially eligible, examined for eligibility, confirmed as eligible, included in the study, completing follow-up, and analyzed.
10) Descriptive data include characteristics of the participants (e.g. demographic, clinical, and social) and information on exposures and potential confounders.
11) Outcome data report numbers of outcome events or summary measures.
12) Discussion summarizes the key results, discusses limitations of the study, and gives a cautious overall interpretation of the results.

3-3. Study characteristics

A total of 12 studies, with a total of 13921 participants, were included in the systematic review (**Table 2**). The included articles were published between 2019 and 2020.

3-3-1. Anxiety in COVID-19- positive mothers

In a study by Kotabagi et al. (2020) on 11 pregnant women infected by the COVID-19, in weeks 27-39, the pregnant women's level of anxiety was found to be low.

However, the peak of anxiety was parallel to the peak of deaths caused by this disease in England (concerns about strict quarantine, lack of trust in the capacities of the health services at the national level, and the consequences of COVID-19) and has reduced by week 11, which might have been due to increasing information and trust in the accessibility of primary health services by the passage of time (30).

3-3-2. Anxiety in COVID-19- negative mothers

The results of a study by Lebel et al. (2020) on 1987 pregnant women in weeks 1-35 showed that the clinical signs of anxiety and the symptoms of anxiety related to pregnancy have increased by 57% and 68%, respectively. The most important causes of anxiety in pregnant women were reported to be fear of reduced quality of pregnancy care, reduced support from others, and lack of access to massage and chiropractic care services and consulting services (31).

In another study on pregnant women in Iran, Sa'adati et al. (2020) showed that the highest anxiety score was related to the women who were in the last trimester of their pregnancy and their largest concern was fear of being inflicted by the disease (see **Table 2**) (25).

Corbet et al. conducted a study in Ireland on pregnant women in the second and last trimester of their pregnancy showing that they were concerned about their own health and the health of their unborn child and their other children (see **Table 2**) (24).

In their study in Greece, Daglis et al. also found that house quarantine influences the level of anxiety. The level of anxiety was found to be high in the first week of quarantine and reached almost the normal state in the third week of quarantine (see **Table 2**) (32).

In Pakistan, Hossain et al. attributed the high anxiety of pregnant women to their concern about the transfer of the disease from mothers to their child (26).

Taubman O et al. (2020) in Israel found that the pregnant women were mostly concerned about the transfer of the disease from spouse to other members of the family, presence in public places, using public transportation, the way they received pregnancy care, later weeks of pregnancy, and lower socio-economic status (see **Table 2**) (27).

Analyzing sensitivity based on the gestational age, Saccone et al. (2020) found in their study in Italy that during the COVID-19 epidemic, pregnant women in their first trimester of pregnancy experienced greater mental effects and anxiety compared to those in the second or third trimester of pregnancy and almost half of the women (46%) referred to vertical transmission of the disease as the most important cause of their anxiety (see **Table 2**) (28).

In another study by Wu et al. in China, pregnant women reported a high level of depression and anxiety, and in some cases, they had self-harm thoughts. The pregnant women with low weight before pregnancy or expecting their first child were less than 35 years of age, full-time jobs, and appropriate living space had higher levels of anxiety and depression during the Coronavirus breakout (29) (see **Table 2**).

The significantly higher BAI and BDI scores in comparison to the scores of the control group in the study by Durankuş et al. represent that pregnant women experienced higher levels of anxiety and depression than usual. They also expressed that mental disorders in pandemic arise two times greater than those observed under normal circumstances (32) (see **Table 2**).

Yanting et al., in a study surveying the mental health of pregnant women during the COVID-19 outbreak, stated that the declaration of human-to-human

transmission and the increased threat of the COVID-19 epidemic have a significant impact on the increasing prevalence of depression and anxiety symptoms. The highest risk for developing depressive symptoms during the COVID-19 outbreak was attributed to primiparous women of younger ages, middle-income status, and full-time employments. Like previous studies, the percentage of women with self-harm thoughts was reported significantly higher during the outbreak (33) (see **Table 2**).

Kahyaoglu et al. also reported an increased prevalence of anxiety and depression in pregnant women during the COVID-19 pandemic. They suggested that having low education levels, not engaging in regular physical activity, experiencing discomfort with face-to-face hospital visits, and not having information about the effects of COVID-19 on pregnancy had a significant impact on pregnancy anxiety (34) (see **Table 2**).

4- DISCUSSION

As reviewed above**,** pregnant women are among the vulnerable groups and experience a high level of anxiety during pandemics as a great health crisis that threatens human life. The present systematic review analyzed the studies on pregnant women's anxiety since the COVID-19 breakout, but only twelve studies met the inclusion criteria, which is an indication of the much lower attention to psychological consequences of COVID-19 for the pregnant women as a high-risk group compared to the physical consequences and the risk of vertical transmission of the disease from the mother to the fetus.

In these studies, a variety of instruments have been used for measuring pregnant women's anxiety. In two studies, GAD-7, in two studies, Spielberger (STAT), in one study Health Anxiety Questionnaire, in one study items 3, 4 and 5 of the Edinburgh Postnatal Depression Scale (EDPS-3A), in two studies EPDS, In one study BAI, in one study HADS and in two studies researcher-made instruments were used.

Some of these studies have investigated general anxiety, some have focused on anxiety related to COVOD-19, and some have examined anxiety associated with pregnancy. What is expected in these studies is the fact that the COVID-19 pandemic has increased the level of anxiety of pregnant women and led to the appearance of the clinical symptoms of anxiety.

In several studies, the anxiety caused by COVID-19 was reported to be moderate in more than half of the pregnant women (25-28,35). Since increased anxiety in women can have short-term (e.g., premature delivery, Cesarean delivery, etc.) and long-term (cognitive injuries to children) consequences, it is very important (36-40).

The highest level of anxiety associated with COVID-19 in pregnant women is related to their concern about the presence in public places and using public transportation and anxiety related to the quality of receiving pregnancy care and fetus health.

In a qualitative study in Iran, Rashidi et al. pointed out that since many of the pregnant women had planned for their child's birth before the Coronavirus breakout, due to the urban restrictions and quarantine, they are worried about how they can receive support from their family particularly their mothers during delivery. Even if there were no inter-city restrictions, they might be worried about their families' infection by the disease (41).

Table-2: Characteristics of studies

Author/year	Location of study	Type of study	Sample Size	Age, years, mean ± SD	Type of sampling	Measuring tool related to Anxiety	Average Anxiety score	Outcome
Saadati N et al., 2020 (25)	Iran	Cross-sectional	300	The First Trimester 25.8±5.1 The Second Trimester 27.2±5.7 Third Trimester 26.4±4.5	Available Sampling	the Health Anxiety questionnaire	-in First trimester 22.3 ± 9.5 -in second trimester 24.6 ± 9.3 -in third trimester25.4 ± 10.6	Pregnant women in the third trimester had significantly higher scores in "total health anxiety," in comparison to those in the first trimester
Hossain N et al. 2020 (26)	Pakistan	Cross-sectional	286	26.47±4.81	Available Sampling	GAD-7 anxiety scale	-	First week =OR: 6.924; 95% CI: 2.807-17.027, second week =OR: 2.654; 95% CI: 1.138-6.192, third week = OR: 1.000). Women who perceived that COVID-19 can affect the child had significantly higher GAD scores (n=37, 15.3%, p-value 0.042). Similarly, women afraid of COVID-19 infection had a significantly higher (n=40, 16.5%, p-value 0.046) GAD score. Women who had high GAD score (≥7) also had significantly higher (p=0.020) fear score (6.90 ± 3.23 vs. 5.68 ± 3.07) compared with women who had normal GAD score (<7).

Author/year	Location of study	Type of study	Sample Size	Age, years, mean ± SD	Type of sampling	Measuring tool related to Anxiety	Average Anxiety score	Outcome
Dogklis T et al., 2020 (32)	Greece	Cross-sectional	146	32% were > 35 and 67.8% were < 35	Available Sampling	STAI (Form Y)	-	Pregnant women exhibit a significant increase in anxiety levels during the lockdown, though the levels reached are considered as moderate. The highest anxiety levels were experienced in the first week of the quarantine and then gradually regressed in the second week, reaching almost normal levels in the third week.
Corbett GA et al., 2020 (24)	Ireland	Letter	71	-	Available Sampling	-	-	The COVID-19 pandemic has caused a rise in anxiety among the pregnant women.
Taubman O et al., 2020 (27)	Israeli	Cross-sectional	336	30.31±4.97	Available Sampling	eight items tapping the respondents' COVID-19-related anxiety	-	Arab women reported significantly higher COVID-19-related anxiety of all types than did the Jewish women. With the exception of the use of public transportation. no significant differences in psychological distress and most aspects of COVID-19-related anxiety emerged between primiparous and multiparous women, save for concern about the delivery itself, which was marginally higher among those expecting their first child.

Author/year	Location of study	Type of study	Sample Size	Age, years, mean ± SD	Type of sampling	Measuring tool related to Anxiety	Average Anxiety score	Outcome
Saccone G et al, 2020 (28)	Italy	Cross-sectional	100, 17 , 35 and 48 women were in the first, second, and third trimester	-	Available Sampling	STAI	in the overall cohort:45.2±14.6 by gestational age: [in First trimester: 58.7±16.8 in secondt rimester: 44.0±12.5 in third trimester: 41.4±12.5]	About two-thirds reported higher than normal anxiety. Almost half of the women reported high anxiety regarding the vertical transmission of the disease.
Wu, Y et. Al., 2020 (29)	China	Cross-sectional	4124 (1285 were assessed after coronavirus epidemic and 2839 were assessed before this pivotal time point)	Median (range)= Group1: 30(27-32) Groug2: 30(27-32)	Available Sampling	EPDS: [items 3, 4 and 5 in EPDS (EPDS-3A) represent the anxiety dimension]	anxiety subscale scores: (Group1:3.4 ± 1.7. Group2: 3.2 ± 1.7)	An increase in the prevalence of depression and anxiety symptoms were found after the announcement of COVID-19 human-to-human transmission.
Kotabagi P et al., 2020 (30)	UK	Cross-sectional	11 (COVID-19-positive pregnant women)	Median (range)= 31 (18-39)	Available Sampling	GAD-7	The median GAD-7 score throughout the 11-week period was 3 (scores of 5, 10 and 15 are taken as the cutoff points for	Anxiety at the tail end of the pandemic in the UK appears low.

Author/year	Location of study	Type of study	Sample Size	Age, years, mean ± SD	Type of sampling	Measuring tool related to Anxiety	Average Anxiety score	Outcome
							mild, moderate, and severe anxiety)	
Lebel C et al., 2020 (31)	Canada	Cross-sectional	1987	32.4±8.4	Available Sampling	1- The PROMIS Anxiety 7-item short form, 2- Pregnancy-related anxiety questionnaire	46.3% of participants had moderately elevated anxiety, and 10.3% severely elevated anxiety (56.6% total with clinically elevated anxiety). 67.6% has clinically elevated pregnancy-related anxiety.	57% reported clinically relevant symptoms of anxiety and 68% reported elevated pregnancy-related anxiety. Higher levels of social support and longer sleep duration were associated with lower psychological symptoms across domains. Partner and general social support were also resilience factors for pregnancy-related anxiety.
Yanting Wu et al., 2020 (32)	China	Cross-sectional	4124	Third trimester age of group one Mean (range): 30 (27–32) Third trimester age of Group two: Mean (range): 30 (27–32)	Available Sampling	EPDS	EPDS score (score of 10 was taken for the (cutoff point of EPDS): Group one: 7.4±4.3 Group two: 7.4±4.4 Anxiety subscale: Group one: 3.2±1.7 Group two: 3.4±1.7	Significant rise in the prevalence of depressive and anxiety symptoms after the declaration of human-to-human transmission and an increased threat of the COVID-19 epidemic. primiparous women of younger age, of middle-income status, and with full-time employment were at increased risk for developing depressive symptoms during the COVID-19 outbreak

Author/year	Location of study	Type of study	Sample Size	Age, years, mean ± SD	Type of sampling	Measuring tool related to Anxiety	Average Anxiety score	Outcome
Durankuş Fet al., 2020 (33)	Turkey	Cross-sectional	260	Mean age: 29.561	Available Sampling	EPDS, BDI, BAI	35.4% (n ¼ 92, case group) scored higher than 13 (cut of point) on the EPDS. The effects of COVID19 on mean BDI scores (20.565 ± 6.605), and mean BAI scores (22.087 ± 8.689) were greater in the case group than in the control group	percentage of pregnant women who scored higher than 13 on the EPDS was 35.4% and the anxiety and depression scores determined via the BAI and BDI were significantly higher in the case group than in the control group
Kahyaoglu Sut H et al., 2020 (34)	Turkey	Cross-sectional	403	Mean age: 28.2 ± 4.5 Mean gestational week: 27.3 ± 8.8	Available Sampling	HADS	Average HADS-anxiety score: 9.6 ± 6.4 THE average HADS depression score: 8.7 ± 5.2. Prevalence of anxiety (HADS-anxiety score ≥8): 64.5% Prevalence of depression (HADS-depression score ≥8): 56.3%	The prevalence of anxiety and depression in pregnant women has significantly increased during the COVID-19 pandemic.

So it concluded that reassurance plays an essential role in reducing anxiety during pregnancy, which could be received from families during pregnancy or from the health care professionals. In addition some stated that due to their concern about getting disease on their way to hospital and in the hospital, they do not refer to the physician. Some even want premature delivery or caesarian operation due to stress and anxiety. So considering unique places for pregnant women is a basic need in the COVID-19 pandemic.

Many women began to use alcoholic detergents to control and prevent the virus's infection due to misinformation. In this case, their anxiety about being poisoned by overuse of the detergents became elevated. Some mothers were anxious about giving birth to a child infected by the Coronavirus. Besides, some were concerned about delivery, breastfeeding, taking care of their child, and vaccination after delivery and screening (41).

Analyzed studies in the present review had some limitations including the impossibility of face-to-face completion of the questionnaires due to the disease breakout, use of accessible sampling method, small sample size and short sampling time, single-center nature of the study, sampling from a particular group that had access to the virtual environment for completing the questionnaires led to selection bias precluding generalization of the results. Furthermore, some studies did not explain the reliability and validity of their questionnaires. Using a self-report questionnaire is accompanied by bias. All the studies had included patients in their study based on the questionnaire, and no study had used a clinical interview based on a valid scale such as DSM4 for screening. Some studies had used web-based questionnaires, which had the advantage of avoiding the spread of the disease and infection. On the other hand, it has certain shortcomings. Technical problems might also arise in the completion of the questionnaire. Most of the studies had not clearly explained their sampling method.

5- CONCLUSION

In the present systematic review, the anxiety level of pregnant women without COVID-19 was reported to range from moderate to high. In contrast, maternal levels of anxiety in those with COVID-19 in the UK appear low. The increase in the level of anxiety of pregnant women during the COVID-19 breakout, as documented by the 11 analyzed studies, indicates the need for paying further attention to mental health as an inseparable aspect of prenatal care, particularly during public health crises. Considering unique health centers for pregnant women, along with the clinical and consulting services at home are among the basic needs in the COVID-19 pandemic. Due to the importance of mothers' increased awareness about the transfer and the risk factors of the COVID-19, providing online advice via mobile phones and the internet for prenatal care can reduce pregnant women's anxiety and stress (38).

6- CONFLICT OF INTERESTS: None.

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