



Effect of different techniques of kinesio-taping in low back pain during the third trimester of pregnancy in primigravidas: Experimental study.

Dr. Pawar Mithila Mukesh (PT)¹, Dr. Dhupkar Abha (PT)²

¹MPT in Community Physiotherapy DES Brijlal Jindal college of physiotherapy, Fergusson College Campus, Pune - 411 004, Maharashtra, India

²MPT in Community Physiotherapy, Associate Professor and HOD of Community Physiotherapy at DES Brijlal Jindal college of physiotherapy, Fergusson College Campus, Pune - 411 004, Maharashtra, India.

*Corresponding Author: Dr. Pawar Mithila Mukesh

Email id: mithilapawarr3@gmail.com

ABSTRACT

Pregnancy related low back pain is a common condition during pregnancy. It is managed with conventional physiotherapy treatment protocols like exercises, use of modalities, manual therapy and various adjunct therapies. Kinesiotaping is also used widely to treat low back pain. There are different techniques of kinesiotaping that are used widely. The aim of this study was to find out the effect of two different techniques of kinesiotaping in pregnancy related low back pain. The outcome measures used were Numerical Rating Scale (NRS) and Pregnancy Mobility Index (PMI). Forty-five participants were allocated in three groups using random number generator with fifteen in each group-control, Taping Technique 1(TT1) and Taping Technique 2(TT2). Control group was provided with conventional exercises like pelvic tilts, core activation and Kegel's exercises which were to be done twice a day for a period of five days along with the ergonomic advice. TT1 was given with the spine in neutral using four I bands which were applied vertically and horizontally. Two I bands were applied vertically using fifty percent stretch and inhibition technique from lower iliac crest to upper twelfth rib and two I bands were applied horizontally using space correction technique. TT2 was applied with the spine in lumbar flexion. Three I bands were used with two applied vertically along the paraspinal muscles with fifteen to twenty five percent stretch and the third tape was applied horizontally with hundred percent stretch in middle and no stretch at the ends. In both the techniques exercises were provided along with the taping given for a period of five days. The outcome measures used were NRS and PMI. Pain was evaluated on NRS at baseline, immediate after intervention and post five days of intervention. PMI score was taken at baseline at post five days of intervention. The results showed significant difference in NRS and PMI scores in all the three groups post five days of intervention but TT1 showed significantly superior difference as compared to other groups. The study thus concluded that TT1 is effective in reducing the pregnancy related low back and it is a better technique of taping as compared to TT2.

Keywords: Exercises, kinesiotaping, low back pain, pregnancy

INTRODUCTION

Human pregnancy lasts for forty weeks or two hundred and eighty days.¹ During these forty weeks of pregnancy a lot of physiological changes take place in the body. These are a result of four factors: effect of hormones on the collagen and involuntary muscle, increased total blood volume with increased blood flow to the kidneys and uterus, growth of foetus resulting in enlargement and displacement of uterus and increase in body weight and adaptive changes in the posture and centre of gravity.¹

As the pregnancy progresses, weight gain and increased abdominal girth cause a shift in the centre of gravity (COG) more anteriorly, thereby leading to compensatory changes in spinal alignment and hence affecting posture.² In order to counteract these compensations, there is increase in the lumbosacral angle, increase lumbar lordosis or anterior shift of the pelvis, anteversion of pelvis, hyperextension at the knee joint and reduction in the plantar arch.³ These are brought about by a counterbalancing force by muscle activities of gastrocnemius and soleus, extension at the hip joint, posterior displacement of the upper trunk. However, the result of these compensations is an increased stress on the spine causing low back pain during pregnancy⁴. Various reports suggest that 68.6% women experience back pain at least once during their pregnancy.⁵

Pelvic girdle pain and lumbopelvic pain are the two different components of low back pain that are associated with pregnancy. Pelvic girdle pain is usually between the iliac crest and the gluteal fold. It is more of stabbing in nature, continuous, intense and might radiate down to posterior thigh and knee.⁶ It has been shown that pelvic girdle pain increases with daily routine activities like standing, sitting, lying and as little walking as thirty min.⁷ Lumbopelvic pain is more around the lumbar spine and above the sacral region, which differentiates it from pelvic girdle pain. It is usually seen with paraspinal muscle tenderness and aggravates more after prolonged hours of sitting.⁶ It may or may not radiate down the leg.

Management of low back pain in pregnancy using medications is limited, with little data on safety of pain medications that can be used during pregnancy. The mainstay of treatment for most of the women is physiotherapy, chiropractic care, home remedies and rest.

In a study by Helen Hall et al on the effectiveness of complimentary manual therapies, like massage, spinal manipulation, osteopathy in pregnancy related low back pain it was found that there is limited evidence to the use of complimentary manual therapies and also its effect on low back pain during pregnancy.⁸

The conventional physiotherapy treatment methods for low back pain in pregnancy include use of corsets to reinforce the spinal and sacroiliac (SI) joints, use of superficial heating modalities, TENS and exercises to reduce the load on the spine, like pelvic tilting exercises in quadruped position and co-contraction of transversus abdominis and multifidus. It

also includes ergonomic advice and modification of work techniques.

Corsets can become cumbersome and many women face issues with using them during daily activities. TENS parameters need to be modified for the patient's use and is a good modality to use. However, there might be issues with accessing an obstetric unit to use at home and compliance to a current based modality during pregnancy might be less. Home remedies, like hot water fomentation, cause pain relief for a limited duration, with a resurgence in pain levels after the effect has worn off. Also, these techniques do not address the underlying issue causing pain and are more symptomatic in nature.

A recent technique being used to reduce pregnancy related low back pain is kinesiotaping, a method of improving body function while maintaining stability of the affected region developed by Kenzo Kase. An elastic bandage method using a waterproof material that allows aeration, it is thought to cause pain relief, improve blood and lymphatic circulation, increase segmental stability, improve fascia function and position and reduce the stresses on the muscle.^{10,11,12}

The various techniques of kinesiotaping, its application and effects have been mentioned in an article by Mariya Gramatikova et al in 2014.¹³ 'I' bands are used for focusing directly on the target tissue for stabilizing the joints. 'Y' bands are used to create tension under the bar and two ends of the connective tissue¹³, used for supporting ligaments, tendons and fascia. 'X' bands are used so tension is focused on the target tissue between the two double edges. It can be used in small areas like elbow, rhomboids etc.¹³ 'Fan cut' and 'Web cut' are the techniques used to reduce oedema and improve blood and lymph circulation. Also, different stretch rates are used to achieve results like mechanical corrections, ligament stability, oedema reduction, facilitating or inhibiting the myofascial structures.¹³

In a study by Pawel Kalinowski on pregnancy related low back pain, the therapeutic effect of kinesiotaping was seen on day two after application and continued even 2 days after removal of tape.¹⁴

The available literature on taping in pregnancy showed a variability of techniques of applying the tape. Hence, a need was felt to identify the better method of taping in this population.

METHOD

Study design

Experimental - intervention based study

Study setting

Obstetric clinics, hospitals, community

Duration of the study

one year.

Inclusion criteria

1. Women between eighteen to forty years of age.
2. Women experiencing pain between T12 spinous process to gluteal fold.
3. Women having posterior pain in the sacral region.
4. Gestational age between seven to nine months.
5. Primipara.
6. Should be able to read and write in English.
7. One of the given special tests should be positive- Faber’s, modified compression, 4P test.

Exclusion criteria

1. Women with diagnosed spine injuries, ankylosing spondylosis, Rheumatoid Arthritis.
2. Inter-Vertebral disc pathology.
3. Twin pregnancy.
4. High risk pregnancies
5. Anterior pain over the pubic symphysis.
6. Attending antenatal classes.
7. Multipara.

Withdrawal criteria

1. Women who refuse to participate.
2. Drop outs due to allergy to the kinesiotope.
3. Women who do not comply with the exercises.
4. Women who do not complete the duration of intervention.

Variables

Dependant variable-pain, pregnancy mobility index
Independent variable- technique of taping.

Materials

1. consent form
2. kinesiotope
3. A pair of scissors
4. Pen
5. Paper
6. Questionnaires.

Sample size-44 (45 for convenience of data analysis)

$$n = \frac{Z^2 Px(1 - P)}{d^2}$$

With fifty percent Prevalence, fifteen percent level of significance and eighty five percent power of test using above formula (Daniel) the desired sample size would be forty-four.

Sampling technique-Samples were selected using Purposive sampling method, and then they were divided into the study groups (control, TT1 and TT2) using simple random sampling.

Outcome measure	Purpose of assessment	Psychometric data
Numerical Rating Scale (NRS) ¹⁵	Objective pain assessment	Test-retest reliability r=0.96 Validity 0.86 to 0.95
Pregnancy Mobility Index (PMI) ¹⁶	Ability to perform routine household activities during pregnancy	Reliability r=0.8 or higher Validity -good construct validity

Ethical clearance was obtained from the institutional ethics committee. Informed written consent was taken from each subject. Demographic data and other relevant details regarding the onset of low back pain were recorded. The tests used for identifying back pain were 4P test, Faber’s and modified compression. Subjects were assessed for pain, using numerical rating scale (NRS), and their functional disability, using Pregnancy Mobility Index (PMI), baseline parameters for which were taken for all subjects. Using random number generator, the participants were divided in three major groups: control, Taping technique one (TT1) and Taping technique two (TT2); each group having fifteen participants.

TT1and TT2 were the interventional groups where two different methods of taping were given along with exercises and ergonomic advice and the control group received only

exercises and ergonomic advice for low back pain. Kinesiotope was applied for a period of five days. NRS was taken immediately after the application of kinesio tape, and at five days whereas PMI was taken at baseline and at the end of five days.

In the first technique of kinesiotaping (TT1) four I band of tape were used and taping was done keeping the spine in neutral. Two were applied longitudinally along each side of the lumbar spine from T12 spinous process to gluteal fold using inhibition technique and the remaining two were applied horizontally using the space correction technique.¹¹ The bands were allowed to stretch fifty percent longitudinally in the middle region with no stretch at the base and the tail of the tape.¹¹ The stretching directions were inferior to superior and sideways respectively.(Figure 1)



Fig 1: Taping technique 1



Fig 2: Taping technique 2

In the second technique (TT2), the tape was applied in maximum lumbar flexion. Two I bands were applied longitudinally along the paraspinal muscles with a stretch of fifteen to twenty five percent in the middle region with no tension at the base and the tail of the tape.¹⁷ Third I band was applied horizontally with maximum stretch in the middle region and no tension at tail and base.¹⁷ (Figure 2)

Exercises⁴ were given to all the three groups for low back pain along with ergonomic advice. Participants were asked to do all the exercises twice per day for a period of five days.

1. Co-contraction of transversus abdominis and multifidus –Quadruped position - ten repetitions with five seconds hold.
2. Pelvic tilts - quadruped position – ten repetitions with five seconds hold.

3. Kegel's exercises - ten repetitions

Ergonomic advice.⁴

1. Avoid activities which require forward bending.
2. Lifting any heavy weight.
3. Prolonged standing in one position.
4. Sitting without back support.

Statistical analysis-Statistical analysis was done using Wilcoxon Signed Rank test, Kruskal Wallis Test.

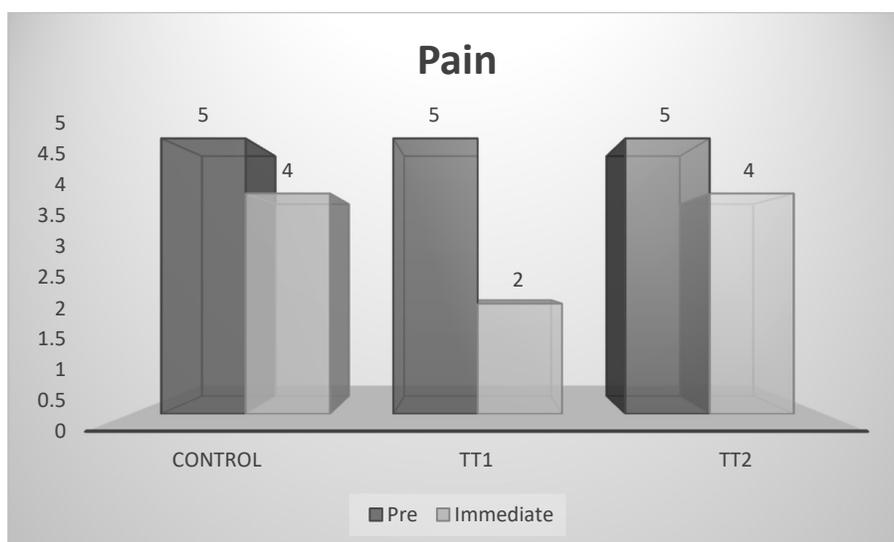
RESULTS

Table1: It shows statistical analyses of pain scores pre and immediate after intervention using Wilcoxon signed rank test.

Graph1: It shows pain scores pre and immediate after intervention in all the three study groups.

Table 1: Statistical analyses of pain scores pre and immediate after intervention using Wilcoxon signed rank test

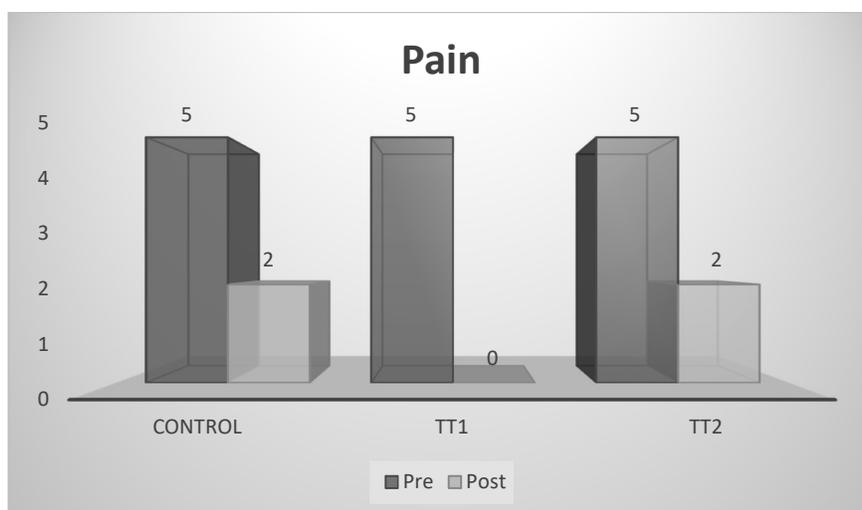
Pain	Median		Wilcoxon Signed Rank W	P-Value	% Effect	Result
	Pre	Immediate				
Control	5	4	-3.275 ^a	0.001	24.4	Significant
TT1	5	2	-3.314 ^a	0.001	54.4	Significant
TT2	5	4	-3.269 ^a	0.001	24.7	Significant



Graph 1: It shows pain scores pre and immediate after intervention in all the three study groups.

Table 2: It shows statistical analyses of pain scores pre and post 5 days of intervention in all the three study groups using Wilcoxon signed rank test.

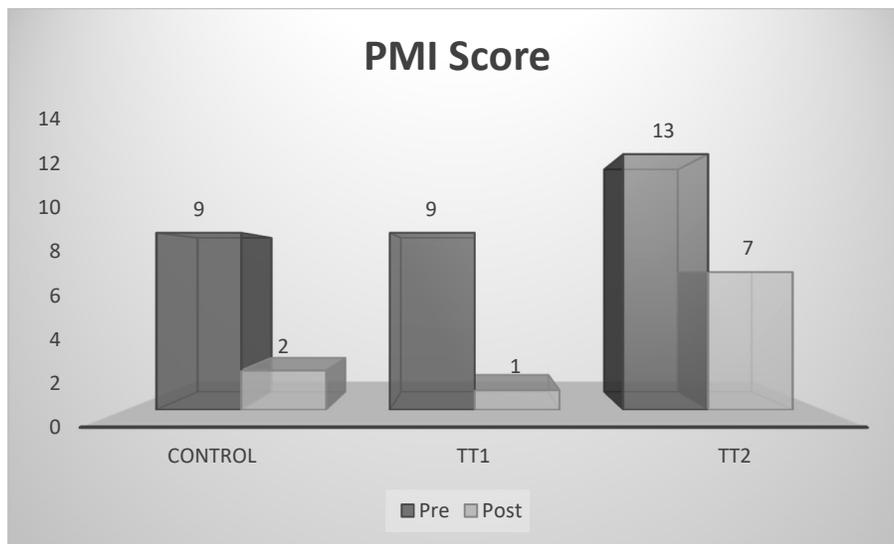
Pain	Median		Wilcoxon Signed Rank W	P-Value	% Effect	Result
	Pre	Post				
Control	5	2	-3.336 ^a	0.001	52.6	Significant
TT1	5	0	-3.417 ^a	0.001	77.2	Significant
TT2	5	2	-3.428 ^a	0.001	62.4	Significant



Graph 2: It shows pain scores pre and post 5 days of intervention in all the three study groups.

Table 3: It shows statistical analyses of PMI scores pre and post 5 days of intervention using Wilcoxon signed rank test.

PMI Score	Median		Wilcoxon Signed Rank W	P-Value	% Effect	Result
	Pre	Post				
Control	9	2	-3.062 ^a	0.002	55.1	Significant
TT1	9	1	-3.298 ^a	0.001	66.9	Significant
TT2	13	7	-2.713 ^a	0.007	36.8	Significant



Graph 3: It shows PMI scores pre and post 5 days of intervention in all the three study groups.

Table 4: Comparison in Control, TT1 and TT2

	Group	N	Mean Rank	Kruskal Wallis H	P-Value
Change in Pain Immediately	Control	15	18.93	7.896	0.019
	TT1	15	30.40		
	TT2	15	19.67		
	Total	45			
Change in Pain Post 5 Days	Control	15	17.40	6.048	0.049
	TT1	15	27.63		
	TT2	15	23.97		
	Total	45			
PMI Score	Control	15	23.10	6.458	0.040
	TT1	15	26.20		
	TT2	15	19.70		
	Total	45			

Kruskal Wallis Test was used for comparison among Control, TT1 and TT2. From above table we can observe that p-values are less than 0.05. Hence, we conclude that there is significant difference in Control, TT1 and TT2. Further we can observe that mean rank for TT1 is greater than Control and TT2 hence we conclude that effect observed in TT1 is more than Control and TT2

DISCUSSION

This study showed positive changes in pain levels and the PMI for all three groups. The PMI assesses the daily functioning of the woman and identifies the issues that she faces in these tasks. This index showed a significant reduction from baseline in all three groups. The NRS, assessed at baseline, immediately after and at the end of the study also showed a significant reduction in all three study groups.

As the pregnancy progresses there is increase in weight, abdominal girth and increased lordosis which shifts the COG anteriorly. The effect of relaxin increases as pregnancy progresses. The pelvic joints are most affected due to a need

to create space for the growing foetus. Added to this, muscles act in subtly altered positions and hence, force production of these muscles can also be affected. The method in which forces on the spine are resolved can hence change, which causes abnormal stresses in the lumbosacral region.

Exercises, mainly core stabilization exercises and pelvic floor exercises, can change the length-tension relationship of the muscles in the low back and pelvic region, thus altering the force production of these muscles. As the transversus abdominis and the multifidus create an almost continuous corset around the abdomen, increased firing of these muscles can change the stability of the back. This, along with the taping techniques could have started realigning the structures and hence, provided stability in the lumbopelvic region.

When taping is given there is more stability given to the lumbosacral structures, relieving abnormal stresses on the paraspinal muscles thus relieving pain.¹¹ The other physiological reasons might be^{17,18}

1. It gathers the fascia to realign the tissues in appropriate position.

2. Stimulation of mechanoreceptors thereby affecting the range of motion
3. Lifts the skin off creating space between the muscles and skin, thereby reducing inflammation.
4. Decreases pressure over lymphatic channels and improves their activity causing removal of exudates.

Morrissey mentioned that when taping is applied to a less active muscle, it reduces in length and shifts the length tension curve towards left.¹⁷ This will pull the actin myosin chains closer together, leading to a contracted state of the muscle, thereby inhibiting the muscle.¹⁹ Alexander et al said that the excitability of motor neurons is reduced if taping is done in the direction of muscle fibre, thereby reducing the firing rate of the muscle and excitability of the muscle.¹⁷ The possible effect of these changes could be on the inhibition of the overactive muscles, hence leading to a reduced stress on the lumbar region, thereby reducing pain.

In contrast Chen et al, Cools et al Fu et al found out that taping had no effect on the excitability of the muscles in healthy individuals¹⁷, results of which are supported by Lindsay Hagen et al (2015), who found that there is no effect of therapeutic taping on back muscle endurance.²⁰ Alpha and gamma motor neurons innervate the skeletal muscle and muscle spindle respectively. When the muscle contracts these are activated simultaneously causing alpha gamma co-activation. When the muscle spindle fibre contracts, the afferents group 1a and 2 sensitizations does not reduce but is maintained in the state of excitement. Thus, the excitability of motor neurons is neither decreased nor increased.¹⁷ This could explain why kinesiotaping over the skin is not enough to cause changes in the muscle activity.

Two different methods of taping were used in this study, TT1 and TT2. A between group analysis, using Kruskal Wallis test, comparing the control, TT1 and TT2 groups, shows that the p values are less than 0.05 for all groups. Effect sizes calculated showed that TT1 group's treatment was more effective.

The addition of taping to exercises could have been one reason for the significant change in the NRS and PMI values. The differences in the two types of taping were the stretch that was applied to the tape (fifty percent in TT1 and fifteen to twenty five percent in TT2), the number of tapes that were applied (four I bands in TT1 and three I bands in TT2) and the position in which they were applied (neutral spine for TT1 and maximum lumbar flexion for TT2)¹³. These differences could have resulted in TT1 stabilizing the spine better and hence caused more change in the pain and PMI scores. It has been seen that as the stretch rate increases more changes are seen in the fascia and muscles.¹⁸ The muscle layers lift up, creating a hollow space between fascia and muscle, allowing

more lymphatic fluid and increased blood circulation, thereby providing pain relief.¹⁸ Taping stimulates mechanoreceptors which interfere with the painful stimuli and facilitate pain gate mechanism (Deleo 2006, Paolini et al 2011). It is also said keratinocytes stimulate the C fibres to initiate pain gate mechanism²¹ (Lumpkin and Caternia 2007). More number of mechanoreceptors could have been stimulated in the TT1 as compared to the other technique, which could explain the effects seen.

PMI was developed by Van de pol et al to assess the ability to perform daily routine household activities on a scale of zero (no problem at all to performing the task) to three (impossible to perform).¹⁶ Higher the score, more the difficulty to perform activities. We used this index in the present study to highlight the difficulty women face when performing daily tasks in an altered biomechanical state.

The present study shows that taping is a viable option in the treatment of low back pain occurring in pregnancy, in addition to exercises. Exercises can modify the length tension relationships in the muscles, which can be augmented by the type of taping and the method of taping. As the tape provides an immediate difference in the pain parameters, it can be a useful modality to control pain and improve function in the woman. A reduction in pain will also contribute in an improved sense of well-being in the woman, hence altering her quality of life. The compliance to taping can be potentially higher than other conventional methods of pain relief, probably as it is an external application. With medications being restricted in the pregnancy period, it falls to the thermal agents and techniques like taping to provide pain relief.

Amongst the two methods of taping that were explored in this study, the first method provided better relief of pain and improvement in quality of life. This could, hence, be considered the better option amongst the two, when deciding on the taping technique to be used.

CONCLUSION

From the present study it can be seen that there is a difference in the two types of kinesiotaping on NRS and PMI, with TT1 being considered better as compared to TT2.

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