The Effects of Psychological Intervention on Pregnant Women with Elevated Cortisol Levels and Adverse Birth Events

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Introduction

Elevated levels of stress, anxiety, and depression during pregnancy are thought to influence cortisol levels. Dysregulations in cortisol, as a byproduct of the hypothalamic-pituitary axis (HPA), have been associated with preterm birth and adverse birth outcomes. Studies have also demonstrated poorer long-term effects of antenatal stress on child neurodevelopment, temperament, and cognition. Psychological interventions of behavioral therapy (CBT), mindfulness, and gratitude have shown to have a positive effect on psychological wellbeing across various populations.

The purpose of this literature review was to analyze a collection of randomized-controlled trials to conclude if psychological interventions during pregnancy for women with elevated levels of stress, may lead to fewer adverse birth events.

Methods

**Literature Search**
- PubMed and Google Scholar Searches
- Conducted in October and November 2019
- 10 research articles were accessed based on sample population, intervention type, inclusion criteria, and relevance to the research topic.

**Variable Measures**
- Cortisol
- CAR (Cortisol Awakening Response)
- Salivary cortisol
- Serum cortisol
- Stress Questionnaires
  - PSS (Perceived Stress Scale)
  - STAI (State-Trait Anxiety Inventory)
  - EPDS (Edinburgh Postnatal Depression Scale)
  - BDI (Beck Depression Inventory)
- Additional questionnaires about prenatal anxiety, life satisfaction, gratitude, perception of racism, depression, anger, affect, attitude, and relationship quality

**Adverse Birth Outcomes**
- Low Birth Weight
- Gestational Age
- Length at Birth
- Birth Complications

Table 1. Comparison of study designs.

<table>
<thead>
<tr>
<th>Study</th>
<th>Total N (n)</th>
<th>Population</th>
<th>Psychological Therapy Intervention</th>
<th>Intervention Length</th>
<th>Variables Measured</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atwill</td>
<td>64</td>
<td>German, married or relationship, high school educated, employed, median income</td>
<td>CBT Group Program vs Control Group</td>
<td>8 sessions</td>
<td>M-CBS, PSS, BDI, EPDS, STAI, ASI, DAS, SSIS, GHQ8</td>
</tr>
<tr>
<td>Estragove</td>
<td>25</td>
<td>Non-Hispanic White, married, college educated</td>
<td>No treatment – Control Study</td>
<td>12 weeks</td>
<td>Salivary cortisol, CAR, serum cortisol, negative affect journal, GA, BW</td>
</tr>
<tr>
<td>Fair</td>
<td>64</td>
<td>Hispanic or African American, low income, high school educated, college educated</td>
<td>Intercultural</td>
<td>12 weeks</td>
<td>Salivary cortisol, SCID, CES-D, STAI</td>
</tr>
<tr>
<td>Mavromatis</td>
<td>46</td>
<td>Irish women, highly educated, married, planned, low-risk pregnancy, 1st pregnancy</td>
<td>Mindfulness &amp; Gratitude</td>
<td>3 weeks</td>
<td>Salivary cortisol, CAR, PSS, EPDS, BDI, SMS, WAI,</td>
</tr>
<tr>
<td>Yim</td>
<td>87</td>
<td>English, White, highly educated, employed, married or cohabitating</td>
<td>No treatment – Control Study</td>
<td>3 weeks</td>
<td>Maternal &amp; Infant Salivary cortisol, Inflammatory markers, BDI, STAI, MMP, HPA</td>
</tr>
<tr>
<td>Yim</td>
<td>86</td>
<td>German, married, college educated, 1st pregnancy, employed, high income</td>
<td>CBT Group Intervention</td>
<td>8 sessions</td>
<td>Salivary cortisol, CAR, PSS, BDI, STAI, MD-CDI</td>
</tr>
<tr>
<td>Yim</td>
<td>37</td>
<td>German and Swis, highly educated, higher class, partnership</td>
<td>Internet-based CBT Stress Management</td>
<td>6 weeks</td>
<td>GA, BW, Length at birth, Rate of preterm birth, CAR, PSS, EPDS</td>
</tr>
<tr>
<td>Yim</td>
<td>62</td>
<td>Spanish-speaking immigrants, married, low income, middle school education, 1+ children, low social support</td>
<td>CBT Stress Management w/ Depression Management</td>
<td>12 weeks</td>
<td>Salivary cortisol, Perceived stress rating, MMSE, CES-D, PANAS, birth complications</td>
</tr>
<tr>
<td>Yim</td>
<td>86</td>
<td>Latina or Asian immigrants, unemployed, single, high school educated, 1+ children</td>
<td>CBT Stress Management</td>
<td>8 weeks</td>
<td>Salivary cortisol, CAR, PSS, SSIS</td>
</tr>
<tr>
<td>Yim</td>
<td>86</td>
<td>Black women, unmarried, high school education, low income, 1+ children</td>
<td>Stress reduction sessions</td>
<td>3 weeks</td>
<td>Salivary cortisol, BDI, SSIS, WAI,</td>
</tr>
</tbody>
</table>

**Results**

Based on the literature, there is mixed evidence that psychological interventions during pregnancy for women with elevated stress levels are efficacious in reducing adverse birth events. Specific markers of cortisol levels did not display the same trends when comparing cortisol measures between groups of high stress and control groups. Though CAR levels seemed to be the most accurate indicator of stress levels. CAR levels decreased in a few studies with psychological interventions, reduced perceived stress and/or cortisol levels. Though many of these articles are limited in their ability to draw generalizable conclusions due to limited sample size, significant participant dropout rates, differing intervention strategies, and varying protocols for measuring stress and cortisol levels. Future research needs to be conducted in order to determine the more reliable measurement of stress. There is no standard measurement of stress, and no standard recommendation for a specific psychological intervention for a pregnant population, at this time.

**Discussion**

Several studies had evidence of at least one cortisol measurement declining with a psychological intervention. A few of the studies show promising results that psychological interventions reduced perceived stress and/or cortisol levels. Though most of these articles are limited in their ability to draw generalizable conclusions due to limited sample size, significant participant dropout rates, differing intervention strategies, and varying protocols for measuring stress and cortisol levels. Future research needs to be conducted in order to determine the more reliable measurement of stress. There is no standard measurement of stress, and no standard recommendation for a specific psychological intervention for a pregnant population, at this time.

**Conclusions**

There is conflicting evidence from the review of literature, and insufficient statistical power. At this time, no conclusion can be drawn about the effect of psychological interventions during pregnancy on stress levels or birth events. Patients and providers may consider psychological interventions as a method to reduce stress during pregnancy, though the evidence is lacking to support a clear reduction in stress levels or adverse birth events. Further research is needed to address the role of psychological intervention during pregnancy, impact of elevated stress levels on birth outcomes, and limitations of the current studies.