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Stress, anxiety and depression in 1466 pregnant women during and before the COVID-19 pandemic: a Dutch cohort study

S. J. M. Zilver^a, B. F. P. Broekman^{b,c}, Y. M. G. A. Hendrix^d, R. A. de Leeuw^a, S. V. Mentzel^e, M. G. van Pampus^d and C. J. M. de Groot^a

^aDepartment of Obstetrics and Gynecology, Amsterdam Reproduction & Development Research Institute, Amsterdam UMC, Amsterdam, The Netherlands; ^bDepartment of Psychiatry, Amsterdam UMC, Amsterdam, The Netherlands; ^cDepartment of Psychiatry, OLVG, Amsterdam, The Netherlands; ^dDepartment of Obstetrics and Gynecology, OLVG, Amsterdam, The Netherlands; ^eDepartment of Sports and Exercise Psychology, WWU Munster, Munster, Germany

ABSTRACT

Objective: The coronavirus disease (COVID-19) pandemic has negatively affected many people's mental health with increased symptoms of stress, anxiety and depression in the general population. Anxiety and depression can have negative effects on pregnant women and result in poor neonatal outcomes. Therefore, we analyzed stress, anxiety and depression in pregnant women during the COVID-19 pandemic.

Materials and methods: Cohort study of pregnant women during COVID-19 compared to pregnant women before COVID-19. Pregnant women were recruited through social media platforms from 21 May 2020 to 22 June 2020. Pregnant women ≥ 18 years of age, who master the Dutch language were included. The Hospital Anxiety and Depression Scale (HADS) and the Perceived Stress Scale (PSS-10) were analyzed. Demographic features were summarized using descriptive statistics. Possible differences in demographic variables between groups were compared using Mann Whitney U test and Chi-squared test. Significant demographic differences between groups were controlled for using logistical regression analysis or an independent one-way analysis of covariance.

Results: Thousand hundred and two pregnant women completed the questionnaires during COVID-19, and 364 pregnant women before COVID-19. We found no differences in clinically high levels of anxiety (HADS-A ≥ 8) and depression (HADS-D ≥ 8) in women during COVID-19 (19.5% and 13.2%, respectively) and women before COVID-19 (23.1% and 15.7%, respectively). A question was implemented whether participants related their stress level to COVID-19. Women who related their stress to the COVID-19 pandemic reported significantly higher overall stress levels on the PSS-10 compared to women with stress unrelated to COVID-19 (mean, 15.62; standard deviation [SD], 6.44 vs. mean, 10.28; SD, 5.48; $p < 0.001$).

Conclusion: In contrast to previous studies, COVID-19 did not increase anxiety and depression levels in Dutch pregnant women. Women who related their perceived stress to the COVID-19 pandemic experienced higher stress levels than women who did not relate their stress to the COVID-19 pandemic, suggesting that interventions that specifically aim to reduce COVID-19 stress, may help to reduce overall stress levels in pregnant women during the pandemic.

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Introduction

The coronavirus disease (COVID-19) pandemic, resulting in economic downturn, has negatively affected people's mental health with increased symptoms of stress, anxiety and depression in the general population [1]. It has been reported that feelings of anxiety are common, as people are fearful of falling ill and are uncertain of the repercussions of the pandemic [2,3]. Especially for pregnant women, anxiety for themselves

as well as for their unborn child results in social distancing, and isolation [4]. In addition, it is reported that pregnant women are anxious to visit labor and delivery wards during the pandemic [5,6] and are even delaying or canceling antenatal visits [7].

Recently, Brooks et al. [8] described the psychologic impact of quarantine in previous pandemics. This review, found that people who have been quarantined reported a higher prevalence of psychological distress. Stressors during quarantine included; the duration of

CONTACT S. J. M. Zilver  s.j.zilver@amsterdamumc.nl  Department(s), Amsterdam Reproduction & Development research institute, Amsterdam UMC, Vrije Universiteit Amsterdam, Boelelaan 1117, Amsterdam, 1081 HV, The Netherlands

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quarantine, fears of infection, frustration and inadequate information. Stressors post quarantine regarded financial problems and stigma. Some studies described predictors with negative psychological impact during quarantine including younger age, one child versus no children and lower levels of education.

Luo et al. [9] analyzed factors related to psychological distress during the COVID-19 pandemic. The main symptoms identified were: anxiety, depression and loneliness. The main stressors included: limited possibility for activities, not seeing family members, work problems, concerns about infection and disruption of normal life.

Several studies have been conducted regarding the mental health of pregnant women during COVID-19. Sun et al. [10] conducted a systematic review including 15 studies about pregnant women that were performed during the first wave of the pandemic. The results showed an overall prevalence of 30% (range 11–65%) for depression and 34% (range 18–56%) for anxiety, although significant heterogeneity was seen.

Lebel et al. [11] concluded that among 1987 pregnant women in Canada 37% reported clinically relevant symptoms of depression and 57% of anxiety. They also found that social isolation had the largest effect on symptoms of anxiety and depression and that physical activity and social support lowered the odds of symptoms of anxiety and depression.

Another study among 4124 pregnant women in China Wu et al. [12] showed a significantly higher rate of depressive symptoms and a positive association between the number of newly confirmed COVID-19 cases and depressive symptoms.

A Turkish study, conducted by Akgor et al. [13] focused on symptoms of anxiety and depression and in addition looked at specific concerns of pregnant women such as: worries that pregnant women have a higher risk for COVID-19 infection compared to other people, the baby is going to be infected during or after delivery and worries about complications if checkups are postponed.

The findings of these studies may have important consequences, as it is known that antenatal mental health issues are associated with poor maternal psychosocial functioning and negative birth outcomes, neurodevelopmental outcomes of the offspring, postnatal depression and posttraumatic stress disorder [14].

Cultural differences between countries make interpreting these results and generalizability to a specific population difficult. Differences in governmental policies such as total lockdown, quarantine or mild preventive measurements can lead to variances in

psychological distress and thus make it difficult to compare the results between countries.

The aim of this study is to investigate differences between stress, anxiety and depression in pregnant women during COVID-19, compared to a cohort of pregnant women before COVID-19 in the Netherlands. This study will provide more insight in the effect of COVID-19 on maternal distress, and will help us guide development of preventive measures and interventions to improve maternal mental health during extraordinary circumstances.

Methods

Cross-sectional cohort study comparing pregnant women during COVID-19 (participants) to pregnant women before COVID-19 (controls).

Data collection and participants

Pregnant women in the Netherlands were invited through social media from 21 May 2020 to 22 June 2020. The campaign was launched using social media platforms such as Facebook, Linked In and Instagram as well as flyers in prenatal clinics in Amsterdam. Informed consent was obtained online after which a questionnaire was provided in a secure online platform.

Inclusion criteria: pregnant women in the Netherlands.

Exclusion criteria: pregnant women younger than 18 years and those who did not master the Dutch language.

Questionnaires

The questionnaire consisted of demographic variables and two validated self-reporting questionnaires. The demographic variables included maternal age, parity, trimester, country of birth and risk area for COVID-19. Trimesters were defined as first trimester ≤ 12 weeks, second trimester from 13 to 27 weeks gestational age and third trimester from 28 weeks gestational age until delivery. Risk areas for COVID-19 were defined according to the statistics of the National Institute for Public Health and Environment: high risk was defined as a mean of >100 new cases a day and low risk <100 new cases a day per region in the period between the 27 March and the 16 April [15]. The two validated self-reporting questionnaires included: the Hospital Anxiety and Depression Scale (HADS) and the Perceived Stress Scale (PSS-10).

General distress was measured by the internationally widely used HADS, composed of 14 items with a 4-point Likert scale (range, 0–42). Questions are related to feelings during the past week. The HADS-A7 consists of seven specifically designed items to measure symptoms of anxiety and the HADS-D7 consists of seven items to specifically measure symptoms of depression [16]. A total score of ≥ 12 was used as an overall high level of psychological distress. On the HADS-A or HADS-D a cutoff score of ≥ 8 indicated clinically significant levels of anxiety or depression.

The PSS-10 is a well-validated measure of subjectively perceived stress levels over the past month. It consists of 10 items with a 5-point Likert scale. The PSS-10 has a two dimensional structure, with one dimension related to perceived stress (measured by six negatively worded items) and the second related to coping ability and stress resilience (measured by four positively worded items).

Questions that relate negative events are rated in a reverse manner. A total score between 0–13 is considered low stress, 14–26 moderate stress and 27–40 high levels of stress [17].

For this study two additional questions were added: (1) if the participant related their stress levels to the COVID-19 pandemic and (2) if the participant had been positively tested for COVID-19.

Control group

The control group consisted of 364 women who filled out the HADS before COVID-19 between February 2019 and January 2020. These data were originally collected for the request for help in fear of childbirth (HEAR study), to get insight in the prevalence of fear of childbirth. This study only included primigravida.

In the HEAR study, pregnant women were also recruited online, as well as with flyers at the OLVG hospital in Amsterdam and midwifery practices. In the flyers an online link was provided. The online link provided information about the study. After informed consent was obtained, women received a personal link to the online questionnaire. Exclusion criteria were women younger than 18 years, women who did not master the Dutch language and multiparity (defined as a previous gestation of ≥ 16 weeks).

Statistical analysis

Data were analyzed using SPSS (version 26.0, Chicago, IL). Before conducting the inferential analysis, descriptive statistics were used to test the assumptions. In

cases where parametric analysis assumptions were not met, nonparametric equivalents were used.

Demographic features of the two cohorts were summarized using descriptive statistics. Possible differences in demographic variables between groups were compared using Mann Whitney U test for continuous variables and Chi-squared test for categorical variables.

The percentage of high total HADS score and HADS sub scores above the clinical cut offs between participants and controls were compared with t-tests. The continuous total HADS score and sub scores between the participants and control group were analyzed with an independent one-way analysis of covariance controlling for possible confounders [18] and a logistic regression analysis was performed for dichotomized outcomes.

The research protocol was approved by the accredited Medical Research Ethics Committee of the Amsterdam UMC (reference METC 2020.260).

Results

The social media campaign resulted in an online reach of 117,000 people and 5076 people who visited the landing page. A total of 1102 pregnant women completed all questionnaires. In both the participant and control group the majority of women were in their third trimester and almost all of them were born in the Netherlands. The participants were older than the controls, there was a difference in parity, and the participants were less often previously treated for psychological distress in comparison to the controls. More than half of the participants lived in a high risk area for COVID-19.

The characteristics of the participants and control group are presented in [Table 1](#).

Overall, 27.9% of the participants scored HADS ≥ 12 compared to 31.9% of the controls, HADS-A ≥ 8 19.5% versus 23.1% and HADS-D ≥ 8 13.2% versus 15.7%, none of these differences were statistically significant ([Table 2](#)).

The continuous HADS scores for anxiety and depression were also compared between the participants and the controls, see [Table 3](#). The overall HADS score indicating general psychological distress was lower among the participants, compared to the controls. After controlling for previous treatment of psychological distress, maternal age, parity and gestation the difference was still statistically significant ($F(1,1459) = 5.76$; $p = 0.02$; $\eta p^2 = .004$). In addition, statistically significant differences were found for the

continuous anxiety and depression sub scores (HADS-A and HADS-D; Table 3).

A logistic regression was performed for the HADS ≥ 12 , HADS-A ≥ 8 and HADS-D ≥ 8 (Table 2). Participants versus controls was not a significant

Table 1. Demographics and characteristics of the participants (during COVID-19) and controls (before COVID-19).

Characteristics	Participants N = 1102 (%)	Controls N = 364 (%)	p Value
Age (years), mean (SD)	32.02 (3.8)	30.65 (4.3)	<0.001
Parity (%)			
Nulliparity	527 (47.8)	364 (100)	<0.001
Multiparity	575 (52.2)	0 (0)	
Gestation (%)			
1 st trimester	213 (19.3)	47 (12.9)	0.018
2 nd trimester	399 (36.2)	137 (37.6)	
3 rd trimester	490 (44.5)	180 (49.5)	
Treated for psychological distress (before) (%)			
Yes	428 (38.8)	174 (47.8)	
No	674 (61.2)	190 (52.5)	0.003
Country of birth (%)			
Netherlands	1051 (95.4)	343 (94.2)	0.736
Morocco	1 (0.1)	1 (0.3)	
Suriname	3 (0.3)	1 (0.3)	
Other	47 (4.3)	19 (5.2)	
Living area (%)			
High risk COVID-19 area	752 (68.2)		
Low risk COVID-19 area	348 (31.6)		
Unknown	2 (0.2)		

Table 2. Discrete analysis of scores on the Hospital anxiety and depression scale (HADS) of the participants (during COVID-19) and controls (before COVID-19).

	Participants N = 1102 (%)	Controls N = 364 (%)	p Value
HADS ≥ 12	27.9	31.9	0.14
HADS-A ≥ 8	19.5	23.1	0.14
HADS-D ≥ 8	13.2	15.7	0.23
HADS $\geq 12^a$	aOR, 1.3; 95% CI, 0.97–1.77		0.081
HADS-A $\geq 8^a$	aOR, 1.3; 95% CI, 0.93–1.83		0.126
HADS-D $\geq 8^a$	aOR, 1.4; 95% CI, 0.94–2.08		0.100

^aAdjusted for age, parity, gestation and psychological history.
aOR: adjusted odds ratio; CI: confidence interval.

Table 3. Continuous scores on the Hospital anxiety and depression scale (HADS) of the participants (during COVID-19) and controls (before COVID-19).

	Participants (N = 1102) Mean, SD	Controls (N = 364) Mean, SD	Effect size ^a	p Value ^a
HADS total score	8.75, 6.09	9.48, 6.01	0.004	0.02
HADS-A	4.90, 3.45	5.33, 3.44	0.003	0.03
HADS-D	3.85, 3.22	4.15, 3.26	0.003	0.03

^a While controlling for previous treatment of psychological distress, parity, gestation and maternal age.

predictor for HADS ≥ 12 scores, HADS-A ≥ 8 and HADS-D ≥ 8 after correction for previous treatment of psychological distress, maternal age, parity and gestation.

The PSS-10 was only conducted among the participants. An additional question was added to differ between perceived stress related to COVID-19 or other causes. A total of 538 (49%) participants related their perceived stress to the COVID-19 pandemic and 564 (51%) did not relate their stress to the COVID-19 pandemic. Of the participants, 58.4% scored low, 38.3% moderate and 3.3% high on the perceived stress ranking.

For the PSS-10 overall score, the positive and negative subscales indicated that participants who relate their stress to the COVID-19 pandemic have a significantly higher score than participants who did not relate their perceived stress to the COVID-19 pandemic; with an effect size of 0.89 on the overall score, 0.69 on the positive subscale and 0.90 on the negative subscale. In this cohort only 0.8% reported that they tested positive for COVID-19, see overview in Table 4.

Discussion

Main findings

There were no significant differences between high scores of depression and anxiety (HADS scores above the clinical cutoffs) between pregnant women before and after the COVID-19 outbreak.

We even found slightly lower anxiety and depression scores on the HADS in pregnant women during the COVID-19 outbreak compared to those who filled out the questionnaire before the pandemic after controlling for previous treatment for psychological distress, maternal age, parity and gestation. The perceived stress scale showed that pregnant women who relate their stress to the COVID-19 outbreak demonstrate significantly higher PSS-10 overall scores.

Interpretation

In contrast to previous studies, we found lower anxiety and depression scores in pregnant women during COVID-19 compared to controls. Effect sizes were

Table 4. Perceived stress scale (PSS-10) in pregnant women during Covid-19.

	Stress related to COVID-19 (N = 538) Mean, SD	Stress not related to COVID-19 (N = 564) Mean, SD	Effect size	p Value ^a
PSS-10 overall score	15.61, 6.44	10.28, 5.48	0.89	<0.001
Positive subscale	5.92, 2.46	4.29, 2.21	0.69	<0.001
Negative subscale	9.68, 4.41	5.99, 3.80	0.90	<0.001

small, indicating that differences in demographics could not explain the difference between the groups. A possible explanation for the higher anxiety and depression scores in the controls, could be selection bias. The main objective of the HEAR study was to study fear of childbirth, which might have led to a more anxiety and depression prone sample of women.

The PSS-10 scores indicated that women relating their stress to the current pandemic had significantly higher scores. To our knowledge no data on this subject have been published.

The timing of the data collection might be reflected in the results. Data collection started in May and stopped four weeks later, on the 22 June, during the first wave of COVID-19 in the Netherlands. This was at the end of the first peak of the pandemic in the Netherlands, it is possible that at this point symptoms of anxiety and depression were less than at the beginning of the lockdown on 15 March. The other studies mentioned in this article collected the data at the peak of the pandemic in their countries. This suggests that symptoms of anxiety and depression may improve during the stabilization phase of the pandemic.

In both our groups a minority of the women were in their first trimester (19.3% vs. 12.9%). The first trimester has the highest risk of pregnancy loss (miscarriage) [19], which could possibly lead to more distress.

The systematic review by Sun et al. [10] showed an overall prevalence of 30% for depression and 34% for anxiety. When specifically looking at depression rates, it ranges from 11–65% between studies and subgroup analyses showed a large difference in relation to different assessment tools. The Edinburgh Postnatal Depression Scale (EPDS) showed a 26% depression rate, with an increase up 52% in self developed questionnaires. Anxiety rates ranged from 18–65%, also depending upon the assessment tool that was used.

Lebel et al. [11], found clinically relevant symptoms of depression in 37% of the women and 57% reported clinically relevant symptoms of anxiety. They also found that social support or isolation mediated the results. This was not taken into account in our study. Patient characteristics such as age and parity were comparable to the participants in our study. However the different questionnaires make comparing of the data to our study difficult.

Wu et al. [12] reported 26% depressive symptoms at the beginning of the pandemic with a rise of up to 34% at the beginning of February. The study also showed that pregnant women younger than 35 years, employed fulltime, with middle income and

nulliparous were more vulnerable to develop depressive symptoms during the COVID-19 outbreak. Our cohort is different but we did find that lower maternal age and treatment for psychological distress negatively affected HADS scores.

Akgor et al. [13] used the HADS to measure anxiety and depression. The mean HADS-A and D were higher compared to our sample. Unfortunately no cutoff scores as discrete variables of HADS-A8 and HADS-D8 were analyzed. Overall, the women in the Turkish study were younger, but showed similarities in parity and gestation compared to our COVID-19 cohort.

The Turkish cohort also showed high rates of concerns about contracting COVID-19 themselves as well as their babies, which may influence their scores on the HADS.

Brooks et al. [8] showed mixed evidence for predictors that influenced the psychological impact of quarantine. One study showed that younger age (16–24 years), female gender, lower levels of education and having one child versus no children were associated with negative psychological impact [20]. This is in line with our finding of the influence of lower maternal age.

Another study however showed no association between, education, age, marital status, living with other adults and having children in relation to psychological outcomes [21].

Strengths and limitations

There are several strengths and limitations that need to be considered when interpreting these data. The strength of this study is the large sample size of the COVID-19 cohort and comparison with a control group of pregnant women before COVID-19. One of the limitations is that the women in the control group before COVID-19 were different than the women during COVID-19. The groups differed in maternal age, parity, gestation and history of being treated for psychological distress, but these factors were taken into account in the analyses. Other factors such as educational level, social-economic status and having a partner are known factors contributing or reducing anxiety and depression levels [22]. These factors might be different between the participants and controls, unfortunately those factors are not available for both groups.

Secondly, the length of the period used for inclusion might play a role. The participants were included over a four-week period whereas the control group over a period of about a year. In these different time

periods there might be other factors that influenced the differences between these two groups including seasons.

Longitudinal studies with multiple points of data collection are necessary to better understand the patterns of anxiety and depression during a pandemic. Outcomes may be different during the second wave of the pandemic.

Conclusion

In pregnant women in the Netherlands, there was no significant difference in high anxiety and depression (above clinical cutoff on HADS) between a sample of pregnant women before and during COVID-19. The symptoms of anxiety and depression were even lower during COVID-19 compared to before COVID-19. Women who relate their stress to COVID-19 experienced higher stress levels than women who did not relate their stress to the pandemic. This suggests that interventions aimed to reduce COVID-19 stress, may help to reduce overall stress levels in pregnant women during the pandemic. This in addition to the fact that it will always be important to check for possible mental health issues during pre-natal checkups.

Ethical approval

The ethical approval for this study was obtained from Medisch Ethische Toetsingscommissie VUmc on 18 May 2020 (Reference number: 2020.260).

Author contributions

BFPB, RA_{dL}, MGvP and CJMdG contributed to the design of the study. RA_{dL} build the online questionnaire. SJMZ, BFPB, RA_{dL}, MGvP and CJMdG reviewed the questionnaires that were included for this study. SJMZ, BFPB, RA_{dL}, MGvP and CJMdG helped raise awareness for the study through online content and flyers in the hospitals and midwifery practices. YMG_{AH} contributed with the data from the control group and analyses. SJMZ, SVM and YMG_{AH} analyzed and interpreted the data. SVM, BFPB, YMG_{AH} and CJMdG provided background knowledge to the data analysis and interpretation. SJMZ drafted the manuscript. All authors reviewed the manuscript and have seen and approved the final version.

Author agreement

We declare that this manuscript is original, has not been published before and is not currently being considered for publication elsewhere. We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved

by all of us. We understand that the corresponding author is the sole contact for the editorial process. They are responsible for communicating with the other authors about progress, submissions of revisions and final approval of proofs.

Disclosure statement

The authors have no conflicts of interest to declare.

References

- [1] Torales J, O'Higgins M, Castaldelli-Maia JM, et al. The outbreak of COVID-19 coronavirus and its impact on global mental health. *Int J Soc Psychiatry*. 2020;66(4): 317–320.
- [2] Fitzpatrick KM, Harris C, Drawve G. Fear of COVID-19 and the mental health consequences in America. *Psychol Trauma*. 2020;12(S1):S17–S21.
- [3] Liu CH, Erdei C, Mittal L. Risk factors for depression, anxiety, and PTSD symptoms in perinatal women during the COVID-19 Pandemic. *Psychiatry Res*. 2021;295: 113552.
- [4] Corbett GA, Milne SJ, Hehir MP, et al. Health anxiety and behavioural changes of pregnant women during the COVID-19 pandemic. *Eur J Obstet Gynecol Reprod Biol*. 2020;249:96–97.
- [5] Verweij EJ, M'Hamdi HI, Steegers EAP, et al. Collateral damage of the covid-19 pandemic: a Dutch perinatal perspective. *BMJ*. 2020;369:m2326.
- [6] Mappa I, Distefano FA, Rizzo G. Effects of coronavirus 19 pandemic on maternal anxiety during pregnancy: a prospective observational study. *J Perinat Med*. 2020; 48(6):545–550.
- [7] Ding W, Lu J, Zhou Y, et al. Knowledge, attitudes, practices, and influencing factors of anxiety among pregnant women in Wuhan during the outbreak of COVID-19: a cross-sectional study. *BMC Pregnancy Childbirth*. 2021;21(1):80.
- [8] Brooks SK, Webster RK, Smith LE, et al. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *Lancet*. 2020; 395(10227):912–920.
- [9] Luo X, Estill J, Wang Q, et al. The psychological impact of quarantine on coronavirus disease 2019 (COVID-19). *Psychiatry Res*. 2020;291:113193.
- [10] Sun F, Zhu J, Tao H, et al. A systematic review involving 11,187 participants evaluating the impact of COVID-19 on anxiety and depression in pregnant women. *J Psychosom Obstet Gynaecol*. 2020:1–9. DOI: [10.1080/0167482X.2020.1857360](https://doi.org/10.1080/0167482X.2020.1857360)
- [11] Lebel C, MacKinnon A, Bagshawe M, et al. Elevated depression and anxiety symptoms among pregnant individuals during the COVID-19 pandemic. *J Affect Disord*. 2020;277:5–13.
- [12] Wu Y, Zhang C, Liu H, et al. Perinatal depressive and anxiety symptoms of pregnant women along with COVID-19 outbreak in China. *Am J Obstet Gynecol*. 2020;223:240.e1–9.
- [13] Akgor U, Fadiloglu E, Soyak B, et al. Anxiety, depression and concerns of pregnant women during the

- COVID-19 pandemic. *Arch Gynecol Obstet.* 2021;1–6. DOI:10.1007/s00404-020-05944-1
- [14] Pearlstein T. Depression during Pregnancy. *Best Pract Res Clin Obstet Gynaecol.* 2015;29(5):754–764.
- [15] RIVM. Rijksinstituut voor Volksgezondheid en Milieu 2020. Available from: <https://www.rivm.nl/coronavirus-covid-19/grafieken>.
- [16] Zigmond AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatr Scand.* 1983;67(6):361–370.
- [17] Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav.* 1983;24(4):385–396.
- [18] Howell DC. *Statistical methods for psychology.* 8th ed. Boston (MA): Cengage Learning; 2012.
- [19] Ammon Avalos L, Galindo C, Li DK. A systematic review to calculate background miscarriage rates using life table analysis. *Birth Defects Res A Clin Mol Teratol.* 2012;94(6):417–423.
- [20] Taylor MR, Agho KE, Stevens GJ, et al. Factors influencing psychological distress during a disease epidemic: data from Australia’s first outbreak of equine influenza. *BMC Public Health.* 2008;8(1):347.
- [21] Hawryluck L, Gold WL, Robinson S, et al. SARS control and psychological effects of quarantine, Toronto, Canada. *Emerg Infect Dis.* 2004;10(7):1206–1212.
- [22] van de Loo KFE, Vlenterie R, Nikkels SJ, et al. Depression and anxiety during pregnancy: the influence of maternal characteristics. *Birth.* 2018;45(4):478–489.