COMPARISON BETWEEN POSTURE OF PREGNANT AND NON-PREGNANT WOMEN DURING LIFTING AND LOWERING LOAD FOR HEAD LOAD CARRIAGE

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INTRODUCTION

In Western Africa, women continue performing heavy physical work that includes carrying loads on their heads for domestic and commercial tasks during pregnancy. Due to important anatomical changes such as a higher trunk mass and stretching of the abdominal muscles, the loads on the spine and lower extremities may increase during lifting/lowering tasks. Pregnant women may adapt to these changes by modifying their postures. The objective of this research was to compare the postures of pregnant women during lifting and lowering a load for head load carriage to those of a non-pregnant control group.

METHODS

Twenty-six pregnant women (age 26 ± 5 years, height 159 ± 9 cm, mass 63 ± 15 kg, 25 ± 9 weeks of pregnancy) and 25 non-pregnant women (26 ± 7 years, 159 ± 6 cm, 57 ± 11 kg), all merchants using the head load carriage method, were recruited in Porto-Novo (Benin). Informed consent was obtained from all subjects.

The task consisted of lifting a load, walking 6 m with the load placed on the head, and then lowering it back to its initial position. The load was a sand bag corresponding to approximately 20% of their body weight, placed on a circular tray. The tray was raised from a stool with a height of 45 cm. The procedure was repeated three times by the subjects. Two digital cameras (Sony Handy Cam DCR-SR82), set on tripods at 1 m above ground and 5 m from the subject simultaneously recorded motion in the coronal and sagittal plane. Symmetry w. r. to the sagittal plane was assumed.

Video analysis software (Dartfish Prosuite, version 4.0.9.0) was used to measure joint angles. Four critical events were selected for analysis based on trunk flexion and trunk extension: 1) Picking up the load from the stool, 2) Trunk extension when placing the load on their head, 3) Trunk extension when removing load from their head (just prior to set down), 4) Setting the load down onto the stool.

Frame by frame control was used to ensure that the frames with maximum trunk flexion and extension were selected. Often subjects held a constant trunk flexion or extension angle for a couple of frames. In such cases, the frame where the subject also exhibited maximum upper arm flexion was selected as the frame to be analyzed.

Joint angle measurements included flexion/extension of the knee, trunk, upper arm, lower arm, wrist and neck, as described in the REBA method [1]. Only the knee and trunk angles are presented here.

The angles for the three repetitions were compared with a single factor ANOVA for repeated measures. No significant differences were found (p > 0.05), therefore the data were averaged and the mean of the three repetitions was used to compare the two groups using unpaired t-tests.

RESULTS

Results are presented for 21 pregnant and 24 non-pregnant subjects after excluding subjects who did not complete the required 3 repetitions with a load on the head corresponding to 20% of their body weight (5 pregnant and 1 non-pregnant) (Tables 1-2).

A significant difference between groups was found at maximum trunk flexion for pick up (knee only, p=0.045) and set down (knee, p=0.035 and trunk, p=0.037).

Table 1: Knee Flexion angles (mean (SD) in degrees for the Pregnant (P) and Non-Pregnant (NP) groups

<table>
<thead>
<tr>
<th>GROUP</th>
<th>Pick up</th>
<th>1st Ext.</th>
<th>2nd Ext.</th>
<th>Set down</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>49.7(26.6)</td>
<td>19.7(9.3)</td>
<td>17.5(6.1)</td>
<td>24.7(16.8)</td>
</tr>
<tr>
<td>NP</td>
<td>65.7(25.5)</td>
<td>21(6.8)</td>
<td>15.3(5)</td>
<td>35.7(17)</td>
</tr>
</tbody>
</table>

Table 2: Trunk angle with vertical (mean (SD) in degrees for the Pregnant (P) and Non-Pregnant (NP) groups

<table>
<thead>
<tr>
<th>GROUP</th>
<th>Pick up</th>
<th>1st Ext.</th>
<th>2nd Ext.</th>
<th>Set down</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>83.4(8.2)</td>
<td>16.0(6.0)</td>
<td>14.2(14.1)</td>
<td>84.4(4.0)</td>
</tr>
<tr>
<td>NP</td>
<td>82.0(8.8)</td>
<td>12.7(4.9)</td>
<td>14.2(3.6)</td>
<td>87.7(6.0)</td>
</tr>
</tbody>
</table>

DISCUSSION & CONCLUSIONS

Pregnant women bent their knees substantially less (<15 degrees) than the non-pregnant group to pick up and set down the load, probably because it was harder for them to lift the trunk due to its increased mass. This had little very little effect on their trunk posture which was identical to the non-pregnant group at pick up and was only less inclined by a few degrees at set down. The lack of significant difference between groups for other angles may be due to the large range of stage of pregnancy between subjects. However, when group comparison was attempted with a smaller sample by excluding women in early pregnancy, the results were similar.

REFERENCES


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