Sleep position and stillbirth risk

Associate Professor Jane Warland
Common Risk factors for stillbirth

At Booking
- Age (young and older)
- Ethnicity (Indigenous, south Asian)
- Nulliparity and parity >4
- Lifestyle factors (smoking, recreational drug, substance)
- Increasing BMI
- Previous stillbirth
- Assisted reproduction
- Pre-existing Medical conditions
- Low SES

During pregnancy
- Hypertension and Diabetes
- Fetal Growth Restriction
- Altered Fetal Movement
- No antenatal care
- Post term pregnancy

- Few of these are amenable to modification especially once pregnant
Sleep and Pregnancy: Why might it matter?

• Humans spend approximately one third of their life asleep

• Some events occurring during sleep are known to be associated with adverse health outcomes esp. sleep disturbance, sleep quality and sleep disordered breathing
What happened in New Zealand in 2011?
Figure 1: Present stillbirth rates and reductions since 2000 in high-income countries
ARR=annual rate reduction. *Countries with less than 5000 annual births.
Association between maternal care practices and risk of late stillbirth: a case-control study

Tomasina Stacey, midwifery lecturer, PhD student,1 John M D Thompson, midwife,2 Ed A Ruffles, former medical officer,1 Jane Mitchell, professor of child health research,2 and Alex Ekeroma, senior lecturer,3 M Zuccollo, senior lecturer, perinatal public health, and gynaecology1

Stillbirth study suggests sleep position important

7:01 pm on 15 June 2011

Expecting? Sleep on your left -- just in case

Alok Jha 15 Jul 2011 17:15

Left-Sided Sleep May Cut Risk of Stillbirth

Pregnant women who sleep on their left side may be decreasing their risk of delivering a stillborn child, a retrospective case-control study suggested.

Sleeping Position in Pregnancy Linked With Stillbirth Risk

Sleeping on left side may halve risk of stillbirth

The Conversation
Despite urging caution, midwives appear to have accepted the findings and are advising their patients to sleep on the left side.

This has resulted in a significant increase in left sided sleep position, from 35.9% in the Auckland stillbirth study (2006-9) to 62.5% in late 2011 (unpublished Findings).

This has been associated with a reduction in late stillbirth for New Zealand.

Although we cannot exclude other reasons for the decline, it is tempting to believe that the decline is a consequence of more pregnant women sleeping on their left. (Mitchell 2014)
Plausible Physiology?
Triple risk in pregnancy

- Placental / Fetal Vulnerability
  - FGR, RFM

- Maternal Factors
  - Supine sleep

- Fetal Stressor
  - IVC compression

Warland & Mitchell (2014)
Research to date
<table>
<thead>
<tr>
<th>Authors</th>
<th>Country</th>
<th>Method</th>
<th>OR</th>
<th>PAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stacey et al 2011</td>
<td>NZ</td>
<td>Case Control</td>
<td>aOR = 2.54, 95% CI: 1.04–6.18, and p = 0.005.</td>
<td>PAR for non-left-sided sleep position night before for stillbirth to be 37%.</td>
</tr>
<tr>
<td>Owusu et al 2013</td>
<td>Ghana</td>
<td>Cross sectional</td>
<td>aOR = 8.0, 95% CI: 1.5–43.2, and p = 0.016).</td>
<td>PAR of ‘typical’ supine sleep position for stillbirth was 25%.</td>
</tr>
<tr>
<td>Gordon et al 2015</td>
<td>Australia</td>
<td>Case-Control</td>
<td>aOR = 6.26, 95% CI: 1.2–34</td>
<td>The PAR for self-reported supine sleep position in last month of pregnancy was 9.88%.</td>
</tr>
<tr>
<td>Lakshmi et al 2017</td>
<td>India</td>
<td>Case-control</td>
<td>OR 2.27 (1.37–3.75)</td>
<td>Not reported</td>
</tr>
<tr>
<td>McCowan et al 2017</td>
<td>NZ</td>
<td>Case-Control</td>
<td>aOR 3.67, 95% CI: 1.74–7.78.</td>
<td>The PAR of supine sleep position for late stillbirth was 9.4%.</td>
</tr>
<tr>
<td>Heazell et al 2017</td>
<td>UK</td>
<td>Case-Control</td>
<td>aOR 2.31, 95% CI: 1.04–5.11</td>
<td>The PAR of supine going to sleep position 3.7%</td>
</tr>
<tr>
<td>O’Brien et al Under review</td>
<td>Internet</td>
<td>Case-Control</td>
<td>n.s.</td>
<td>N/A</td>
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</tbody>
</table>


Sleep Position and Stillbirth

<table>
<thead>
<tr>
<th>Name</th>
<th>Ref</th>
<th>Design</th>
<th>Predictor</th>
<th>ES (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>adjusted OR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heazell</td>
<td>72</td>
<td>C-C</td>
<td>supine</td>
<td>2.3 (1.0, 5.1)</td>
</tr>
<tr>
<td>Stacey</td>
<td>44</td>
<td>C-C</td>
<td>supine</td>
<td>2.5 (1.0, 6.2)</td>
</tr>
<tr>
<td>Lakshmi</td>
<td>102</td>
<td>C-C</td>
<td>non-left lateral</td>
<td>3.0 (1.5, 5.8)</td>
</tr>
<tr>
<td>McCowan</td>
<td>73</td>
<td>C-C</td>
<td>supine</td>
<td>3.7 (1.7, 7.8)</td>
</tr>
<tr>
<td>Gordon</td>
<td>45</td>
<td>C-C</td>
<td>supine</td>
<td>6.3 (1.2, 34.0)</td>
</tr>
<tr>
<td>Owusu</td>
<td>18</td>
<td>CS</td>
<td>supine/supine+side</td>
<td>8.0 (1.5, 43.2)</td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td></td>
<td>(I-squared = 0.0%, p = 0.726)</td>
<td>3.1 (2.2, 4.5)</td>
</tr>
</tbody>
</table>
Individual participant Data (IPD) meta-analysis of:

- NZ (TASS) 155 cases, 310 control
- Australia (SSS) 103, 192 controls
- NZ (MCSS) 164 cases, 569 controls
- UK (MINESS) 297 cases, 742 controls
- International (STARS) 153 cases and 480 controls
Going to sleep in the supine position compared with all other positions is associated with a pooled odds ratio OR of 2.59 (95% CI 1.76-3.80) $I^2$ of O
Current Research: understanding the physiological mechanism
29 healthy singleton pregnancies

35-38 weeks

4 positions: supine, right, left lateral (30° tilt), & semi-recumbent

FHR via AN24
Fetal Behavioural State: FBS

1F
- Quiescence which can be regularly interrupted by brief body movements (startles)
- Stable heart rate, small oscillation
- Isolated accelerations occur strictly related to movement

2F
- Frequent gross body movement
- Heart rate with wider bandwidth than 1F
- Frequent accelerations during movement

4F
- Vigorous activity with many trunk rotations
- Unstable heart rate
- Large and long lasting accelerations fused into sustained tachycardia

FBS in according to maternal position when awake

<table>
<thead>
<tr>
<th>Position</th>
<th>1F</th>
<th>2F</th>
<th>4F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left</td>
<td>11.3</td>
<td>79.1</td>
<td>9.6</td>
</tr>
<tr>
<td>Right</td>
<td>22.0</td>
<td>71.7</td>
<td>6.3</td>
</tr>
<tr>
<td>Semi-recumbent</td>
<td>16.7</td>
<td>81.9</td>
<td>1.5</td>
</tr>
<tr>
<td>Supine</td>
<td>34.4</td>
<td>63.4</td>
<td>2.3</td>
</tr>
</tbody>
</table>

Chi-Sq: 32.2 (p<0.0001)

- 46% of all 4F in left-lateral,
- 41% of all 1F in supine
- Intra-observer Kappa 0.8
FBS in according to maternal position when asleep

<table>
<thead>
<tr>
<th>Variable</th>
<th>1F</th>
<th>2F</th>
<th>4F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left</td>
<td>13.4</td>
<td>82.2</td>
<td>4.4</td>
</tr>
<tr>
<td>Right</td>
<td>11.3</td>
<td>83.5</td>
<td>5.2</td>
</tr>
<tr>
<td>Supine</td>
<td><strong>14.0</strong></td>
<td>85.2</td>
<td><strong>0.8</strong></td>
</tr>
</tbody>
</table>

Chi-Sq: 81.53 (p<0.0001)

- 4F occurred almost exclusively when mother was on her side,
- 1F was more common when mother was supine (OR 1.30, 95% CI, 1.11-1.52)
How do we bring this into practice?
Should we tell women not to settle to sleep on their back?.

“Curling up or stretching out on your side – preferably the left side, though either side is fine-...is ideal for both you and your fetus. It not only allows maximum flow of blood and nutrients to the placenta but also enhances efficient kidney function, ...” [15 p.247].
Public awareness campaigns

Call our free PregnancyLine 0800 0147 800 Open 9-5, Monday to Friday

Safest sleep position in pregnancy

In the third trimester of pregnancy going to sleep on your side has been shown to help prevent late stillbirth

In the third trimester our advice is to go sleep on your side because research has shown that this is safer for baby. This includes night sleep and day time naps.

https://www.tommys.org/pregnancy-information/sleep-side-pregnancy-campaign
Tips for helping a woman sleep on her side in late pregnancy

- Put pillows behind her back to reduce falling on her back and between knees for comfort. It won’t prevent being on your back for certain but is likely to make it more uncomfortable.
- If she has long hair, try tying it in a low bun, which may make it uncomfortable to sleep on her back for any length of time.
- If she wakes up for any reason during the night, don’t worry about being on back but go back to sleep on her side.
- If she naps during the day pay the same attention to sleep position during the day as she would during the night.
- For women with pain on side sleeping the important thing is that she is not lying flat on her back as this is what the research is related to.
Keep your baby safe in pregnancy - poster

A3 poster about two of the most important things for women to remember in the third trimester, monitoring fetal movements and going to sleep on your side.

Free

Quantity
1
Add to basket

A3 poster for GP surgeries, antenatal clinics and so on. Covers two of the most important things to remember in the third trimester - monitoring fetal movements and going to sleep on your side.

https://www.tommys.org/pregnancy-information/sleep-side-pregnancy-campaign
Global Alliance-Awareness for stillbirth prevention (GAASP)

SAFE SLEEP IN PREGNANCY

Star Legacy Foundation is honored to be partnering with Tommy's in the UK and Still Aware in Australia for the #SleepOnSide campaign to educate expectant mothers and health professionals across the globe about safe sleep during pregnancy. There are now 4 studies from around the world that have had the same finding: women who sleep on their backs during the 3rd trimester have a higher rate of stillbirth than women who sleep on their sides.

Research will never provide a perfect answer for all situations, and #SleepOnSide is not a ‘magic bullet’ that will end all stillbirths. But, there is much we can learn from the data in these studies. For more information, please visit our Sleep Research Studies page and Sleep FAQs, and read our Executive Director Lindsey Wimmer’s blog post about safe sleep practices. Still have questions? Please feel free to contact us.

Help us share the new PSA video, research overview video, and infographic published about this topic:

- Safe Sleep in Pregnancy-USA
- The research behind #Sleep...
- Why go to sleep on your side in late pregnancy...
- The research behind the campaign
- Pregnant? Side to Sleep
- Why should I sleep on my side?
- When you are pregnant sleeping on your side helps promote best oxygenation to you and your
SAFE PREGNANCY

Information to help keep baby safe in pregnancy.

STILL AWARE
stillaware.org
What are maternity care providers (MCPs) doing?
The study

- Australian Maternity care providers (MCPs)
- 110 Responses
- 93 Midwives 13 Obs and 3 GPs
Q: Do you currently give pregnant women advice regarding sleep position and pregnancy?

![Sleep Advice Pie Chart]

- **Yes**: 63%
- **No**: 19%
- **In some cases**: 10%
- **N/A**: 8%
What advice do you give?

- Sleep on Left Side
  - Blood and Oxygen
  - Compression

- Pillows
  - Uterus
  - Blood Flow

- NOT Sleep on Back
Q: What position do you advise women to settle to sleep in?

Settling Position Advice

- Left Side: 48.57%
- Right Side: 10%
- Either Side: 35.71%
- Whatever is comfortable: 2.86%
- N/A: 2.86%
When do you suggest she start changing her sleep position?

<table>
<thead>
<tr>
<th>SUGGESTED CHANGE TIME</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>FROM BEGINNING</td>
<td>30.0</td>
</tr>
<tr>
<td>FROM 20 WKS</td>
<td>5.72</td>
</tr>
<tr>
<td>FROM 28 WKS</td>
<td>42.86</td>
</tr>
<tr>
<td>LAST FEW WEEKS</td>
<td>1.43</td>
</tr>
<tr>
<td>N/A</td>
<td>15.71</td>
</tr>
<tr>
<td>OTHER</td>
<td>2.86</td>
</tr>
</tbody>
</table>
Q: Jenny is in the last three months of her very first pregnancy. After watching this video what do you think Jenny's strongest feeling would be?
The strongest feeling is **INFORMED** with 67.8%.

- **EMPOWERED**: 11.86%
- **CONFUSED**: 1.69%
- **WORRIED**: 3.39%
- **ANXIOUS**: 1.69%
- **OTHER**: 10.17%
Jenny comes to see you for her next antenatal visit and mentions she has seen the video and is now trying to settle to sleep on her side. Please outline what your response to Jenny might be?

- That’s Great
- Good Choice
- Encourage
- Don’t worry if you wake up on your back
- Good Work
- Pillow
Care providers educating pregnant women

- Say something like:
- Recent research is showing that settling to sleep on your back is not best for baby. I’d like you to try to settle to sleep on your side. Don’t worry if you wake up in the middle of the night on your back, that’s normal, just settle back to sleep on your side?
Recommendation

- A consensus guideline to provide a standardised, evidenced based approach to MCP information about what is currently known about sleep position and stillbirth risk seems warranted.
Remaining Questions:
How much supine sleep is needed to cause harm?

We don’t know and may never know so best to avoid
Who do we tell?

Everyone....irrespective of perceived risk ....just like SIDS safe sleep messaging
Wont we make women anxious

- Online survey of 537 women, analyses are presented of 176 women who reported being currently pregnant (mean age=27.9, SD=5.5y). For 37%, this was their first pregnancy.

Anxiety

Jenny is in the last three months of her very first pregnancy. She hears that if a woman sleeps on her back during the last three months of her pregnancy, then it is possible that the enlarged uterus can place pressure upon a large blood vessel and limit blood flow to the placenta. This may prevent oxygen from being delivered to the unborn baby. Jenny then also hears that a woman should perhaps instead maintain sleep on her left side, as this may allow for a greater amount of oxygen to be delivered to the unborn baby.
Summary

• Settling to sleep supine is associated with increased stillbirth risk
• Public health campaigns have been launched or are being considered
• Maternity care providers (MCPs) can influence women’s knowledge and practices during pregnancy.
• MCPs are currently providing inconsistent information about sleep and sleep position during pregnancy
• Further research to determine the effectiveness of interventions to encourage side sleep are needed…and are underway….or planned
References

• Heazell AEP et al Association between maternal sleep practices and late stillbirth – findings from a stillbirth case-control study. BJOG 2017; https://doi.org/10.1111/1471-0528.14967.
• Heazell AEP et al Going to sleep position and risk of late stillbirth – A systematic review and meta-analysis. Paper to PSANZ congress Auckland March 2018
• Humphries A The effect of position on maternal haemodynamics in late pregnancy Paper to PSANZ congress Auckland March 2018
• McCowan LME, et al Going to sleep in the supine position is a modifiable risk factor for late pregnancy stillbirth; findings from the New Zealand multicentre stillbirth case-control study. PLoS One 2017;12:e0179396.