Risk of postpartum depressive symptoms is influenced by psychological burden related to the COVID-19 pandemic and dependent from individual stress coping

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Research Article

Keywords: postpartum depression, COVID-19 pandemic, mental disorders, stress and coping inventory

Posted Date: September 9th, 2022

DOI: https://doi.org/10.21203/rs.3.rs-2025627/v1

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Abstract

Purpose

There are different studies worldwide, which have shown a higher risk of mental disorders due to the COVID-19 pandemic. One aim of this study was to characterize factors influencing the psychological burden related to the COVID-19 pandemic and the impact on postpartum depressive symptoms. Further, the role of individual stress and coping strategies was analyzed in this context.

Material and Methods

131 women, who were in obstetric care at the LMU Clinic Munich, between March and October 2020, were questioned by different self-report questionnaires, before birth, one month, two months and 6 months after birth. A designed questionnaire to evaluate the psychological burden related to the COVID-19 pandemic, a modified version of the Stress and coping inventory (SCI) and the Edinburgh Postnatal Depression Scale (EPDS) were utilized.

Results

We could show that the psychological burden related to the COVID-19 pandemic influenced the EPDS score one, two and 6 months after birth. In addition, the prenatal stress and individual coping strategies affected the EPDS and the burden related to the COVID-19 pandemic before and after birth significantly.

Conclusion

An association of the psychological burden related to the COVID-19 pandemic with the risk of developing postpartum depressive symptoms could be shown in this study. In this context, the separation of the partner and the family were recognized as important factors. Furthermore, the SCI was identified as effective screening instrument for mothers before delivery to possibly avoid the development of postpartum depression by early diagnosis and intervention.

Introduction

Different studies, which have been performed worldwide during the COVID-19 pandemic showed an increased risk for mental disorders [1]. In the general population of different countries, relatively high rates of anxiety, depression, post-traumatic stress disorders, and psychological distress were found during the COVID-19 pandemic [2–4]. Different risk factors have been identified e.g. female gender, age ≤ 40 years, presence of chronic or psychiatric illnesses, unemployment, student status, and frequent exposure to social media [3]. Specifically for the German population data indicate comparable effects of the COVID-19 situation and the accompanying restrictions on mental health, showing an increase in
depressive and anxiety symptoms [5]. For pregnant women, restrictions and consequences on the daily life, as well as the uncertainty about conditions at the hospitals during and after delivery, represented crucial risk factors for COVID-19 related psychological burden [7]. With the outbreak of the COVID-19 pandemic the inexperience and vagueness regarding negative consequences of a prepartum infection and possible effects on the unborn, seem likely to influence the psychological burden. Different studies which have investigated the occurrence of depressive symptoms and anxiety of delivery during the COVID-19 pandemic, revealed an increased incidence of postpartum depression [8, 9].

After delivery many mothers develop a psychological disorder. Around 25% of these women suffer from postpartum dysphoria in the first weeks after delivery, named baby blues [10]. In addition 10–15% develop a postpartum depression (PPD) requiring treatment [11, 12], while the incidence during the COVID-19 pandemic increased up to 30–40%[13]. A PPD is characterized by a depressive mental state with listlessness, exhaustion joylessness, loss of interest, concentration disorders, anxiety as well as feelings of guilt and suicidal thoughts [14]. PPD is frequently recognized and treated very late or even not at all. However, this mental illness causes severe problems, not only for the mother but also for the child [15] in terms of difficulties in cognitive functioning and social contact with parents as well as poor self-control [16]. Further, the mothers depression might affect the relationship to her baby [17]. Accordingly, screening of PPD and the development of distinct screening methods is of high interest and very important to avoid potential harm to mother and child. Mothers with a lack of social support suffered more often from PPD then mothers with a well sustained social life [18, 19]. Further a disturbed partnership influences the occurrence of PPD [20]. Various predictors, like a personal history of previous depressive episodes and anxiety before delivery as well as significant psychosocial stressors during childcare, like fatigue, and lack of sleep, are associated with PPD [21]. When considering stressors and their influence on the development of PPD the importance of individual stress management - named stress coping - must be emphasized. Inadequate coping due to e.g. missing social support leads to negative stressors [22]. Therefore, one important aspect which needs to be analyzed, is how individual coping is affecting the prevalence of postpartum depressive symptoms and PPD during the COVID-19 pandemic.

One aim of this study was to investigate the psychological burden related to the COVID-19 pandemic and the main contributing factors by a questionary survey - as well as, how the burden related to the COVID-19 pandemic influences the occurrence of postpartum depressive symptoms. Further we wanted to address the question how individual coping strategies and stress are contributing to the risk of developing postpartum depressive symptoms and whether it correlates with the psychological burden related the COVID-19 pandemic. Therefore, we tested the Stress and coping inventory (SCI) as a screening instrument to categorize study participants into different groups, to identify women having possibly higher risk for postpartum depressive symptoms and higher burden related to the COVID-19 pandemic. By addressing the individual stress level and coping strategies, there might appear possible approaches to decrease the risk of developing postpartum depressive symptoms and PPD. Findings about distinct
screening instruments might enable to avoid or reduce that risk through intensive individual support during and after birth.

**Methods**

**Study design**

We performed a prospective cohort study by following up a group of pregnant women, prepartum, peripartum and postpartum by a questionary survey (prenatal, one, two and 6 months postpartum). Therefore, a longitudinal analysis with different printed questionnaires was performed. Detailed information about the questionnaires is given in the following paragraphs.

The survey was performed by self-report questionnaires which were handed out to participants at the time points related to childbirth as presented in Fig. 1. The questionaries were all presented in the same order for all participants, to avoid a possible bias.

**Study population**

The study was conducted with 142 pregnant women, who were in obstetric care between the 23rd March 2020 and the 22nd October 2020 at the LMU Perinatal Center Grosshadern of the Department of Obstetrics and Gynecology. Due to exclusion criteria such as not having completed the sections needed for the analysis, invalid or missing values, 11 women were excluded from the study. Due to the sudden beginning of the COVID-19 pandemic 35 of the 142 participants of the cohort were retrospectively included into the study. All participants of the monocentric study fulfilled the subsequent criteria: a due date (spontaneous or caesarian section) within the next 48 hours, being 18 years or older and written consent and willingness to cooperate.

Demographic data are depicted in Table 1. Further clinical data like mode of delivery and whether there were complications during delivery were evaluated. All participants gave their written consent for participation and completed the questionnaires in printed form. The present study was approved by the local ethics committee of the Ludwig-Maximilian-University of Munich (reference number – Nr. 20–378).
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<tr>
<td>35–48</td>
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<tr>
<td>missing</td>
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<tr>
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<td></td>
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<tr>
<td>married</td>
<td>102 (77.8)</td>
<td></td>
</tr>
<tr>
<td>divorced</td>
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<tr>
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<tr>
<td>Middle maturity</td>
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<tr>
<td>Highschool diploma</td>
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<tr>
<td>pregnancy</td>
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<tr>
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<td>Complications¹</td>
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<tr>
<td>no</td>
<td>82 (62.6)</td>
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<tr>
<td>mode of delivery</td>
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<td>vaginal delivery</td>
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<td>caesarean section</td>
<td>43 (32.8)</td>
<td></td>
</tr>
<tr>
<td>missing</td>
<td>14 (10.7)</td>
<td></td>
</tr>
</tbody>
</table>

¹ suspect/path. CTG green amniotic fluid, umbilical cord entanglement, protracted birth, fever sub partu

**Questionnaires**

**Stress and coping inventory (SCI) (modified)**
The stress and coping inventory (SCI) is a German-language stress questionnaire with 54 items [23]. The first 21 items of the SCI are organized in three subscales consisting of seven items each: “stress caused by insecurity”, “stress caused by being overwhelmed” and “stress caused by loss”. Here, a seven-point Likert scale from “not burdened” to “very heavily burdened” is operated. Together, these three subscales assess the total stress level in the last three months. The following 13 items measuring physical stress symptoms, were not used as in pregnancy these values are biased by physical burdens due to pregnancy. The last 20 items were used to evaluate the coping strategies with a four-point Likert scale (“positive coping”, “active coping”, “coping by support”, “coping by believing in God or powers that be” and “coping by drinking alcohol and/or smoking”) being applied on these items. For the evaluation of SCI scales, the sum of all item points of each scale was formed following the instructions of the evaluation manual.

To organize the cohort into different profiles the evaluation manual was used. The median of the actual stress burden (stress due to uncertainty + stress due to overload + stress due to loss + overall stress) and of the adaptive stress coping (positive thinking + active coping with stress + social support + support in God faith) was used (medianstress = 29, mediancoping = 43). The groups are structured as followed: profil A - high stress level with poor coping (medianstress > 29, mediancoping < 43), profil B - high stress level with effective coping (medianstress > 29, mediancoping > 43), profil C - low stress level with poor coping (medianstress < 29, mediancoping < 43), profil D - low stress level with effective coping (medianstress < 29, mediancoping > 43).

Depressive symptoms (EPDS)

The Edinburgh Postnatal Depression Scale (EPDS) was developed in 1987 as a screening instrument for postnatal depression and translated and adapted to German [24–26]. The total score is the sum of all ten items with a four-point Likert scale (from 0 to 3). An EPDS value of 10 or higher has a middle (10–12) to high (> = 13) probability for depression [27]. Patients were asked to answer how they felt in the last 7 days.

Burden related to the COVID 19-pandemic

To evaluate the psychological burden related to the COVID-19 pandemic, questionnaires were created where the general psychological burden due to the COVID-19 pandemic (“How much did the COVID-19-pandemic burden you psychologically ...?”) was analyzed by a four-point Likert scale from “very low”, “low”, to “high” and “very high” before childbirth, in the first month after birth, in the second month after birth, between the 2nd and 6th month and in the 6th month after birth. Further following influencing factors were evaluated by the same Likert scale (“Which factors did lead to this psychological burden in what extend?”): “separation of the partner” “possible consequences of an infection of the child”, “possible consequences of an infection for you”, “missing support in baby care”, “separation of the family after birth”, “limitations of free time activities” and “missing contact to friends”.

Statistical analysis
Software SPSS Statistics 26 (IBM in New York, USA) was used to perform statistical analyses and table creation. Data are presented accordingly as mean (± standard deviation [SD]) or median (interquartile percentile) values. Distribution analysis was performed by the Shapiro-Wilk test. To examine whether the EPDS at different times of retrieval vary in demographic and birth-related categories the non-parametric Mann-Whitney-U (complications / birthmode) and Kruskal-Wallis Test (realationship status / leaving school qualification / pregnancy / abortions) was performed. To compare non-parametric distributed means in measurement repetitions, such as burden related to the COVID-19-Pandemic or the EPDS at different time points of retrieval, the non-parametric Friedman's two-factor ANOVA was used. We performed a Spearman-Rho-correlation to examine a connection between the EPDS and the psychological COVID-19-burden. Multiple regression was performed to predict the influence of the psychological burden due to COVID-19 on the EPDS. The non-parametric Chi-squared test was used to show statistical dependence between categorical variables (e.g. SCI-Groups and EPDS in categories low / medium / high risk for depression). Correlation analysis was Bonferroni-corrected. p-values ≤ 0.05 were rated as statistically significant.

We performed a sample size calculation before starting the survey. Assumption of minimum incidence of postpartum depressive symptoms was set to 3%, maximum incidence to 20%. Alpha-cut off was set to 0.05 with a power of 0.8. The statistical output indicated that a design with 54 samples per group (a total of 108) has a ~ 80% chance to detect a difference of 0.1

**Results**

**Impact of demographic factors and clinical characteristics on the EPDS**

58.8% of the participants were between 18 and 34 years old, 38.9% between 35 and 48 years. 77.8% were married (Table 1). Spearman-Rho-correlation showed no connection between the measurement-repeated EPDS and the age of the patients. Further school-leaving qualification was assessed, there the majority of the participants had high school diploma (69.4%). 54.2% were multiparas and the majority did not have prior abortions (82.4%). In 37.4% of the pregnancies, complications were documented, most of the deliveries were vaginal (56.5%). Nonparametric tests were performed to analyse the impact of demographic factors and clinical characteristics (relationship status, school-leaving qualification, pregnancy, prior abortions, complications, mode of delivery) on the EPDS by using the Mann-Whitney-U as well as the Kruskal-Willis-Test. The data show no significant difference of the EPDS in relation to demographic factors (age, relationship status, school-leaving qualification) prenatal and one month after birth. The maternal age did not correlate significantly with the EPDS (prenatal: r = 0.122, p = 0.249; one month postpartum: r = 0.070, p = 0.528; two months postpartum r = 0.027, p = 0.776; 6 months postpartum r = 0.136, p = 0.182). The central tendencies of the EPDS two and 6 months after birth vary significantly in patients who experienced complications during birth (two months postnatal: p = 0.015, 6 months postnatal: p = 0.012).

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EPDS and correlation with the burden related to the COVID-19 pandemic

The EPDS was evaluated in the study population prenatally, one and two months postpartum as well as 6 months after delivery. A significant difference was found between the different evaluated time points ($p = 0.021$; prenatal $= 7.52 \pm 4.683$ median $= 8$; one month postpartum $= 7.20 \pm 4.921$ median $6.5$; two months postpartum $= 6.84 \pm 5.654$ median $= 6$; 6 months postpartum $= 6.94 \pm 5.101$ median $= 6$) (Fig. 2A).

Further, the overall burden related to the COVID-19 pandemic at the different time points related to the childbirth was analyzed. A significant difference of the mean burden related to COVID-19 pandemic was found, even though there was no clear trend, except from a slight increase of the burden from 2 month postpartum to 6 months postpartum and an increase of the median over the time ($p < 0.001$; prenatal $= 2.32 \pm 0.938$ median $= 2$; one month postpartum $= 2.01 \pm 2.00$ median $2$; two month postpartum $= 1.97 \pm 0.870$ median $= 2$; 2–6 months postpartum $= 2.45 \pm 0.918$ median $= 2$; 6 months postpartum $= 2.589 \pm 0.8437$ median $= 3$) (Fig. 2B).

To reveal possible associations between the psychological burden related to the COVID-19 pandemic, a correlation analysis with the EPDS was performed. We found a strong positive correlation of the EPDS score prenatal and the overall psychological burden related to the COVID-19 pandemic 2–6 months postpartum ($r = 0.411$, $p = 0.00$) and 6 months postpartum ($r = 0.400$, $p = 0.01$). The EPDS one month postpartum correlated strongly positive with the burden one month ($r = 0.416$, $p < 0.001$), two months ($r = 0.459$, $p < 0.001$) 2–6 months ($r = 0.407$, $p = 0.001$) and 6 months postpartum ($r = 0.461$, $p < 0.001$). Two months postpartum a strong positive correlation of the EPDS and the burden related to the COVID-19 pandemic could be found 2–6 ($r = 0.411$, $p < 0.001$) and 6 months ($r = 0.419$, $p < 0.001$) postpartum. 6 months after delivery the EPDS correlated merely positive with the burden due to the COVID-19 pandemic two ($r = 0.397$, $p < 0.001$) and 6 months ($r = 0.330$, $p < 0.001$) postpartum (Table 2).
Correlations between the psychological burden related to the COVID-19 pandemic and the EPDS scoring: the upper value is the correlation coefficient $r$, the second value is the p-value. * significant ($p < 0.05$), ** highly significant ($p < 0.01$).

<table>
<thead>
<tr>
<th></th>
<th>prenatal</th>
<th>1 month postpartum</th>
<th>2 months postpartum</th>
<th>2 to 6 months postpartum</th>
<th>6 months postpartum</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPDS score prenatal</td>
<td>0.335**</td>
<td>0.327**</td>
<td>0.306**</td>
<td>0.411**</td>
<td>0.400**</td>
</tr>
<tr>
<td></td>
<td>0.002</td>
<td>0.003</td>
<td>0.005</td>
<td>&lt; 0.001</td>
<td>0.001</td>
</tr>
<tr>
<td>EPDS score 1 month postpartum</td>
<td>0.265*</td>
<td>0.416**</td>
<td>0.459**</td>
<td>0.407**</td>
<td>0.461**</td>
</tr>
<tr>
<td></td>
<td>0.021</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>0.001</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>EPDS score 2 months postpartum</td>
<td>0.251**</td>
<td>0.369**</td>
<td>0.373**</td>
<td>0.411**</td>
<td>0.419**</td>
</tr>
<tr>
<td></td>
<td>0.007</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>EPDS score 6 months postpartum</td>
<td>0.168</td>
<td>0.182</td>
<td>0.277**</td>
<td>0.397**</td>
<td>0.330**</td>
</tr>
<tr>
<td></td>
<td>0.106</td>
<td>0.080</td>
<td>0.007</td>
<td>&lt; 0.001</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Furthermore, we performed a multiple regression analysis, showing the influence of the burden related to the COVID-19 pandemic on the EPDS Score at all survey time points (prenatal ($R^2 = 0.169$, $p = 0.013$), one month ($R^2 = 0.239$, $p = 0.002$), two months ($R^2 = 0.180$, $p = 0.001$) and 6 months ($R^2 = 0.121$, $p = 0.025$) postpartum) (Fig. 3). Further the influence of different factors on the burden related to the COVID-19 pandemic were analyzed by multiple regression. There, we found a significant influence of the separation from the partner before delivery on the EPDS prepartum ($p = 0.022$). In addition, the prenatal fear of being separated from relatives influenced on the EPDS two months postpartum ($p = 0.014$) significantly.

**The SCI as possible screening instrument for postpartum depressive symptoms**

To evaluate whether the SCI could be used as instrument to assess the risk for postpartum depressive symptoms prenatally, we analyzed the EPDS in the different SCI profiles. The Boxplot in Fig. 4 shows the EPDS-Scores in the 4 different SCI-Groups at the different survey times points.

First of all, the mean EPDS scores in the different SCI profiles were compared with each other. This revealed significant differences of the EPDS scores over the four different SCI profiles at all time points (prepartum: $p = 0.001$, one month postpartum: $p = 0.014$, two months postpartum: $p = 0.001$, 6 months postpartum: $p = 0.025$). Further analysis by pairwise comparisons showed that these differences occurred especially between the SCI profile A and D (prepartum: $p = 0.001$, one month postpartum: $p = 0.050$), A and C (prepartum: $p = 0.002$, one month postpartum: $p = 0.025$, two months postpartum: $p = 0.003$) and B and C (after two months postpartum: $p = 0.029$).
Performing the Chi-square test at the different survey time points, showed a statistical significant dependence of the EPDS categories (chance for postpartum depression low / medium / high) from the SCI profiles prepartum (Chi\(^2\) = 21.595, p = 0.001), one (Chi\(^2\) = 16.337, p < 0.05) and two (Chi\(^2\) = 15.451, p < 0.05) months postpartum.

By performing linear regression analysis, a significant influence of the SCI-Score on the EPDS prepartum (R\(^2\) = 0.154, p < 0.001), one (R\(^2\) = 0.131, p = 0.001), two (R\(^2\) = 0.137, p < 0.001) and 6 (R\(^2\) = 0.062, p = 0.017) months postpartum could be revealed. Analyzing the influence of the mean total stress - assessed by the SCI - on the EPDS showed a significant influence on the EPDS prenatal (p < 0.001), one month (p < 0.001), two months (p < 0.001) and 6 months (p = 0.006) postpartum.

**Influence of the SCI score on the burden related to the COVID-19 pandemic**

We further examined the burden related to the COVID-19 pandemic in the different SCI groups (Fig. 5). Interestingly we found a significant influence of the SCI-Scoring on the overall burden related to the COVID-19 pandemic during pregnancy (R\(^2\) = 0.126, p < 0.001), one (R\(^2\) = 0.076, p < 0.05), two (R\(^2\) = 0.134, p < 0.001) and 6 (R\(^2\) = 0.065, p < 0.05) months postpartum. Further, no significant differences of the overall psychologic burden related to the COVID-19 pandemic between the different SCI profiles could be found except from the overall psychological burden related to the pandemic between 2 and 6 months postpartum (p = 0.022).

**Discussion**

At the beginning of the COVID-19 pandemic, the missing knowledge about the virus and its dangers in pregnancy, resulted in a great uncertainty and anxiety, especially for pregnant women [28]. In this study we could demonstrate that the psychological burden related to the COVID-19 pandemic was clearly associated with the risk of postpartum depressive symptoms. While, the mode of delivery and demographic factors did not influence the risk of postpartum depressive symptoms significantly. Further, we identified the SCI as an effective instrument, to screen mothers before delivery and subdivide them into groups - with an unfavourable constellation of stress and coping strategies, having a higher risk to suffer from postpartum depressive symptoms compared to those who had favourable constellation of stress and coping strategies, with a lower risk for PPD symptoms.

PPD is a severe and very frequently appearing disorder which occurs within weeks and months after delivery. During the COVID-19 pandemic several studies indicate an increasing incidence of PPD, which was highly related to stress and anxiety during pregnancy, delivery and postpartum [13, 33, 34]. In our study cohort which was analyzed over 6 months, the mean EPDS differed significantly over the time points of retrieval. Exceptional high EPDS values prepartum might indicate the particularity of the situation due to the COVID-19 pandemic. On the other hand, the delivery mode did not show a significant correlation with the EPDS in our study, in contrast to other data which indicate a higher incidence of PPD
in mothers who underwent caesarian sections [36–38]. Further, demographic factors could not be revealed as relevant risk factors in our study, conversely to the path analysis model, which showed a significant influence of the maternal age, occupation, living conditions and quality of life on PPD [39]. However, complications during birth seemed to play a significant role.

The trends of the changing psychological burden related to the COVID-19 pandemic were similar to the EPDS assessed over the time. Participants with high psychological burden related to the COVID-19 had high EPDS values. An association could be confirmed by the means of correlation analysis between the overall mean burden related to the COVID-19 pandemic and the EPDS, where especially the psychological burden one month and two months postpartum seemed to have a relevant influence on the EPDS one, two and 6 months postpartum. Multiple regression analysis showed that the burden related to the COVID-19 pandemic influenced the EPDS significantly. Looking at these data from the other side, point to a possible effect of the EPDS on the burden related to the COVID-19 pandemic. The main factors influencing the psychological burden related to the COVID-19 pandemic changed over time, as prenatal and in the first days after delivery the separation from the partner and the family, as well as possible consequences for the child birth were superficial. One month and two months postpartum the separation from the family and from friends were important factors. Later, the risk of an infection with SARS-CoV-2 of the baby was the main concern (Supp. Table).

Anxiety, stress and ineffective coping are main factors effecting the risk of postpartum depressive symptoms. There are several studies which demonstrated the influence of coping strategies on the development of PPD, independently from the COVID-19 pandemic. There, active coping (emotional support, positive reframing and acceptance) was shown to predict depressive symptoms [35]. Our findings confirmed that high stress levels and unfavourable coping strategies increased the risk of postpartum depressive symptoms PPD. Interestingly the stress level seemed to play a very important role in our cohort. The occurrence and the effects of PPD is underestimated as it remains often undiscovered and untreated, and because of the high dark number of sufferers is much larger [40]. Therefore, the introduction of an effective screening instrument to identify patients with a high risk for PPD symptoms is highly relevant to prevent postpartum depressive symptoms and PPD. This necessity comes more to the fore, especially from the point of view of the future chronic mental burden related to the COVID-19 pandemic. Since peripartum stress is representing a very important factor and coping is crucial for the development of PPD [43], the SCI was tested as possible screening element for PPD predisposition in our study. We classified our cohort into 4 different profile groups with high stress level and poor coping (profile A), high stress level and effective coping (profile B), low stress level and poor coping (profile C) and low stress level with effective coping (profile D). Our data revealed a clear correlation of the different profiles with the occurrences of PPD symptoms. Further, the burden related to the COVID-19 pandemic and the EPDS were dependent from the SCI score. This points to a promising opportunity to use the SCI as screening instrument to identify mothers with high vulnerability to stress, psychological burden and postpartum depressive symptoms.
At this point some limitations of this study need be considered when interpreting our results: the small size of the study group and the missing references of the designed questionnaires to evaluate the psychological burden related to the COVID-19 pandemic. The subjective character of this assessment needs to be considered when interpreting our results. Further, the study is based on a survey with printed questionnaires, rather than personal interviews.

Our data underline that the psychological burden related to the COVID-19 pandemic is clearly associated with the risk of postpartum depressive symptoms. Evaluation of stress and coping profiles revealed vulnerability for the risk of postpartum depressive symptoms and high burden related to the COVID-19 pandemic in our cohort. Therefore, individual support to improve coping strategies might have a positive effect on the mean mental strain and the COVID-19 pandemic related burden. Mental health screening before and after delivery would be necessary to address psychological burden by targeting intervention strategies for the prevention of long-term impacts on maternal well-being and child development.

Declarations

Funding:
Sa. M. was funded by DFG-funded Clinician Scientist Program PRIME, grant number 413635475

Acknowledgments:
We thank Franziska Pfaller and Katja Mack for their competent input to design this study.

Conflicts of interest:
Sv.M: Research support, advisory board, honoraria and travel expenses from AbbVie, AstraZeneca, Clovis, Eisai, GlaxoSmithKline, Medac, MSD, Novartis, Olympus, PharmaMar, Roche, Sensor Kinesis, Teva, Tesaro, TK: holds stock of Roche, Biontech, Valneva, relative employed at Roche, AB: Research support, advisory board, honoraria from, AstraZeneca, Roche, Tesaro

The authors declare that no funds, grants or other support were received during the preparation of this manuscript. The authors have no relevant financial or non-financial interests to disclose.

Author Contributions

Ethics approval and consent to participate

This study was performed in line with the principles of the Declaration of Helsinki and was approved by the local ethics committee of the Ludwig-Maximilian-University of Munich (reference number – Nr. 20-378).

References


**Figures**
Figure 1

Schematic representation of the survey time points and the used questionnaires: Stress-Coping-Inventory (SCI), Edinburgh-Postnatal-Depression-Scale (EPDS)

Figure 2

EPDS scores and psychological burden related to the COVID-19 pandemic at time points of inquiry, (A) Boxplots of medians ± SD at the different time points of evaluation, (N=131), (B) means of the psychological burden related to the COVID-19 pandemic.
Figure 3

Correlation between the burden related to the COVID-19 pandemic and the EPDS: (A) Boxplots EPDS one month postpartum and the burden in the first weeks after births, mean ± SD; (B) Visualization of the correlation EPDS one month postpartum and the burden in the first weeks after birth, correlation was calculated using the Spearman-Rho-Correlation-Test; (C) Boxplot of the correlation between EPDS two months postpartum and the burden in the two months after birth, mean ± SD; (D) Visualization of the correlation EPDS two months postpartum and the burden in the two months after birth. Correlation was calculated using the Spearman-Rho-Correlation-Test. The regression line refers to the total collective.
Figure 4

EPDS rates evaluated in the different SCI profiles, Boxplot of the EPDS scores mean ± SD in the different SCI profiles (A, B, C, D)
**Figure 5**

The mean burden due to the COVID-19 pandemic in the different SCI profile

**Supplementary Files**

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