BIOMECHANICAL CHANGES IN THE LOWER BACK DURING THE THIRD TRIMESTER OF PREGNANCY

DR. MARIA AHMAD1, DR. MUHAMMAD SALMAN BASHIR2, DR. SYED IMTIAZ HUSSAIN SHAH3, DR. IMRAN GHAFOOR4

SCHOOL OF ALLIED HEALTH SCIENCES CHILDREN HOSPITAL LAHORE, RIPHAH INTERNATIONAL UNIVERSITY LAHORE, RIPHAH INTERNATIONAL UNIVERSITY LAHORE, KING EDWARD MEDICAL UNIVERSITY LAHORE.

ABSTRACT

Pregnancy is a period of various physiological and physical adaptations. During this process a lot of biomechanical changes are confronted by the female body. These biomechanical changes, although temporary, lead to debilitating back pain especially in the lumbar area. They may include sway back posture, leg length discrepancy, hormonal changes, stretched and weakened muscles and compression of sciatic nerve. Objective: This study is aimed at determining the biomechanical changes in the lower back of pregnant females which is their cause of discomfort. Method: This observational study included 50 females in their third trimester of pregnancy that completed a questionnaire regarding their low back pain and its potentially influencing factors. The data was collected from patients coming to the gynecology department of Fatima Memorial Hospital, Lahore. Results: Showed that out of 50 patients, leg length discrepancy occurs in 24%, lumbar curve exaggeration in 58%, muscle girth difference in 20%, and radiating sciatic like pain in 50% of pregnant females. Previous history of back pain is also an evident factor in predisposition of low back pain in pregnancy. Conclusion: Hence it is concluded that lower back pain is common in pregnant women especially in their third trimester. Females with a history of back pain are more likely to develop discomfort during pregnancy. The timing of symptom onset in mid to late pregnancy may suggest that biomechanical factors particularly postural imbalances play a larger role than hormonal influences.

Keywords: BIOMECHANICAL CHANGES ; LOWER BACK ; THIRD TRIMESTER OF PREGNANCY
INTRODUCTION:

During pregnancy, women gain 25 to 35 pounds, on average, and undergo multiple hormonal changes and biomechanical alterations which impact the musculoskeletal system, resulting in back pain. Exaggerated lordosis of the lower back causes the weight of the growing baby to be carried by the pubic bones at the front of the pelvis and by the abdominal muscles exerting more pressure on the pelvic floor muscles and the pelvic ligaments. A significant increase in the anterior tilt of the pelvis occurs and stance is widened to maintain trunk movement.

Hormonal fluctuations are bound to cause some discomfort and as pregnancy progresses, the concentration of relaxin hormone rises causing laxity of the joints and ligaments so as to accommodate the growing uterus and provide enough room for the baby to be delivered. Joint laxity in the longitudinal ligaments of the lumbar spine creates more instability and can predispose to muscle strain. Relaxin also causes the abdominal muscles to expand sideways leading to diastasis recti. Multiple births and repeated pregnancies aggravate the condition.

Sacro Iliac joint dysfunction may also be caused by hormonal changes. There is widening and increased mobility of the sacroiliac joints and pubic symphysis in preparation for the fetus' passage through the birth canal causing altered joint mechanics and pain. Some pregnant women may experience sciatica, a sharp pain down the back of the thigh that is caused by one of the nerves of the thigh being squashed as it travels down the leg. Sciatica and pregnancy go together for many women simply because the additional stress of carrying the baby is what pushes the body beyond its ability to adapt. Those underlying disc injuries are exacerbated by the weight and posture of pregnancy, resulting in sciatic nerve disturbance and sciatica pain, either in the back, the
buttocks or the legs. In susceptible women, pregnancy may be a factor for the development of degenerative spondylolisthesis.

**METHODOLOGY:**

**Study design:**
Observational study.

**Sample design:**
Convenience method.

**Settings:**
The study will be conducted at the Department of Gynaecology, Lahore General Hospital and the Department of Gynaecology, Fatima Memorial Hospital, Lahore.

**Duration of study:**
3 months after the approval of synopsis.

**Study group:**
Pregnant women in their 3rd trimester.

**Sample size:**
This was a time based study of 3 months. 50 patients were included in that period of time.
Sampling Technique:
Convenient and Purposive Non Random Sampling technique was used.

Sample selection criteria:

Inclusion criteria:
1. Prima gravida
2. Pregnancy in its 3rd trimester
3. Patients up to 35 years of age

Exclusion criteria:
1. C-section
2. Gestational diabetes
3. Patients undergoing pre eclampsia
4. Multiple pregnancy

Methodology:
The assessment is done according to the postural-structural-biomechanical model (PSB):

Static postural examination:
The shape of the back is observed, whether there are any increases in spinal curves such as scoliosis, kyphosis or lordosis.
Pelvic angle is measured in the coronal plane, pelvic nutation and counternutation angles, the relative position of the sacrum to the ilia and leg length differences.
Dynamic assessment:
It is done in standing in which the spine is examined in all plane of motion. Regional and segmental movement losses and stiffness is observed and often used to determine the severity of the spinal condition and is also used to explain the cause of the condition.

Palpatory examination:
It is performed during standing or lying on the treatment table. Information is gathered about abnormal tissue textures, unusual muscle stiffness or abnormal relationships between body masses, muscle bulks or position of vertebral landmark.

Data Collection Tools/Instruments
Structure questioner guide was used to collect data. From these questionnaire data was collected about patients, gender, age and medical history of disease.

STATISTICAL ANALYSIS:
Using SPSS v.17 the data was managed and analyzed. The continuous variables were expressed as mean ±S.D. whereas categorical variables were expressed in the form of frequency table and percentages. Appropriate graphs are used to display the data.
RESULTS:

This observational study was based on 3 months’ time period and 50 patients were studied. A Performa was used for each patient, which was filled out based on history and examination.

All of the patients were pregnant females under the age of 35, primagravidas and in their third trimesters as considered in the inclusion criteria. Their body has undergone numerous changes to accommodate the growing baby inside. 44% of these women were 40-45 kg before getting pregnant. 54% of them were 50-55 kg and only 2% were 60-65kg. During their third trimester the weight of 44% women has increased to 60-65 kg whereas 64% of them were in the range of 70-75kg.

This increase in weight was confronted by the body by adaptation of some biomechanical changes which helped them in carrying the increasing load of the baby.

When asked, all of them responded with the same answer of debilitating back pain and spinal stiffness. Out of 50 patients 31 had the history of previous back pain.

On examination of leg length 24% of the pregnant women presented with leg length discrepancy which in other words is shortening of one leg causing postural and gait deformities. 20% of the pregnant women showed girth difference in arm, thigh and leg muscles.

56% of them had positive radiating, sciatic-like pain in their back and legs. Out of these 22% women had pain radiating up to knee, 24% had pain up to foot and 4% had pain radiating in both legs.

On postural examination, 58% of them showed exaggerated lumbar curve which was caused by stretched abdominal muscles and weakened spinal muscles.
DISCUSSION:

The purpose of my study was to determine the biomechanical changes occurring in the lower back during the third trimester of pregnancy. These changes although help females to carry their growing fetus, they have an extremely painful and discomforting effect and lead to functional disability in women at this period of time.

The factors responsible for back pain are postural changes that are leg length discrepancy, girth difference in the muscles of arms, thighs and legs, lumbar curve exaggeration and radiating pain in the lower limbs caused by compression of sciatic nerve.

This study proves that the most influencing features among these are the previous history of back pain. The second most promising biomechanical change is the compression of sciatic nerve leading to radiating pain followed by leg length discrepancy and girth differences.

These changes and the weakening and stretching of spinal muscles form a vicious circle and continue to debilitate the body image of pregnant female and cause severe low back pain.

Many similar studies have been carried out with respect to this problem. I suggest that research should be done and implemented in fields of pregnancy counseling and training of postural awareness and control with the help of proprioceptive and therapeutic techniques so as to strengthen the pregnant body image and avoid weakening of related musculature.
CONCLUSIONS:

- Lower back pain is common in pregnant women especially in their third trimester.
- Females with a history of back pain are more likely to develop discomfort during pregnancy.
- The timing of symptom onset in mid to late pregnancy may suggest that biomechanical factors particularly postural imbalances play a larger role than hormonal influences.
REFERENCES:

- Ireland, ML. and Ott, SM. *Kentucky Sports Medicine*, Lexington 40517, USA.
- Jenny, E. ( 2009)
• Pennick, V. and Young, G. (2008) *Interventions for preventing and treating pelvic and back pain in pregnancy.*


PERFORMA FOR DATA COLLECTION

Study serial no. ___________  Date of assessment: ___________

Name of patient: ______________  Age: ______________

Address: ______________________  Contact no. ____________

Socioeconomic status:  Upper [ ]  Middle [ ]  Lower [ ]

Age at marriage: ______________

Parity status:  Primagravida [ ]  Multigravida [ ]

Any previous history of back pain: Yes [ ]  No [ ]

Trimester of pregnancy:  1st [ ]  2nd [ ]  3rd [ ]

Weight before pregnancy:  40-45kg [ ]  50-55kg [ ]  60-65kg [ ]

Weight during pregnancy:  50-55kg [ ]  60-65kg [ ]  70-75kg [ ]

Complain of spinal stiffness: Yes [ ]  No [ ]

Leg length discrepancy: Yes [ ]  No [ ]

Length:  Right _______  Left _______

Girth measurement:  Right  Left

   Arm: ___________  ___________

   Thigh: ___________  ___________

   Leg: ___________  ___________

Observation of lumbar curve: Normal [ ]  Exaggerated [ ]

Radiating pain: Yes [ ]  No [ ]

Please specify if yes: ____________________________
TABLES:

Weight before and during pregnancy:

<table>
<thead>
<tr>
<th>FEATURES</th>
<th>RANGE</th>
<th>FREQUENCY</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEIGHT BEFORE PREGNANCY</td>
<td>40-45kg</td>
<td>22</td>
<td>44%</td>
</tr>
<tr>
<td></td>
<td>50-55kg</td>
<td>27</td>
<td>54%</td>
</tr>
<tr>
<td></td>
<td>60-65kg</td>
<td>1</td>
<td>2%</td>
</tr>
<tr>
<td>WEIGHT DURING PREGNANCY</td>
<td>50-55kg</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>60-65kg</td>
<td>18</td>
<td>36%</td>
</tr>
<tr>
<td></td>
<td>70-75kg</td>
<td>32</td>
<td>64%</td>
</tr>
</tbody>
</table>

History of back pain:

<table>
<thead>
<tr>
<th>FACTOR</th>
<th>FREQUENCY</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>HISTORY OF BACK</td>
<td>YES</td>
<td>31</td>
</tr>
<tr>
<td>PAIN</td>
<td>NO</td>
<td>19</td>
</tr>
</tbody>
</table>
Percentage of normal and exaggerated lumbar curve:

<table>
<thead>
<tr>
<th>LUMBAR CURVE</th>
<th>VALUE</th>
<th>FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>NORMAL</td>
<td>21</td>
<td>42%</td>
</tr>
<tr>
<td>EXAGGERATED</td>
<td>29</td>
<td>58%</td>
</tr>
</tbody>
</table>

Percentages of biomechanical changes responsible for back pain in pregnancy.

<table>
<thead>
<tr>
<th>FACTORS CAUSING BACK PAIN</th>
<th>VALUES</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEG LENGTH DISCRIPANCY</td>
<td>12</td>
<td>24%</td>
</tr>
<tr>
<td>GIRTH DIFFERENCE</td>
<td>10</td>
<td>20%</td>
</tr>
<tr>
<td>RADIATING PAIN</td>
<td>28</td>
<td>56%</td>
</tr>
</tbody>
</table>

Percentage of radiating pain and its distribution.

<table>
<thead>
<tr>
<th>RADIATING PAIN</th>
<th>FREQUENCY</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO PAIN</td>
<td>25</td>
<td>50%</td>
</tr>
<tr>
<td>PAIN UP TO KNEE</td>
<td>11</td>
<td>22%</td>
</tr>
<tr>
<td>PAIN UP TO FOOT</td>
<td>12</td>
<td>24%</td>
</tr>
<tr>
<td>PAIN IN BOTH LEGS</td>
<td>2</td>
<td>4%</td>
</tr>
</tbody>
</table>
Frequency of biomechanical changes in pregnancy.

Normal and exaggerated lumbar curve: