WORK AND STRESS IN PREGNANCY

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WORK AND STRESS IN PREGNANCY

We are asked about work by almost every pregnant woman we see.

Part of our evaluation includes the history of work and occupational exposure.

Not infrequently, we need to revisit the issue if the mother has pregnancy complications.
WORK AND STRESS IN PREGNANCY

The goal of this presentation is for the participant to be able to advise pregnant women and their families about safe levels of work in pregnancy.
WORK AND STRESS IN PREGNANCY

How much is safe to lift?
How long should one be standing?
What if she has to work—what should we do as providers?
Are there specific risks?
WORK

- Physiologic issues of work and stress
- Clinical studies of work and adverse outcomes
- Case study of physician pregnancies
- Recommendations
PHYSIOLOGIC CHALLENGE OF PREGNANCY

For all animals with internal development the mother must be able to move, hunt or run, (work so to speak) without taking away from the developing offspring.
PHYSIOLOGIC CHALLENGE OF PREGNANCY

PROVIDE FOR GROWING FETUS WITHOUT COMPROMISING THE MOTHER
PHYSIOLOGIC CHALLENGE OF PREGNANCY

She must increase her intravascular volume, beyond what is needed after redistribution of blood flow to exercising muscles.

She must decrease smooth muscle contractility in response to the increased stretch of the expanding uterus.
HOW DOES THE MOTHER ACCOMPLISH THIS?

CARDIAC OUTPUT INCREASES >40%

MATERNAL BLOOD PRESSURE DECREASES

BLOOD VESSELS BECOME REFRACTORY TO PRESSORS**

INCREASED PROGESTERONE
PHYSIOLOGIC ADAPTATION TO PREGNANCY

FACTORS WHICH INTERFERE WITH THESE ADAPTATIONS LEAD TO INADEQUATE UTERO PLACENTAL PERFUSION AND PREGNANCY COMPLICATIONS
WORK AND STRESS IN PREGNANCY - CAVEATS

• Each woman’s INDIVIDUAL response to environmental challenge is very specific.

• Though there are fairly discrete and documented limits, many women tolerate high stress without any problems, while others develop severe issues from mild stress.

• Additionally, superimposed diseases such as hypertension, obesity, or diabetes—a few examples—increase the risks.

• Lastly, stress effects are cumulative.
WORK AND STRESS IN PREGNANCY - CAVEATS

• From 1960 on there have been multiple studies of work and its effects on pregnancy.
• Many studies were biased and flawed
• Many were influenced by social norms
2 meta-analyses reviewed studies through 2005, plus several large cohorts

‘Occupational fatigue’

1. Standing longer than 3 hours
2. Work with Industrial Machinery
3. Repetitive Physical Tasks
4. Work with noise, vibration, or cold
5. Repetitive lifting 25-30 lbs

Some studies have added working long hours (more than 8/day and 40/week)
• Work in pregnancy is associated with improved outcomes compared to no work.
• However, stressful work has been found in studies involving over a million pregnancies to be associated with a series of disorders centered around utero-placental insufficiency.
• LBW, IUGR, PTD, PPROM, IUFD
• And to a lesser extent, early loss and HTN
<table>
<thead>
<tr>
<th>Complication</th>
<th>Relative Risk</th>
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<tbody>
<tr>
<td>Occupational fatigue</td>
<td></td>
</tr>
<tr>
<td>Preterm birth</td>
<td>1.22-1.63</td>
</tr>
<tr>
<td>Low birth weight</td>
<td>1.37-2.2</td>
</tr>
<tr>
<td>PIH</td>
<td>1.3-2.4</td>
</tr>
<tr>
<td>SAB</td>
<td>1.5</td>
</tr>
<tr>
<td>Fetal demise</td>
<td>1.85</td>
</tr>
<tr>
<td>Irregular and night shift work</td>
<td></td>
</tr>
<tr>
<td>Low birth weight</td>
<td>1.63</td>
</tr>
<tr>
<td>SAB</td>
<td>1.6</td>
</tr>
<tr>
<td>Psychological stress</td>
<td></td>
</tr>
<tr>
<td>Low birth weight</td>
<td>Decreased by 190 g</td>
</tr>
<tr>
<td>SAB</td>
<td>2.45</td>
</tr>
<tr>
<td>Preterm labor</td>
<td>Increased</td>
</tr>
<tr>
<td>Preterm birth</td>
<td>Increased</td>
</tr>
<tr>
<td>PIH</td>
<td>Increased</td>
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</tbody>
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Numbers are relative risk compared with controls.

PIH indicates pregnancy-induced hypertension; SAB, spontaneous abortion.
• Work in night shifts, and variable shifts increased fetal demise (1.85), Miscarriage (1.6)

• Preterm Prediction Study showed an increased risk of/PPROM. This study controlled for multiple variables, and showed an increased risk of adverse outcomes with all the components of occupational fatigue.

• Quebec Study documented increasing risks for adverse outcomes with increasing Occup. Fatigue scores
Does decreasing work stress help?

Several large studies from France showed that decreasing ‘Occupational fatigue’ decreased the rates of adverse outcomes. The result was changes in French work rules for pregnancy
Studies of psychologically stressful work have also shown an increased risk of adverse outcomes—PTL, PTD, IUGR etc. Multiple studies have documented psychologic stresses to be associated with adverse outcomes in humans and animals.
In overview, studies from 1960 to the present, have shown consistent and proportional associations with stressful work and adverse pregnancy outcomes. The next question is: Why?
There are Three Main Synergistic Mechanisms

1. Decreased uterine blood flow through postural effects. This is often made even worse by decreased oral intake during work—‘occupational dehydration’. Think of the irritable uterus.
Mechanisms

2. Catecholamine Excess
Chronic overactivation of the sympathetic nervous system. Physical stress increases norepinephrine which is not only a vasoconstrictor but also a uterotonic. Psychologic stress is associated with release of epinephrine-similar qualities. Catecholamines cause acidemia in animals as well as contractions.
Mechanisms

A study of pregnant women working in stressful conditions (psych. and physical) compared to non stressful time periods and to women working in unstressed situations showed 60% increased levels of catecholamines.
Mechanisms

3. Activation of the HPA axis. Hypothalamic-Pituitary-Adrenal
This produces ACTH, Cortisol and most important CRH.
Usually this system has very strong negative feedback and
downregulation. Exception is the placental receptors.
Increased levels of CRH are associated with increased contractility, prostaglandins, and fetal lung maturity. Higher stress levels are also associated with shorter cervical lengths. This hormonal milieu is also associated with increased ADH, the most potent of uterotonics.
Thus, the various mechanisms work to both increase contractility and decrease uterine blood flow.
Modifying Factors

Timing of stress
Duration of stress over the women’s reproductive life
Co-morbidities, such as hypertension
Stressful life situations
Stress and Adverse Outcomes

Is this an association, or is this truly a cause and effect relationship?
**TABLE 2. Causal Criteria for Stressful Work and Its Relationship to Pregnancy Complications**

1. Biological gradients: increased levels of stress and fatigue lead to increased risks for pregnancy complications
2. Biological plausibility: stressful work produces increased physiological responses of catecholamines and activation of the HPA axis, which adversely affects uteroplacental blood flow and uteroplacental function
3. Consistency: the effects of stressful work have been documented for over 60 y in multiple work settings
4. Consistent with existing knowledge: similar effects are seen in animals. Abnormal uteroplacental blood flow from other diseases produces similar complications
5. Specificity: work does not increase the risks for adverse outcome; stressful work does. Stressful work also produces other effects such as depression and inhibition of the immune system, which may lead to similar biological effects. Thus, specificity is more problematic in fulfilling the postulates
6. Temporal association: stressful work precedes the adverse outcomes and decreasing stress improves the outcome

Modified from Koch's postulates with appreciation to the principles and instruction of Grimes and Schulz.
HPA indicates hypothalamic-pituitary-adrenal axis.
Case Study
Physician Pregnancy

Beginning in the late 1970’s reports were published about increased complications among physician, notably resident pregnancies. By 1986, a third of residents were women. Anecdotal bias and lack of controls led to more intense observation.
Physician Pregnancy

- Schwartz-Increased abruption and PTL
- Phelan-Increased PIH
- Katz-RR of 1.86 for LBW, PTL, PTD
- Klebanoff- anaesthesia residents 26% SAB rate, Double PTL rate necessitating stopping work, PIH 2 ½ x increased; 26% of residents had to be taken off of work for complications
- Gabbe-Increased PTL, LBW, PIH in OB residents
Physician Pregnancy

- Catecholamine levels at work in MDs 64% higher than controls (p<.025)
- Highest levels were in an anaesthesia attending doing a night shift in the CT room (She went into PTL a few days later.)
- No increased PPROM among docs in any study
- MD hours have changed in training
Work and Pregnancy

Large data bases have reviewed occupational exposures in their affect on SAB and anomalies. Some are insidious, and unsuspected, some like cosmetology and VDT have been shown to be safe.
### TABLE 3. Major Occupational Teratogens (References Available Upon Request)

<table>
<thead>
<tr>
<th>Teratogen</th>
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<tbody>
<tr>
<td>Anesthetic gasses (veterinary and dental workers in particular)</td>
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<tr>
<td>Battery acids</td>
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<tr>
<td>Benzene</td>
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<tr>
<td>Chemotherapeutic agents</td>
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<tr>
<td>Dyes (textile and leather manufacturing)</td>
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<tr>
<td>Electronic manufacturing</td>
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<tr>
<td>Formaldehyde</td>
</tr>
<tr>
<td>Heavy metals: arsenic, cadmium, chromium, lead, mercury, nickel</td>
</tr>
<tr>
<td>Leather work</td>
</tr>
<tr>
<td>Organic and chemical solvents (including those used in pharmaceuticals and by orthodontists, chemists, painters, laboratory technicians, carpenters, funeral workers, veterinary workers, auto cleaning, and some type of arts and crafts work)</td>
</tr>
<tr>
<td>Pesticides and herbicides</td>
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<tr>
<td>Printing inks</td>
</tr>
<tr>
<td>Radiation</td>
</tr>
<tr>
<td>Rubber and plastic products manufacturing</td>
</tr>
<tr>
<td>Textile manufacturing</td>
</tr>
<tr>
<td>Wastewater exposures</td>
</tr>
<tr>
<td>Wood preservatives (creosotes, arsenic, chromium)</td>
</tr>
</tbody>
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Work and Pregnancy Management

• Work and Occupational histories should be taken at the first prenatal visit or at a preconception visit.

• This history should be reviewed at the beginning of the third trimester, and followed up with an open ended question.

• Keep an eye out for hidden stressors—e.g., commuting or repetitive tasks.
Work and Pregnancy Management

• Large studies in populations have shown that cutting back work increases birth weight.

• How should we apply population studies to individuals? -- History, Personal Characteristics, Co-morbidities
Work and Pregnancy Management

• Eliminate any exposure to teratogens
• Eliminate variable shifts,
• Eliminate night shifts if possible
• Recommend:
  Standing limited to <3 hours at a time,
  40 hour work week
  Lifting <25-30 lbs
Any woman with a stressful work environment should have consideration for a third trimester ultrasound. (A fetus <15-20% should have a follow-up exam)**

All, ALL recommendations should be individualized.
Work and Pregnancy Management

PTL without cervical change in the face of a stressful work environment should be followed up with more than a one week visit.

The woman who had uterine irritability, drinks some water and lies down, has not treated the cause effectively.
Conclusions

• *Work is not detrimental to pregnancy.*
• *When work potentially interferes with uteroplacental physiology, either work or pregnancy will be altered.*
• *This is part of our partnership with our patients to help make recommendations to achieve a healthy outcome.*
References

- Others available on request.