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Gabriele Saccone, MD, Alessia Florio, MD, Federica Aiello, MD, Roberta Venturella, MD, Maria Chiara De Angelis, MD, Mariavittoria Locci, MD, Giuseppe Bifulco, MD, Fulvio Zullo, MD, Attilio Di Spiezio Sardo, MD

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Gabriele Saccone MD,[1] Alessia Florio MD,[1] Federica Aiello MD,[1] Roberta Venturella MD,[2] Maria Chiara De Angelis MD,[1] Mariavittoria Locci MD,[1] Giuseppe Bifulco MD,[1] Fulvio Zullo MD,[1,2] Attilio Di Spiezio Sardo MD[5]

[1]Department of Neuroscience, Reproductive Sciences and Dentistry, School of Medicine, University of Naples Federico II, Naples, Italy

[2]Department of Obstetrics and Gynaecology, School of Medicine, Magna Graecia University of Catanzaro, Catanzaro, Italy.

[3]Department of Maternal and Child Health and Urological Sciences, Sapienza University of Rome, Italy

[4]Department of Child and Adolescent Neuropsychiatry, Local Health Unit of Avezzano-Sulmona-L'Aquila, Sulmona, Italy

[5]Department of Public Health, University of Naples Federico II, Naples, Italy

Correspondence: Gabriele Saccone, Department of Neuroscience, Reproductive Sciences and Dentistry, School of Medicine, University of Naples Federico II, Naples, Italy

E-mail: gabriele.saccone.1990@gmail.com

Expanded Research Letter

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INTRODUCTION

The COVID-19 outbreak poses significant risk to public health, including mental health. A survey conducted in China showed that 53.8% of the respondents rated the psychological impact of the outbreak as moderate or severe, and 28.8% reported moderate to severe anxiety symptoms and stress levels.[1] During pregnancy, women may experience stress and anxiety associated with potential adverse obstetrical outcomes such as fetal death or fetal abnormalities. Stress and anxiety level may also increase during infectious disease outbreaks. Currently, there is no known information on the psychological impact, the effect on individual's social and/or psychological aspects, and mental health of pregnant women during the COVID-19 epidemic.

The aim of this study was to survey pregnant women to evaluate psychological impact, and anxiety during the COVID-19 outbreak.

METHODS

Study design

This was a cross-sectional survey study aimed to assess the psychological response of pregnant women during the epidemic of COVID-19. The study was conducted at University of Naples Federico II (Napoli, Italy), from March 15, 2020 to April 1, 2020. Women with singleton pregnancies were eligible to participate in the study regardless of the gestational age.

After a written informed consent was obtained from the eligible participants, women were asked by their counselor to fill out two questionnaires. A combination of validated measures in the questionnaires were used to assess the psychological impact, and anxiety.

Psychological impact questionnaire

The psychological impact of COVID-19 was measured using an Italian version of the Impact of Event Scale-Revised (IES-R). The IES-R is a 22-item self-administered questionnaire composed of three subscales aimed to measure the mean avoidance, intrusion, and hyperarousal. Each item can be scored from 0 to 4. Total score therefore can be ranged from 0 to 88, with higher scores mean higher psychological impact. The total IES-R score was divided into 0-23 (normal), 24-32 (mild psychological impact), 33-36 (moderate psychological impact), and ≥37 (severe psychological impact).[2]

Anxiety questionnaire

Anxiety of COVID-19 was measured by an Italian version of the six-item short form of the state scale of the Spielberger State-Trait Anxiety Inventory (STAI), as described by Marteau et al.[3] Women can be scored on a scale of 20-80, where higher scores mean higher levels of anxiety. A STAI score of 34-36 was considered normal anxiety.

Women were also asked to fill out the visual analogue scale (VAS) for anxiety.[4] VAS for anxiety ranged from 0 (not at all anxious) to 100 (extremely anxious) and referred to the following question: *How anxious are you regarding the coronavirus epidemic and the possibility of vertical transmission to your offspring?*

In order to evaluate the anxiety of pregnant women during the COVID-19 outbreak we also assessed:

- Rate of cell-free DNA compared to combined screening as first-trimester screening test (only in women who are enrolled in the first trimester of pregnancy)
- Mode of delivery and rate of cesarean delivery on maternal request (only in women who delivered during the study period)

Statistical analysis

Univariate comparisons of dichotomous data were performed with the use of the chi-square with continuity correction. Comparisons between groups to test group means with standard deviation were performed with the use of the T-test by assuming equal within-group variances or with the use of the One-way ANOVA. A 2-sided P value less than .05 was considered significant. Questionnaires scores were also analyzed according to the gestational age at patient's enrollment.

RESULTS

During the study period, 100 women were enrolled for the study. 17 were in the first, 35 in the second, and 48 in the third trimester of pregnancies. None of the enrolled women had history of postpartum depression in a prior pregnancy or of psychiatric disorders.

Overall, the COVID-19 outbreak had a moderate psychological impact on pregnant women with a mean IES-R score of 36.9±10.1. More than half of the respondents (53/100, 53%) rated the psychological impact as severe. Mean score at STAI questionnaire was 45.2±14.6, with an overall incidence of STAI >36 of 68% (68/100). Mean score at VAS for anxiety for COVID-19 vertical transmission was 43.0±26.9, with an overall incidence of score >50 of 46% (46/100) (Table 1).

Out of the 17 women who were in the first trimester of pregnancy during the COVID-19 outbreak, the 52.9% (9/17) opted for cell-free DNA as first-trimester risk assessment, while 41.7% (8/17) underwent combined screening with nuchal translucency.

Out of the 48 women enrolled in the third trimester of pregnancy, 18 delivered during the study period. Of them, 10 women underwent vaginal delivery (55.6%), and 8 women (44.4%) underwent cesarean delivery. Out of the 8 cesarean deliveries, 1 was planned breech delivery, 4 were emergency cesarean deliveries performed during labor, and 3 were planned cesarean deliveries on maternal request.

Psychological impact of the COVID-19 outbreak was much severe in women in the first trimester of pregnancy. Women who were in the first trimester of pregnancy reported significantly higher mean STAI score, higher rate of STAI score >36, higher mean score at VAS for anxiety for COVID-19 vertical transmission, and higher rate of VAS score $\geq$50 (Table 2).

DISCUSSION

The aim of this cross-sectional survey study was to evaluate psychological impact and anxiety in pregnant women during the COVID-19 outbreak in Italy using validated questionnaires.

The study showed that the COVID-19 outbreak had a moderate-to-severe phycological impact on pregnant women. More than two third of the women also reported anxiety higher than the normal. Almost half of the women (46%) reported high anxiety regarding the vertical transmission of the disease, assessed as VAS for anxiety scored $\geq$50. Sensitivity analyses according to gestational age, showed that women in the first trimester of pregnancy during the

COVID-19 epidemic, had higher anxiety and much severe phycological impact compared to those in the second or third trimester of pregnancy.

We also found that 52.9% of the women who were in the first trimester during the COVID-19 outbreak opted for the cell-free DNA as first-trimester risk assessment compared to the combined screening. This quite high rate of non-invasive prenatal testing, may be explained by the fact that first-trimester risk assessment for trisomy 21 with cell-free DNA is associated with better maternal reassurance and less anxiety compared to the standard first-trimester combined screening based on nuchal trasclucency. Out of the 18 women who delivered during the study period, we reported a 16.7% rate of cesarean delivery on maternal request. This rate is significantly higher compared to the 5-10% rate reported in the literature.[5] Notably, anxiety for fetal injury or fetal death, and emotional aspects, are two of main reasons for planned cesarean delivery on maternal request.[6] However, assessment of the rate of cell-free DNA and of mode of delivery was limited to a very small subgroups according to gestational age at the time of study period, and therefore the study was not powered for these two analyses.

Findings from the study were limited by the single center study design, and the small sample size.

COVID-19 is spreading rapidly through Europe and North America. Governments have imposed quarantines and travel bans on an unprecedented scale, with lock down of several cities. So far, the COVID-19 has caused thousands of deaths around the globe. Fear and phycological impact of the disease may be as harmful as the infection, with also suicidal cases reported.

Pregnancy is a well-known period of profound change. Adequate mental and physical health is a protective factor for mood disorders, and for some women, pregnancy may increase vulnerability to psychiatric disease like depression. Antenatal depression affects about 10% of women in the developed countries, and the number of pregnant women prescribed antidepressants has increased over the last decade[7] Isolation, social distancing, and extreme changes in daily life may increase the risk of depression among vulnerable population such as pregnant women. Therefore, it is of paramount importance to assess the psychological impact of COVID-19 outbreak.

Conclusion

In summary, among pregnant women, more than half of the respondents rated the psychological impact of COVID-19 outbreak as severe, and about two third reported anxiety higher than the normal. Almost half of the women reported high anxiety regarding the vertical transmission of the disease. Psychological impact and anxiety of the COVID-19 epidemic seems to be more severe in women who are in the first trimester of pregnancy during the outbreak. Our findings can be used to formulate psychological interventions to improve mental health and psychological resilience during the COVID-19 epidemic.

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TABLES

Table 1. Questionnaires results in the overall cohort

	N = 100

Psychological impact	
Mean IES-R	36.9±10.1
IES-R ≥ 24	95 (95%)
IES-R ≥ 33	61 (61%)
IES-R ≥ 37	53 (53%)
Anxiety	
Mean STAI	45.2±14.6
STAI >36	68 (68%)
Mean VAS-A	43.0±26.9
VAS-A ≥ 50	46 (46%)
First-trimester screening test	
Women who opted for cell-free DNA	9/17 (52.9%)
Mode of delivery**	
Vaginal delivery	10/18 (55.6%)
Cesarean delivery	8/18 (44.4%)
Cesarean delivery on maternal request	3/18 (16.7%)

Data are presented as number (percentage) or as mean ± standard deviation
IES-R, Impact of Event Scale-Revised; STAI, Spielberger State-Trait Anxiety Inventory; VAS-A visual analogue scale for anxiety
**Only 17 women enrolled in the first trimester*
***Only 18 women who delivered in the study period*

Table 2. Questionnaires results according to gestational age at enrollment

	First-trimester N = 17	**Second trimester N = 35**	**Third trimester N = 48**	**p-value**

Psychological impact				
Mean IES-R	42.9±17.0	39.1±7.2	33.1±7.0	**<0.01**
IES-R ≥ 24	14 (82.4%)	33 (94.3%)	48 (100%)	0.06
IES-R ≥ 33	12 (70.6%)	29 (82.9%)	20 (41.7%)	**0.03**
IES-R ≥ 37	11 (64.7%)	26 (74.3%)	16 (33.3%)	**0.01**
Anxiety				
Mean STAI	58.7±16.8	44.0±12.5	41.4±12.5	**<0.01**
STAI >36	17 (100%)	22 (62.9%)	29 (60.4%)	**<0.01**
Mean VAS-A	65.9±25.2	45.9±25.6	32.8±23.0	**<0.01**
VAS-A ≥ 50	14 (82.4%)	20 (57.1%)	12 (25.0%)	**<0.01**

Data are presented as number (percentage) or as mean ± standard deviation
Boldface data, statistically significant
IES-R, Impact of Event Scale-Revised; STAI, Spielberger State-Trait Anxiety Inventory; VAS-A visual analogue scale for anxiety