Stress and stress reduction to prevent preterm birth

“I didn’t know I was pregnant. My office is such a stressful place to work, everyone feels nauseous in the morning!”

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Overview

- Stress and PTB/LBW
  - Biological plausibility
  - Epidemiological plausibility
  - Partial explanation for racial disparities

- Systematic review of stress reduction interventions to prevent PTB/LBW infants
Preterm birth (PTB) and Low birth weight (LBW)

- Major cause of perinatal mortality
- Leading cause of infant morbidity
- Rate in US has been decreasing since 2006
- But still higher than other industrialized countries
Preterm birth (PTB) and Low birth weight (LBW)

Annual Societal Economic Costs Associated with Preterm Birth, US, 2005

- Medical Care Services: $16.9 billion (65%)
- Lost Household and Labor Market Productivity: $5.7 billion (22%)
- Maternal Delivery: $1.9 billion (7%)
- Special Education Services: $1.1 billion (4%)
- Early Intervention Services: $611 million (2%)

Total Costs = $26.2 billion

Preterm is less than 37 completed weeks gestation.
Stress and PTB

One potential contributor to PTB is chronic stress:

- through direct physiologic mechanisms
- through behavioral pathways

Drug use  Nutritional intake  Prenatal care
Stress
Process of stimulus, appraisal of it and response

Stimuli or stressor

Appraisal

- Found to be threatening/ unmanageable
- Psychological state of stress

Cascade of biological and behavioral adjustments

Lazarus 1984
Biologic plausibility

Cha and Masho 2013
Biologic Plausibility-
HPA Axis

Biologic Plausibility - Decrease in immune system function

- Chronic stress down regulates function of T and B lymphocytes
  - Decreased proliferation, differentiation and cytotoxicity

- Increased host resistance to viral pathogens and some bacteria

- May act as co-factors precipitating PTB

Biologic Plausibility - Chronic inflammation

Epidemiologic plausibility

• Recent review of over 80 investigations that have shown a link between self reported maternal stress and PTB/LBW  
  Dunkel Schetter 2011

• Other studies have not shown this association
Epidemiologic plausibility Discrepancies

• Definition of stress
• Measure of stress
  • Stressful life events
  • Anxiety
  • Depression
  • Stressful work
  • Physical abuse
  • Perceptions of neighborhood discrimination
  • Low levels of social support
• Focus on isolated stressful life events
  – Minimal threat/quick resolution
Office of the Surgeon General and NICHD

Recommended further research into resolving pregnancy related stress and anxiety through interventions that will likely need to be varied based on differences in ethnic, cultural and socioeconomic status

Racial disparities in PTB

- Chronic stress may explain some of the racial disparities in PTB rates

Chronic stress and racial disparities

- African-American (AA) women in US under higher levels of chronic stress (?)
  - Racism/discrimination, job instability, economic difficulties and lower access to resources

- PTB correlated with:
  - Higher perceived discrimination
  - Poor neighborhood safety
  - Greater number of negative life events (Dole, 2003)

- Very low birth weight (<1,500 g) correlated with
  - AA mother’s perception of poor neighborhoods and increased stress
  - Higher lifetime exposure to racism (Hogue 1993, Collins 1998)
Why racial differences?

Two models of chronic stress

– Life-course theory
  (Lu and Halfon, 2003, Kingston 2012)

– Weathering
  (Geronimus 1997)
Life-Course Theory

• Racial disparities in LBW reflect pre-pregnancy prevalence among AA women of
  – Greater contextual risk factor
  – Less protective variables

• Pregnancy outcome influenced through two mechanisms
  – Early life (fetal) programming
  – Cumulative wear and tear (weathering)
Life-course theory
Weathering

• Risk of PTB/LBW for AA monotonically with advancing age
  – Not extremes of age like in Non-Hispanic white women
    (Geronimus 1996, Collins 2006, Borders 2007)

• Conceptualization of the physical consequences of social inequality on pregnancy outcomes

• Limited to AA women with lifelong residence in low-income urban neighborhoods (Collins 2009)
Race and PTB

“By assuming that racial disparities in PTB are a result of numerical differences in conventional risk factors, researchers and physicians overlook non-random, pervasive, and multifaceted inequality that is bound up in the historical context of race.”

David, 1991
Interventions to reduce maternal stress

- Chronic stress appears to be associated with PTB and may contribute to racial disparities

- Imperative that interventions aimed at reduction of maternal stress be identified and rigorously evaluated.

- There are many potential stressors affecting women in pregnancy
  - financial problems, neighborhood conditions, discrimination, strain in intimate relationships, family responsibilities, employment conditions and pregnancy related concerns.
  (Dunkel Schetter 2011)

- Potential interventions
  - improved patient support and education in the clinical setting, group support, outreach with home visitation or phone calls, to teaching stress reduction and improved coping mechanisms.
Objective

• To identify studies that investigated interventions to decrease maternal stress with preterm birth as a measured outcome.

• Since gestational age and fetal weight are often correlated with infant outcomes, we also included studies that evaluated reduction in low birth weight (LBW) (<2500g).
Methods:
Search Strategy
• Fall 2013, Published after 1980

• MEDLINE, OVID and PUBMED databases using a combination of keywords and MeSH terms
  – PTB, LBW and stress reduction
    • Outcome terms (preterm birth and low birth weight)
    • Intervention terms (psychosocial, stress reduction, stress intervention, self-efficacy, centering of pregnancy, group prenatal care, coping, social support, mindfulness, and nurse-family partnership).
  – Pregnancy and stress reduction
    • Outcome term (pregnancy)
    • Intervention terms (“mindfulness, stress-reduction, coping skills, complementary medicine and/or alternative medicine”)

• NIH clinical trials studies on preterm birth, prematurity or low birth weight that related to stress and stress reduction.
• The references from retrieved studies were reviewed to assess for other publications not found with the original search.
Methods

Study selection criteria

• Titles reviewed by 2 researchers (HS and SQ) for relevance to study question, if there was a disagreement, the study was included for further review by an additional researcher (AB).

• Abstracts reviewed to see if met criteria for inclusion:

  1) there was a formalized attempt to decrease prenatal stress or provide additional prenatal support before birth

  2) the outcome studied was preterm birth or low birth weight.
Methods

Data abstraction

• Reviewed for:
  – study design
  – number of participants
  – Intervention
  – outcomes and findings
    • including any attempts to control for confounding factors.
Clinic visits 8

Titles from search 330

Abstracts reviewed 139

Articles included 47

Not related to study question (n=49)
No intervention (n=42)
Unable to retrieve journal (n=1)

Non-English language or duplicates 191

Care coordination 8

Group prenatal care 11

Expansion of public health insurance 4

Expanded prenatal education/support

Teaching stress reduction strategies 5

Clinic visits 8

Home visitations 9

Telephone contact 2
Care coordination
(aka case management)

• Help vulnerable populations to identify the areas where they need assistance, and then connecting them to relevant resources in the community

• Ensures that a person is linked to the most cost-effective and highest quality services that will meet their needs

• Social workers or other health care providers
  • provide women with social and emotional support helping reduce stress during pregnancy

Frankel 2004
Care Coordination

• **8 articles** (2 RCTs, 3 Cohort, 3 Observational)
• Promising but mixed results

• Some studies suggest reduction in PTB and LBW—particularly in minority groups

• May be in part due to heterogeneity in what is considered care-coordination

• Unclear how much is related to stress reduction (not specifically measured)
Group prenatal care/CenteringPregnancy™ (CP)

- Reduction in maternal stress across the pregnancy through education, social and emotional support.  
  (Ickovics 2007, Kennedy 2009)

- Supported by some observational data that link CP to fewer feelings of being alone higher satisfaction with care, and lower risks for postpartum depression.  

- RCT looking at CP found that high-stress women randomly assigned to CP reported:
  - significantly increased self-esteem
  - decreased stress and social conflict
  (Ickovics 2011)
Centering Pregnancy™

- Relationship-centered model for PNC
- Women are empowered through peer support to:
  - participate
  - learn
  - make informed decisions
  - self-manage
- Groups of 8-12 women with ~EDD
- 10 visits/2 hrs a session
- Educational curriculum through facilitated discussion

CP and PTB/LBW

- 11 articles (3 RCT, 5 cohort, 2 observational, 1 meta-analysis)

- Majority of studies showed decreased rates of PTB/LBW compared to traditional PNC

- Studies performed:
  - In public health clinics, with Medicaid eligible or low SES women.
  - In settings predominately serving minority patients including African Americans, Hispanic

- Appears to
  - be effective high risk groups such as teenagers
  - be effective after translation into Spanish
  - to diminish racial and ethnic disparities for PTB


- Outcomes maybe due to three aspects of the intervention:
  - Enhanced education empowering women to seek medical attention earlier
  - Better communication leading to improved compliance
  - Enhanced levels of social-support helping low resource women with stress-coping.

(Pickleseimer 2012)
Other group PNC

• Peer mentors and group care with care coordination.
  – No difference (Ford 2002, Willis 2004)

• “RCT”- of group PNC in Iran
  – No difference (Jafari 2010)

• Meta-analysis (2 RCTs, 4 Cohort Studies, 3242 women)
  – reduce the rates of PTB (RR 0.71, 0.52-0.98)
  – no difference in LBW (RR 0.91, 95% CI 0.65-1.27) (Ruiz-Mirazo 2012)
Expansion of public health insurance

• Likely includes other interventions (care coordination/home visits)

• Shown to decrease symptoms of depression and financial strain (Baicker 2013)

• Few studies looking at PTB/LBW
  – New York State Prenatal Care Assistance Program
  – Washington state
  – California
Increased prenatal care education/support
Clinical setting

• **8 Articles** (5 RCTs, 1 randomized intervention, 1 cohort, 1 observation)

• One study in 1970s/1980s in E. France used risk-scoring system and targeted activity counseling showed decreased PTB over next decade (Papiernik 1985)

• Other studies found no decrease in LBW/PTB
Increased prenatal care education/support
Home visitation

• 9 Articles (8 RCTs, 1 Cohort)

• Nurse-family partnership (NFP)
  – Evidence-based, national health program partnering with local organizations
  – Two studies, one showed reduction in PTB (Olds 1986, Kitzman 1997)

• 1 RCT- 25% reduction in PTB and larger reduction in twin PTB (Brooten 2001)

• 3 other RCTs no decrease in PTB (Kitzman 1997, Villar 1992, Blondel 1990)

• May reduce PTB in certain subsets
  – Smokers (Olds 1986)
  – Australian women with poor OB histories (Bryce 1991)
  – Unmarried teenagers (Rogers 1996)

• May reduce LBW in certain subsets
  – Low-support African American women (Norbeck 1996)
Increased prenatal care education/support
Telephone interventions

• Retrospective cohort where women received daily calls-No difference (Boehm 1996)

• More recent study
  – No overall reduction in PTB or LBW
  – Subgroup of black women>18
    • 44% decrease in PTB
    • 34% decrease in LBW
  – Cost-benefit perspective $117/pregnancy would provide ~$17,000 in economic benefit
    (Moore 1998, Muender 2000)
Teaching stress reduction strategies

- One-on-one stress reduction sessions (Wesley 2006)
- Applied relaxation (Bastani 2006)
- Targeted cognitive behavioral counseling (Kiely 2011, Subramanian 2012)
- Mindfulness
  - Aquatic exercise (Lox 2000)
Conclusions

• Chronic stress contributes PTB
  – direct physiologic mechanisms
  – behavioral pathways

• Current literature on stress reduction through education, additional social support and/or coping skills/mindfulness interventions is heterogeneous and mixed in the findings associated with PTB and LBW outcomes.
Conclusions

- **Care-coordination or case management**
  - may be beneficial to reduce PTB and LBW rates particularly in minority groups

- **Increased education and social support**
  - in the clinic setting does not appear to affect PTB or LBW,
  - home visitation appears to be beneficial to certain groups (e.g. high-risk patients, smokers, unmarried teenagers)
  - telephonic support appeared to be beneficial for a subgroup of patients (black women over 18)
Conclusions

• **Expanded public health coverage**
  - results are mixed, hard to tease out which aspect of expanded services was associated with improvements

• **Other stress reduction strategies**
  • reduce stress during pregnancy
  • unclear that specific interventions decrease the rate of PTB and LBW outcomes for all low-risk women
  • may show increased benefit for specific groups (e.g. teenagers, low support women, or racial minorities).
Conclusions

• **Group prenatal care**-
  – most evidence showing an association with PTB and LBW prevention.

• **CP:**
  – decrease self-reported maternal stress
  – significant increases in self-esteem, decreased stress and social conflict during the third trimester of pregnancy.
  – The consistent, positive findings of the CP model suggest that it is .... the reduction in maternal psychosocial stress through social support and self-efficacy training.
Conclusions

• Given the heterogeneity of results, further research is needed:
  – to assess the efficacy of interventions designed to prevent PTB through reduction in maternal stress
  – to understand the components of CP that contribute to improved outcomes
  – to understand the behavioral and biological processes underlying outcomes
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Questions?
References

Web viewers

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• Non physicians may obtain a certificate of participation by successfully completing the post test using the following link: http://www.surveygizmo.com/s3/2000150/WCGR0215

Certificate will be emailed to participant within 21 business days.