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Pelvic tilt exercises in different positions for alleviating lumbar pain during pregnancy – a pilot study

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Abstract

Introduction. The Global prevalence of lumbar pain during pregnancy is reported to range from 24% to 90% where pregnant women experience lumbar pain as the pregnancy advances (from a later stage of the second trimester). Only limited studies have emphasised the importance of pelvic tilt exercises for lumbar pain during pregnancy. Thereby, our aim is to find the immediate and short-term effects of sitting and standing pelvic tilt exercise on lumbar pain during pregnancy.

Methods. An experimental study of pre and post type performed on 40 pregnant women selected according to the inclusion and exclusion criteria and randomly divided into an experimental group (group A) and the control group (group B). Each group consisted of 20 subjects. The experimental group was treated with sitting and standing pelvic tilt exercise along with Kinesiotaping, whereas the Control group with Kinesiotaping alone.

Results. Immediate and short-term effects on lumbar pain were statistically significant in the experimental group ($p \leq 0.01$) compared to the control group. The immediate and short-term effects on functional disability were not statistically significant between the experimental group (24.28%) and the control group (20.81%) at ($p > 0.05$).

Conclusions. It is concluded that pelvic tilt exercise in sitting and standing positions proved to be an effective treatment for lumbar pain during pregnancy.

Key words: lumbar pain, pregnancy, kinesiotaping, sitting and standing pelvic tilt exercise, core activation, musculoskeletal pain

Introduction

Lumbar pain during pregnancy is a common complaint among pregnant women, which has a negative impact on their quality of life [1]. One report says that 45% to 75% of women are affected by lumbar pain at some time during pregnancy [2]. In pregnancy, lumbar pain typically happens where the pelvis meets the spine at the sacroiliac joint, caused by weight gain, postural changes, hormonal changes, and muscle separation (rectus abdominis) [3]. Lumbar pain during pregnancy can be classified as pelvic girdle pain, lumbar pain, or their combination. In rare cases, severe back pain may be related to problems such as pregnancy-associated vertebral osteoarthritis, osteoporosis, or septic arthritis [4].

During pregnancy, there will be an increased biomechanical strain on the muscles, ligaments and the joints, which occur due to the influence of hormones [5]. The first episode of pain in a pregnancy may occur at any stage, but for most women, it is between the 20th and 30th week of gestation [6]. This discomfort may occur due to the centre of gravity shifting forwards, placing more strain on the lumbar area, and gradual stretching and weakening of the abdominal muscle [7].

As pregnancy progresses, the hormones acting on the ligaments relax and loosen the joints in and around the pelvis so that the joints are flexible enough to allow the foetus to pass through the birth canal easily, which may also have an impact on lumbar pain [8, 9]. In Western countries, prenatal practitioners educate pregnant women on how to cope with their pelvic pain, lumbar pain or both, and refer them to a physiotherapist if needed [10]. The updated interventions used to manage the pain are non-pharmacological in nature and include frequent rest, exercises, massage, relaxation, abdominal or pelvic support belts, hot and cold compresses, acupuncture, aromatherapy, chiropractic treatment, yoga, herbs, and Reiki [10]. Women's health physiotherapy can provide a non-invasive intervention to benefit the pregnant population.

The growing trend of the kinesiotaping method developed by Dr Kenso Kase in 1970, which is used in various fields of physiotherapy, has gained attention in treating lumbar pain in pregnancy [11, 12]. The discomfort experienced by pregnant women due to lumbar pain varies from disturbed sleep to decreased daily functional activities, which are considered the most prevalent reasons for sick leave [13]. Research into an exercise intervention program targeting lumbar pain and daily life interference in pregnancy is lacking. Studies have recommended that kinesiotaping can be used as a complementary treatment method to achieve the effective control of pregnancy-related lumbar pain [2].

Studies have reported that the effect of sitting pelvic tilt exercise on primigravida (a woman who is pregnant for the first time) could decrease back pain without causing any adverse effect on maternal or foetal health [13, 14]. However, studies on functional sitting and standing pelvic tilt exercise for this specific population (patients with lumbar pain during pregnancy) are sparse. As a fundamental starting position, pelvic tilting exercises in these two positions can resemble the activities of daily living (ADL). Therefore, our goal is to find the immediate and short-term effects of sitting and standing pelvic tilt exercise on lumbar pain during pregnancy.

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Subjects and methods

An experimental pre-post design was conducted in SRM medical college hospital and research centre as a pilot study. Once approval was given by the local institutional review board, according to the Declaration of Helsinki, subjects were recruited from our institution's antenatal clinic. We included both primigravid and multigravida pregnant women at gestational age of 16 to 30 weeks, having low back pain from T12 to the gluteal fold. Those with a history of low back pain prior to pregnancy, lumbar radiculopathy, spinal deformities, intervertebral disc pathology, high-risk pregnancy, IVF (in vitro fertilisation) or any allergic reaction to Kinesio tape were excluded from the study. The procedure was explained clearly, and written consent was taken from 40 subjects. The estimated sample size was adequate to differentiate a medium-to-large effect between the groups with 90% power. Prior to the study, the 40 subjects were divided into two groups. Group A was an experimental group, where kinesiotaping was done followed by sitting and standing pelvic tilt exercise. Group B was a control group, who received kinesiotaping alone.

Subject selection procedure for kinesiotaping

An allergy test was performed on all subjects. A patch of Kinesio tape was applied to the skin. The patients were asked to keep this patch on for 24 hours. If any allergic reaction occurred, the patients were instructed to remove the patch. Those without an allergic reaction to the patch test were then included in the study.

Measurement for kinesiotaping

Vertical measurement (two I-shaped bands) was taken from the posterior superior iliac spine (PSIS) to the 12th rib and horizontal measurement (two I-shaped bands) was taken from 3 cm lateral to the PSIS on both sides in a standing position by inch tape before the application. Four I-shaped Kinesio bands with a width of 5 cm and thickness of 0.5 mm were used.

Group A intervention

Application of Kinesio tape

In a stride standing position, the patient was asked to bend slightly forward so that she can lean comfortably on the high couch infront of her with supported pillows under her elbows (for lumbar flexion at a point of maximal comfort for the patient). Two I-shaped bands were applied, one on each side of the lumbar spine vertically from 2 cm below the PSIS to the 12th rib region. The remaining two I-shaped bands were attached horizontally, one laterally to the PSIS and the other above the PSIS, to provide stability for the bands applied vertically. All four bands were given 50% longitudinal stretching during application of the kinesiotape by following the inhibition technique. The patient was advised to take off the applied kinesiotape after eight hours.

Sitting and standing pelvic tilt exercise protocol

Sitting position

The patient was asked to sit straight in a back rest chair and take a deep breath in. While breathing out, they were asked to roll their hips back and hold for 5 seconds, then relax for 5 seconds. This was repeated 5 times for 3 sets per day for 5 days.

Standing position

The patient was asked to stand straight with wall support and take a deep breath in. While breathing out, they were asked to roll their hips back and push against the wall and hold for 5 seconds, then relax for 5 seconds. This was repeated 5 times for 3 sets per day for 5 days.

Group B intervention

Kinesiotaping alone was performed as mentioned above.

Assessment procedure

The severity of the lumbar pain was measured in both groups using the Numerical Pain Rating Scale (NPRS) and the functional disability was evaluated using the Roland-Morris Disability Questionnaire (RMDQ). The numerical pain rating scale consists of a 10 cm line, where the 0 cm position, on the left, represents no pain and the 10 cm position, on the right, represents the worst pain. The numerical pain rating scale was explained clearly, and the two groups' pre-test scores were taken before the treatment and post-test scores were taken after 5 minutes of movements (walking at their comfortable pace). The Roland-Morris Disability Questionnaire of 24 questions was explained clearly to the patients and scoring was calculated according to the number of ticks. The scores ranged from 0 (no disability) to 24 (maximum disability). Later, the improvement was calculated as a percentage.

For example: Percentage calculation for the RMDQ pre-test score was 12 and the post-test score was 2 (10 points of improvement) (10/12 × 100 = 83%). Pre-test was taken from NPRS and RMDQ. Post-test NPRS and RMDQ were taken after 5 minutes of movements (walking at their comfortable pace).

Statistical analysis

The results were analysed using the IBM SPSS version 20.0 software. For inferential statistics, the paired *t*-test was selected for within-group analysis and the unpaired *t*-test for between-group analysis to assess the immediate and short-term effect of sitting and standing pelvic tilt exercise with kinesiotaping on lumbar pain during pregnancy.

Ethical approval

The research related to human use has complied with all the relevant national regulations and institutional policies, has followed the tenets of the Declaration of Helsinki, and has been approved by the scientific review board of the SMR College of Physiotherapy (SRM University).

Informed consent

Informed consent has been obtained from the legal guardians of all individuals included in this study.

Results

The immediate effect on pain intensity values (NPRS) was significant in both groups on each day of the treatment at $p \leq 0.001$. With the functional disability scores (RMDQ), there was no change in the immediate pre- and post-test

value on each day of the treatment (Table 1). However, the short-term effect on pain intensity values and functional disability scores was significant in both groups after five days of the treatment at $p \leq 0.001$ (Table 2).

Analysing the changes in the post-test values, from day 1 to day 5 of treatment, the experimental group showed a greater improvement in both the immediate and short-term effects on pain intensity (NPRS) than the control group at $p \leq 0.001$ (Table 3). On the functional disability scores (RMDQ), the experimental group showed a 4% improvement over the control group on the percentage calculation for short-term effect alone (Table 3).

Table 1. Immediate effect on lumbar pain and functional disability within experimental group and control group

NPRS	Pre-test (mean ± *SD*)	Post-test (mean ± *SD*)	Paired *t*-test	*p*-value
Experimental group (*n* = 20)				
Day 1	9.30 ± 0.16	3.10 ± 0.33	21.637	0.0001
Day 3	5.15 ± 0.08	1.70 ± 0.27	14.038	0.0001
Day 5	3.45 ± 0.17	0.90 ± 0.20	10.860	0.0001
Control group (*n* = 20)				
Day 1	9.30 ± 0.15	4.10 ± 0.32	17.592	0.0001
Day 3	6.85 ± 0.15	2.65 ± 0.20	22.535	0.0001
Day 5	4.60 ± 0.21	2.35 ± 0.21	22.650	0.0001

RMDQ	Pre-test (mean ± *SD*)	Post-test (mean ± *SD*)	Paired *t*-test	*p*-value	Improvement %
Experimental group (*n* = 20)					
Day 1	11.70 ± 0.56	11.70 ± 0.56	–	–	–
Day 3	11.70 ± 0.56	11.65 ± 0.60	–	–	–
Day 5	8.80 ± 0.52	8.80 ± 0.52	–	–	–
Control group (*n* = 20)					
Day 1	9.85 ± 0.52	9.85 ± 0.52	–	–	–
Day 3	9.85 ± 0.52	9.85 ± 0.52	–	–	–
Day 5	7.80 ± 0.64	7.80 ± 0.64	–	–	–

NPRS – Numerical pain rating scale
RMDQ – Roland-Morris Disability Questionnaire

Table 2. Short-term effect on lumbar pain and functional disability levels within experimental group and control group

NPRS	Pre-test (mean ± *SD*)	Post-test (mean ± *SD*)	Paired *t*-test	*p*-value
Experimental group (*n* = 20)	9.30 ± 0.16	0.90 ± 0.20	35.904	0.0001
Control group (*n* = 20)	9.30 ± 0.15	2.35 ± 0.21	37.648	0.0001

RMDQ	Pre-test (mean ± *SD*)	Post-test (mean ± *SD*)	Paired *t*-test	*p*-value	Improvement %
Experimental group (*n* = 20)	11.70 ± 0.56	8.80 ± 0.52	6.328	0.0001	24.78
Control group (*n* = 20)	9.85 ± 0.52	7.80 ± 0.64	6.098	0.0001	20.81

NPRS – Numerical pain rating scale
RMDQ – Roland-Morris Disability Questionnaire

Table 3. Immediate and short-term effect on lumbar pain and functional disability between experimental group and control group

	Experimental group (*n* = 20) (mean ± *SD*)	Control group (*n* = 20) (mean ± *SD*)	Unpaired *t*-test	*p*-value
NPRS				
Day 1 Post	3.10 ± 0.33	4.10 ± 0.32	–2.158	0.037
Day 3 Post	1.70 ± 0.27	2.65 ± 0.20	–2.832	0.007
Day 5 Post	0.90 ± 0.20	2.35 ± 0.21	–4.970	0.0001
RMDQ				
Day 1 Post	11.70 ± 0.56	9.85 ± 0.52	2.416	0.021
Day 3 Post	11.65 ± 0.60	9.85 ± 0.52	2.279	0.028
Day 5 Post	8.80 ± 0.52	7.80 ± 0.64	1.213	0.233
Improvement %	24.28	20.81	–	–

NPRS – Numerical pain rating scale
RMDQ – Roland-Morris Disability Questionnaire

The immediate effect based on the pre- and post-test values was significant in both the experimental and control groups for lumbar pain (NPRS) ($p \leq 0.001$) for functional disability (RMDQ).

The short-term effect based on the pre- and post-test values was significant in both the experimental and control groups for lumbar pain (NPRS) ($p \leq 0.001$) and functional disability (RMDQ) ($p \leq 0.001$).

The immediate and short-term effects on lumbar pain were statistically significant in the experimental group ($p \leq 0.01$) over the control group, whereas functional disability was not statistically significant between the experimental group (24.28%) and the control group (20.81%) at $p > 0.05$.

Discussion

Immediate and short-term effect of sitting and standing pelvic tilt exercise proved to be more effective in reducing pain and improving the functional ability in patients with lumbar pain during pregnancy when compared with kinesiotaping alone.

The literature clearly indicates that lumbar pain during pregnancy could be limiting the activities of daily living and impairing productivity, making it functionally disabling and thereby treatment cannot be neglected [15]. Despite these negative effects, most women consider lumbar pain as an inevitable, normal discomfort during pregnancy. Only 50% of women suffering from pregnancy-related low back pain will seek advice and 70% of them will receive some kind of treatment. Given the high incidence of lumbar pain during pregnancy [16], larger studies are needed to test potential preventions and treatment options in wider populations to contribute to improving women's health.

Considering the treatment options for lumbar pain during pregnancy, multimodal intervention (Exercise, Manual therapy and education), acupuncture, core stabilisation, craniosacral therapy, and osteopathic manipulative treatment (OMT) are the most frequently used interventions [17, 18].

Kinesiotaping is an alternative to pharmacological treatment in pregnancy-related low back pain and has been found most effective when used as an adjunctive therapy with exercise in chronic low back pain [2]. In our study, kinesiotaping was applied following the copula technique to favour maximum stretching [19]. Findings from the literature suggest that pelvic tilt exercise in a sitting position would decrease back pain and sleep disorder in patients with lumbar pain during pregnancy. In addition, the level of evidence is low for exercise in this specific population. Therefore, our study provides a valuable contribution to the existing literature regarding the benefits of pelvic tilt exercise done in two different positions which provided pain relief and considerable improvement in functional ability among women with lumbar pain during pregnancy [18, 20].

The scoring of the NPRS and RMDQ was marked by the examiner during the treatment session [21]. Pain intensity measured by using NPRS can also be used as a unidimensional measure [22]. The scoring of the numerical pain rating scale ranges from 0 to 10 points, where 0 represents no pain and 10 represents the worst pain [23, 24]. The RMDQ was checked for its reliability in assessing functional disability on low back pain in Thai patients [25].

Regarding the interpretation of our data, the treatment is effective in providing both immediate and short-term relief from lumbar pain as the experimental group, who was treated with sitting and standing pelvic tilt exercise along with kinesiotaping, showed a significant difference in both the immediate and short-term effects on lumbar pain ($p \leq 0.001$) over the control group, who received kinesiotaping alone. Considering the functional disability scores, there was no immediate improvement, as the pre- and post-test values on each day were the same [26], even though the post-test values were taken after five minutes of movement. This shows that to prove the immediate effect of sitting and standing pelvic tilt exercise on functional disability scores, post-test values can be taken at the end of each day of the treatment rather than after 5 minutes of movement.

Analysing the short-term effect revealed that experimental group, who were treated with sitting and standing pelvic tilt exercise along with kinesiotaping, showed a greater decrease in lumbar pain and functional disability during pregnancy than the control group, who underwent kinesiotaping alone. Pelvic tilt exercises designed in a sitting and standing position are a low- intensity exercise done to activate the core muscles (internal oblique, external oblique, transverse abdominis, pelvic floor), which are stretched during pregnancy. This co-activation of the core muscles imparts active stiffness through thoracolumbar fascia to the lumbar spine and thereby reduces the exaggerated lumbar lordosis which is considered one of the causes of lumbar pain during pregnancy [27, 28]. Like any other joints in the human body, the range of motion and core activation around the pelvic joints also need to be maintained.

In both the within- and between-group analyses, the immediate effect of sitting and standing pelvic tilt exercise on functional disability was not statistically significant. However, when the percentages were calculated, the experimental group showed a 24.28% improvement while the control group showed a 20.81% improvement on functional disability scores for the short-term effect. Pregnancy-related musculoskeletal disorders need timely management to prevent future complications. The effect on reducing the pain intensity and functional disability would have been higher if treatment was given continuously. Being a pilot study, potentially influential factors, such as age, BMI, health-related literacy level and postural variation, were not analysed. However, in support of our findings, there is an immense need for studies with larger sampling and longer follow-up periods. Furthermore, being a home-based exercise program, these pelvic tilt exercises can be tailored with other daily activities done while sitting and standing to maintain the pain relief throughout the day.

Conclusions

The results of our study revealed that the experimental group (sitting and standing pelvic tilt exercise with kinesiotaping) experienced a significant immediate and short-term effect on lumbar pain during pregnancy when compared to the control group (kinesiotaping alone). Thereby in support of our hypothesis, it is concluded that sitting and standing pelvic tilt exercise proved an effective treatment for pregnant women suffering from lumbar pain.

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Disclosure statement

No author has any financial interest or received any financial benefit from this research.

Conflict of interests

The authors state no conflict of interest.

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