INTRODUCTION

Distress is defined as a pathologic stress condition that is related to daily life. Maternal psychological distress during pregnancy is defined as a mental or emotional disturbance that happens to pregnant women daily. Maternal psychologic distress during pregnancy can be acute or chronic. The prevalence of psychosocial stress and anxiety during pregnancy has been a concern worldwide. Maternal psychosocial stress concept as a teratogen. Maternal and fetal health is one of WHO's 2013-2020 programs, in which it is estimated that around 10% of pregnant women experience mental problems, especially depression, and the percentage increases to 15.6% in developing countries.1

Even though pregnancy is supposed to be a time of happiness and joy, 10-20% of pregnant women experience psychological distress. In addition, in Sweden it was also found that 20-25% of pregnant women had physical and mental health problems.1

Based on the results of the meta-analysis, it was found that distress in pregnant women can increase the incidence of preeclampsia 1.88 times. The research that has been done pays more attention to the conditions of depression and anxiety that occur in pregnant women.3

Stress directly alters the hypothalamic-pituitary-adrenal (HPA) axis, which can lead to increased cortisol levels and altered cellular immunity at the maternal-fetal interface. This was proven in the study of Vianna et al., who found increased cortisol levels in the placenta of depressed pregnant women.4 Maternal distress is also associated with pregnancy complications such as preeclampsia, premature delivery and adverse fetal outcomes.4,5

Many instruments can detect prenatal stress, but none has shown consistent results between studies. Instruments that can be used include the Perceived Stress Scale (PSS), State-Trait Anxiety Inventory (STAI), Edinburgh Postnatal Depression Scale (EPDS), Depression anxiety and stress scale (DASS), and Hamilton Anxiety Rating Scale (HAM), but several studies stated that the use of PSS, STAI and DASS is more sensitive for assessing stress in the population of pregnant women.1,2,6-10

Preeclampsia is a specific hypertension syndrome in pregnancy associated with vasospasm, increased peripheral resistance and decreased organ perfusion. This syndrome occurs during pregnancy, where clinical symptoms characterized by hypertension and proteinuria occur from 20 weeks of gestation to 6 weeks after delivery.11 It is known as early-onset preeclampsia (EOPE) if the symptoms appear before 34 weeks of gestation, while it is defined as late-onset preeclampsia (LOPE) if the symptoms occur after 34 weeks of gestation. Preeclampsia occurs in around 3-9% of all pregnancies, which varies depending on the country. Preeclampsia is a complication of pregnancy that most often causes maternal morbidity and mortality. Around 70,000 deaths occur worldwide.11,13

Preeclampsia is also known as the disease of theory because many pathogeneses of preeclampsia have been developed, such as abnormal trophoblastic
invasion, maternal placental and fetal immunological maladaptation, maternal maladaptation to cardiovascular changes, genetic or epigenetic changes in the placenta and psychoneuroimmunological theory. The psychoneuroimmunological theory shows that there is a role of exposure to stress during pregnancy, the process of adaptation to stress, and the impact after exposure to stress with the susceptibility to preeclampsia. This study aims to assess the correlation between maternal distress and the incidence of preeclampsia using PSS and DASS-21 questionnaires.

METHODS

Study design
This research conducted a cross-sectional study within 2 populations at two secondary hospitals in Surabaya, East Java, Indonesia. The population was divided into preeclampsia and non-preeclampsia group.

Sample
The sample of this study was divided into two groups: preeclampsia and non-preeclampsia. The inclusion criteria for the preeclampsia group: 1) pregnant women with severe preeclampsia that terminated as soon as possible, 2) the first antenatal care history is one time before 34 weeks of gestation, 3) singleton pregnancy. The inclusion criteria for the non-preeclampsia group: 1) pregnant women without preeclampsia signs and symptoms, 2) the first antenatal care history is one time before 34 weeks of gestation, 3) singleton pregnancy. The exclusion criteria for both groups: 1) past medical history of hypertension, autoimmune disease, kidney disease and heart disease, 2) premature rupture of membrane, 3) sign of infection (leucocyte level >16000/µL), 4) taking medicine that increases cortisol level such as steroid. This research conducted the sample size using a purposive sampling technique. This research got 20 samples for the preeclampsia group and 17 samples for the non-preeclampsia group.

Data collection
Thirty-seven participants in this study completed two self–reported questionnaires, including the Perceived Stress Scale (PSS) and Depression, Anxiety, Stress Scale (DASS-21), and the data was processed to be edited, coding, and tabulating.

Data analysis
The participant characteristics were analyzed using univariate analysis, shown as a frequency distribution. All the data between the preeclampsia and non-preeclampsia groups was compared using an independent t-test for normally distributed data and the Wilcoxon-Mann Whitney test for not normally distributed data. Before doing the comparison test, this research did a normality test using the Shapiro-Wilk test and a homogeneity test using Levene’s test. This research also conducts correlation analysis using regression analysis to analyze the correlation between distress and the incidence of preeclampsia.

RESULTS

Subject Characteristics
From Table 1, the mean gestational age when the termination of labor done from the preeclampsia group is 36-37 weeks (36.75 ± 2.15), with the mean maternal age is 34.15 years old, the mean body mass index is 32.18, the mean of parity is 1.75. Education is mostly completed senior high school (55%), unworking status is mostly about 90% of all participants and also without preeclampsia history before this pregnancy about 75% from all participant. The non-preeclampsia group has a mean gestational age when the termination of labor is 38-39 weeks (38.91 ± 1.18),

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Description/Category</th>
<th>Preeclampsia n=20</th>
<th>Non-Preeclampsia n=17</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal age (years old)</td>
<td>Mean ± SD (Min-Max)</td>
<td>34.15 ± 6.42 (21-42)</td>
<td>29.59 ± 6.71 (19-43)</td>
<td>0.042</td>
</tr>
<tr>
<td></td>
<td>&lt;20</td>
<td>0 (0.0%)</td>
<td>1 (5.9%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20-&lt;25</td>
<td>2 (10.0%)</td>
<td>4 (23.5%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25-&lt;30</td>
<td>2 (10.0%)</td>
<td>2 (11.8%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>30-&lt;35</td>
<td>6 (30.0%)</td>
<td>7 (41.2%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>≥35</td>
<td>10 (50.0%)</td>
<td>3 (17.6%)</td>
<td></td>
</tr>
<tr>
<td>Gestational age (week)</td>
<td>Mean ± SD (Min-Max)</td>
<td>36.25 ± 2.15 (33-40)</td>
<td>38.41 ± 1.18 (37-41)</td>
<td>0.001</td>
</tr>
<tr>
<td>Parity</td>
<td>Mean ± SD (Min-Maks)</td>
<td>1.75 ± 1.41 (0-6)</td>
<td>1.12 ± 0.99 (0-3)</td>
<td>0.130</td>
</tr>
<tr>
<td>Body mass index</td>
<td>Mean ± SD (Min-Max)</td>
<td>32.18 ± 4.27 (26.43-41.62)</td>
<td>28.29 ± 3.47 (22.06-33.71)</td>
<td>0.005</td>
</tr>
<tr>
<td>Education</td>
<td>Completed Elementary school</td>
<td>5 (25.0%)</td>
<td>2 (11.8%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Completed Junior high school</td>
<td>2 (10.0%)</td>
<td>0 (0.0%)</td>
<td>0.412</td>
</tr>
<tr>
<td></td>
<td>Completed Senior high school</td>
<td>11 (55.0%)</td>
<td>12 (70.6%)</td>
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</tr>
<tr>
<td></td>
<td>Completed college</td>
<td>2 (10.0%)</td>
<td>3 (17.6%)</td>
<td></td>
</tr>
<tr>
<td>Working status</td>
<td>Unemployed</td>
<td>18 (90.0%)</td>
<td>13 (76.5%)</td>
<td>0.383</td>
</tr>
<tr>
<td></td>
<td>Employed</td>
<td>2 (10.0%)</td>
<td>4 (23.5%)</td>
<td></td>
</tr>
<tr>
<td>Preeclampsia history</td>
<td>None</td>
<td>15 (75.0%)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>5 (25&gt;0%)</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>
Table 2. Maternal distress analysis

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Preeclampsia</th>
<th>Non-preeclampsia</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression Median (range)</td>
<td>5 (0-14)</td>
<td>2 (0-12)</td>
<td>0.006b</td>
</tr>
<tr>
<td>Anxiety Median (range)</td>
<td>8 (0-22)</td>
<td>4 (0-16)</td>
<td>0.082b</td>
</tr>
<tr>
<td>Stress Mean ± SD range</td>
<td>20.2 ± 7.40</td>
<td>7.41 ± 5.86</td>
<td>0.000a</td>
</tr>
<tr>
<td>PSS Median (range)</td>
<td>25.5 (11-28)</td>
<td>14 (5-24)</td>
<td>0.000b</td>
</tr>
</tbody>
</table>

Table 3. Correlation between distress and preeclampsia risk

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>0.126</td>
<td>0.357</td>
<td>0.125</td>
<td>0.723</td>
<td>1.135</td>
</tr>
<tr>
<td>Anxiety</td>
<td>-0.281</td>
<td>0.201</td>
<td>1.947</td>
<td>0.163</td>
<td>0.755</td>
</tr>
<tr>
<td>Stress</td>
<td>0.188</td>
<td>0.237</td>
<td>0.633</td>
<td>0.426</td>
<td>1.207</td>
</tr>
<tr>
<td>PSS</td>
<td>0.742</td>
<td>0.228</td>
<td>2.121</td>
<td>0.000</td>
<td>1.394</td>
</tr>
</tbody>
</table>

DISCUSSION

The results show that preeclamptic women are more depressed and stressed than the control group. The PSS score in preeclamptic women was also higher than the control group. PSS score positively correlates with the occurrence of preeclampsia with a β value of 0.742. This condition can be explained by the stress concept, where conditions of psychological stress can activate the maternal HPA axis and sympathetic activity that can cause vasoconstriction, which is the key to preeclampsia pathogenesis. HPA axis induces stress response by glucocorticoid.

Corticotrophe-releasing hormone (CRH) is released by the paraventricular nucleus in the hypothalamus as a response to stressors and stimulates the release of adrenocorticotrophin hormone (ACTH) from the pituitary gland. This ACTH stimulates the adrenal cortex to release cortisol into the bloodstream.

The results of this study also supported by medical hypothesis proposed by Vianna et al. that distress conditions such as depression, anxiety, and stress during pregnancy can induce the incidence of preeclampsia as one of the pregnancy complications by increasing cortisol levels in circulation and also placenta and decreasing the sensitivity of lymphocyte to glucocorticoid. Moreover, another study also proved a correlation between distress measured using DASS-21 and the incidence of preeclampsia.

Kurki et al. showed that depression and anxiety conditions during early pregnancy correlated with the incidence of preeclampsia. Still, this study used the Beck Depression score and dichotomy questions to measure anxiety. Kordi et al. also showed the correlation between anxiety and the incidence of preeclampsia, with the relative risk being 2.9 times compared with the pregnant women that did not experience anxiety. In this study, they used DASS-21 questionnaires.

Moreover, a meta-analysis study conducted by Zhang et al. provided information that the results from thirteen studies that meta analyzed indicated that mental stress was associated with the increased risk of preeclampsia (OR = 1.49). Meanwhile, anxiety or depression was positively associated with the risk of preeclampsia (OR = 1.88).

Preeclampsia has known as the disease of theory. The pathogenesis of preeclampsia itself has been associated with the maternal psychological condition called psychoneuroimmunology theory. This theory explains how stress can induce high cortisol levels in the bloodstream and placenta. The increasing cortisol in the placenta can lead to placental intermittent hypoxia, which can later be placental ischemia. Placental ischemia is the main condition in preeclampsia that can cause the transcription of anti-angiogenic factors such as sFlt-1 and...
lead to endothelial dysfunction and the appearance of preeclampsia signs and symptoms.3,13,22-29 The limitation of this study is that we used a cross-sectional design and the participant filled out the questionnaires after the labor was done and the condition was stable. Further research still needs to be done to unravel the mechanisms by which maternal distress can induce preeclampsia using cohort design. From this study, we need to explore more about the mechanism of maternal distress that can increase the occurrence of preeclampsia.

CONCLUSION

There is a positive correlation between maternal distress and the occurrence of preeclampsia in pregnant women. A perceived stress scale can be used as a screening instrument to detect the distress condition of pregnant women and reduce preeclampsia.

CONFLICT OF INTEREST

The authors report no conflict of interest.

FUNDING

This research was funded by the author personally.

ETHICS APPROVAL

This research has received ethical approval from the Ethics Committee for Airlangga Hospital in Surabaya, Indonesia with ethical clearance number SK 124/KEP/2022.

AUTHOR CONTRIBUTION

All authors contributed to this research. SNK: Making initial drafts (originality) and research concepts, formulating research objectives as a whole, coordinating each research activity according to its stages, validating and visualizing, as well as making initial drafts (originality) of research articles, collecting data, doing all laboratory processes, data analysis, and preparing for publication. EGD: coordinating technical and supervising the implementation of the fundamental research, GS: supervising technical research and preparing for publication.

REFERENCES


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