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The effect of Kinesio taping for pregnant women suffering from sacroiliac joint dysfunction induced pain

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Abstract
Background and objectives: Sacroiliac is a joint which has eminent stability and minimal mobility. The Sacroiliac joint primary action is shift of load from the upper limb and torso through the sacroiliac joint towards the lower limb, also functions as shock absorber during the contact phase of gait cycle. This eminently strong and intricate network of ligaments was documented to be significantly mobile only during pregnancy and labour this was made noticeable by Hippocrates dated (460-377BC). This distinctive feature of SIJ comes with a cost of "SIJD" (sacroiliac joint dysfunction), which renders the most disabled symptom called "PAIN".
Pregnant women globally (38%to 90%) suffer from sacroiliac joint dysfunction induced pain, mostly the pain increases during the 2nd and 3rd trimester.
The objective of this study is to investigate the effectiveness of Kinesio-Tape for pregnant women suffering from sacroiliac joint dysfunction induced pain
Methods: The subjects were assessed for inclusion and exclusion criteria. Samples were selected through random sampling method. In this study, 30 subjects with sacroiliac joint dysfunction induced pain in pregnant women. Kinesio tape was applied for 5 consecutive days and subjects were analyzed pre and post intervention.
Outcome measure: VAS was used to measure the pain experienced by the subject; ODI was used to measure the percentage of disability faced by the subject followed by PGQ a set of Questionnaire which is used for analysis of pelvic girdle related symptoms. Lastly PPT, An objective analysis for the threshold of pain.
Results: Following 5 days of treatment with Kinesio taping showed a better improvement of pain in pregnant women suffering from SIJD induced pain. On statistical analysis the pre-test value of VAS was 7.96 and this value decreased to 2.7 by the end of intervention with $p<0.0001$. The mean of pre-test for ODI questionnaire was 72.5 whereas the post test was 27.5, followed with the percentage of difference pre-and post- test is 62.1% p(0.001). This shows a significant reduction disability in pregnant women. The PGQ mean for the pre-test value was 78 and the post-test 28.9 and the percentage of difference was 62.9%. The ($p<0.0001$) this shows a significant reduction in the pelvic girdle related symptoms. The Pain pressure threshold (PPT) to measure the threshold of pain using a hand held algometer. The pre-test mean value was 3.91 and post-test mean value 8.57 and the percentage of difference between the pre and post intervention group is 119.2% also the ($p<0.0001$) which is a statistically significant result.
Conclusion: Kinesio taping is effective in reducing pain and improving functional activity in pregnant women suffering from SIJD induced pain.

Keywords: Sacroiliac joint dysfunction, pain pressure threshold, Oswestry disability scale, Kinesio taping

1. Introduction
Sacroiliac is a joint which has eminent stability and minimal mobility. It is a large diarthrodial joint formed by concave sacrum embedded with intra articular bony tubercle ventrally and predominantly convex ilium. It is an important structure between 3 large lever (spine and 2 lower limb), with the primary function of transferring the load from upper body through the SI joints to the lower limb, the joint also function as a shock absorber during the gait pattern [1].
Sacroiliac joint dysfunction is the pain which is felt between PSIS of Ilium bone of pelvis and gluteal fold particularly in Surrounding to the Sacroiliac joint [2]. Since many years Research Scholar have Studied Immensely About the structure, function of SIJ with respect to movement and pain.

Dated back from (460-377 BC) to (1514-1564), Research Scholars like Hippocrates, Vaesalius had suggested that the SIJs move only during pregnancy, the SIJ fibrous under the influence of relaxin. Also relative symphysiolysis occurs, both factors resulting in an increase in SIJ mobility.

Primary Symptom of sacroiliac joint dysfunction is Pain followed with disability. Increased mobility results in pelvic pains in Women. High Incidence for women who asymmetric SIJ during pregnancy have a three times higher risk of developing moderate to severe PGP (Pelvic Girdle Pain) [1].

Universally sacroiliac dysfunction during pregnancy ranges from 24% to 90% concurrently SIJD has led to several mechanical and biomechanical changes, eventually it Results in increased prevalence of sacroiliac joint dysfunction in pregnant women [3].

Anatomy

The Human pelvis is a union of 2 ilia and the sacrum, Also the sacrum is made of 5 fused vertebrae to form the stable posterior pelvic column [4].

The base of the triangle formed by the first sacral vertebra supports two articular facets that face posteriorly for articulation with the inferior facets of the 5th lumbar vertebra, the apex of the triangle formed by the fifth sacral vertebra, articulates with the coccyx.

The sacral auricular (ear shaped) part is generally concave; however, an intra-articular bony tubercle is located in the middle aspect of the sacrum. The lateral part of the sacrum or ala bears an auricular surface that articulates with Ilium. The iliac part is predominantly convex.

The SIJ can be divided into three parts based on surfaces S1, S2, S3 they participate in the (sacral) auricular surface. These three parts, of which the S1 being the largest and the S3 part the smallest. The sacrum is wider superiorly than inferiorly making it a wedge Lookalike bone. Sacrum in humans is made to withstand shear force i.e. gravity. Significant 'keystone' like structure on the sacrum Adds for stability [5]. The SIJ is considered largest pivot joint in the body [4].

At about week 8 of intra-uterine development of human pelvis starts as, a three-layered structure in the pelvic mesenchyme, the first: sacral cartilage; second: iliac cartilage, and third: the interposed zone of mesenchyme it contains a slit, which forms the first articular cavity it should be noted that the SIJ will develop from this structure. In week 10, articular cavities become more evident The small movements of a joint influence the formation of the Articular cavity in the SIJ. The SIJ clearly appreciated by 8th month of gestation. The bony surfaces of the joint are smooth and flat until puberty. At a later age, different combinations of bony ridges and grooves occurs, these play an important role in providing shape and contour that evolve throughout adult life [1].

Sacroiliac joint is diarthrodial joint surrounded by a fibrous capsule which consist of synovial fluid. The anterior one third of the sacroiliac is a true synovial joint, whereas the remaining portion of the joint contains predominately ligamentous connections are considered to be bicondylar joints [7].

Sexual dimorphism of pelvis

The human Pelvis body shows evident difference between male and female bony architecture. The pelvic dimensions are clear at about the 22nd month, with the male pelvis being larger. This difference decreases in the later phases of life. Inter-cristal measurement are greater in males than females Also the articular facet on the sacral base for the fifth lumbar vertebra occupies more than a third of the width of the sacral base but less than the female pelvis dimension. The female sacrum is more uneven, less curved and more backward tilted than the male sacrum.

Women have a wider sciatic notch, wider acetabulum also groove in the iliac bone, Para glenoidal sulcus, which usually happens in the 2nd decade of life. The male and female SIJ ROM values are also different with the maximum ROM of 1.28 degrees (men) and 2.88 (women) also minimum translation of the joint is about 0.7 mm [1].

With respect to the above-mentioned Gender-related differences shows higher rate of SIJ misalignment in young females. Stoev *et al*., (2012) report that of patients aged 10-20 years (median 15.7 years) who presented with LBP resulting from SIJ dysfunction in which 77% were female. Braune & Fischer (1892) related the position of the centre of gravity in the trunk to SIJ function and gender [8].

The sacral surface of SIJ is covered by hyaline cartilage whereas the iliac surface contains fibrocartilage [1]. The iliac joint surface is 'fibrocartilaginous' only in early childhood, becoming more hyaline with maturation. In the adult, the cartilage on the sacral surface of the joint can reach 4 mm in thickness, but does not exceed 1-2 mm on the iliac surface [5].

The SIJ primary function is to maintain stability. This is achieved through the expansive ligamentous network attaching to the SIJ. The SIJ is six times more resistant to medially directed forces compared to the lumbar spine. The second mechanism is by well-developed fibrous apparatus and the specific architecture of the SIJ result in limited mobility [5]. The role of the sacroiliac joints works on relieving the stress on the pelvic ring, which is transmitted from the trunk and lower limbs, body weight, the ground reaction forces. the joints must allow movement to absorb the twisting forces ascending from the lower limb yet be stable enough to transmit the forces from the vertebral column descending to the lower limbs [11].

Innervation

The sacroiliac joint anterior joint line is being innervated by the sacral plexus, and the posterior portion is being innervated by the spinal nerves. Many researches have confirmed the presence of mechanoreceptors, nerves, and nerve fascicles in the periarticular tissues also paciniform and non paciniform receptors in the central nervous system receives inputs from the joint [4].

Vascularisation of the joint

Superior Aspect of SIJ is supplied by the common iliac vessels and the internal iliac vessels. Posteriorly, the superior gluteal vessels supply to the SIJ. The venous drainage is analogous to the arterial anatomy, mainly from branches of the internal iliac veins [11].

Ligaments

The Sacroiliac joint has maximum stability and minimum mobility for the sacroiliac joints and this is because of the ligaments. Posterior ligaments long and short ligament, Sacro tuberous, Sacrospinous, Anterior ligament, iliolumbar ligament are the major ligaments supporting the SI joint.

A portion of the posterior sacroiliac ligament is called either the long posterior sacroiliac ligament or the long dorsal sacroiliac ligament. The cranial side the long ligament extends its attached to the PSIS and the attaches to the part of the ilium, at the caudal side to the lateral crest of the third and fourth sacral segments.

The iliolumbar ligaments, two types: dorsal band restrains forward flexion, sacroiliac band restrains dorsal band and as a whole restrains lateral bending. The sacrospinous ligaments connect the ischial spines to the lateral borders of apex of sacrum and coccyx. The primary restraint movement is sacral flexion [12].

The Sacro tuberous ligaments connect the ischial tuberosities to the posterior spines at the ilia and the lateral sacrum and coccyx, The sacroiliac ligaments are continuity of quadratus lumborum, erector spinae, gluteus maximus, gluteus minimus, piriformis, and iliacus muscles, which contribute to the joints' stability. The fascial support is greater posteriorly than anteriorly because more muscles are located posteriorly [1].

Biomechanics

Kinematics

Roentgen Stereophotogrammetric Analysis (RSA) have been used for measuring small amounts of joint motion, it was used to measure SIJ ROM The degree of rotation (2 degrees), Translation (0.7 mm) at joints. In End of the study it can be stated that the sacroiliac joints do permit motion, but in small ranges, although small in ranges, this motion is important for reducing the forces transmitted via the pelvic ring to prevent sacral fracture.

During Anterior pelvic tilt anterior superior iliac spines and the pubic symphysis move Inferiorly. bilateral hip extension in prone and during Posterior pelvic anterior superior iliac spines and the pubic symphysis move superiorly. Zaglas (as cited in Weisl, 1955), in the mid-19th century, demonstrated that most of the sacral movement takes place around a transverse axis [5].

Sacroiliac joint and its ligaments undergoes laxity, and this happens during repetitive or asymmetrical loading like kicking, throwing, single leg stance, gymnastics, powerlifting, basketball, golfing, rowing, Shear force related activities contributes to sacroiliac joint dysfunction. Other risk factors include systemic inflammatory conditions, pregnancy, leg length discrepancy, hypermobility, obesity, scoliosis, direct trauma, degenerative joint disease, postural changes [9].

Epidemiology of sacroiliac joint dysfunction

In 10% to 25% of patients with low back pain in general population the source of pain was sacroiliac joint [4], Specifically prevalence of sacroiliac joint dysfunction in pregnant women population ranges from 24% to 90%. SIJ dysfunction pain can present as localised or referred pain. The referral pain arears are buttocks (94%) lower lumbar region (72%) lower extremity (50%) and groin (14%).

Sacroiliac joint (SIJ) pain exhibits a bimodal prevalence, being more commonly observed in younger athletes and the elderly. Additionally, pregnancy can precipitate SIJ pain due to increased body weight and accentuated lumbar lordosis (3&14).

In large-scale research, the authors reported a nine-month period prevalence of low back pain (LBP) in 49% of pregnant women, with sacroiliac joint-related pain constituting the majority of cases [10], In one study (n = 194), approximately 62% of pregnant women reported experiencing low back pain, and among these individuals, 54% described pain localized to the pelvic girdle region around the sacroiliac joints [15].

Pathophysiology

Pain that appears to originate in the Sacroiliac Joint (SIJ) region can actually stem from a wide differential diagnosis including lumbar spine pathology, hip joint issues, and even visceral sources. When pain and stiffness are specifically tied to the SIJ, this is classified as sacroiliac joint dysfunction. The etiology of SIJ dysfunction is diverse and broadly categorized into traumatic and atraumatic causes. High-energy trauma such as motor vehicle collisions or falls may result in pelvic ring injuries, occult fractures, or ligamentous strains to the SIJ. Degenerative changes like osteoarthritis and inflammatory arthropathies (e.g., ankylosing or psoriatic arthritis, reactive arthritis) can lead to sacroiliitis and SIJ discomfort, particularly when systemic symptoms are present. Infections though less common can also involve the SIJ and should be considered in appropriate clinical contexts.

Atraumatic mechanical stress may result from moderate-impact activities such as lifting or jogging, especially in individuals without systemic disease. Pregnant individuals are particularly susceptible to SIJ dysfunction due to hormonal effects (e.g., relaxin-mediated ligament laxity), weight gain, and increased lumbar lordosis. Secondary biomechanical contributors including prior lumbar or sacral spinal fusion, structural scoliosis, and leg-length discrepancies can alter forces across the pelvis, predisposing to SIJ instability or degeneration.

In sum, SIJ dysfunction arises from an interplay of direct and indirect factors from traumatic injury and degenerative or inflammatory joint disease to biomechanical stressors and anatomical imbalances [16].

Increasing leg length discrepancy leads to progressively higher mechanical stresses across the Sacroiliac Joint (SIJ) surfaces, particularly on the longer leg side. This biomechanical imbalance can predispose individuals to SIJ dysfunction. However, when evaluating pain localized to the SIJ region, it's essential to consider other potential causes. Conditions such as appendicitis, ovarian cysts or torsion, and pelvic inflammatory disease can present with symptoms that mimic SIJ dysfunction. Appendicitis typically causes pain that starts near the belly button but can radiate to the lower right abdomen or back. Ovarian cysts, especially if they rupture or cause ovarian torsion, can lead to sharp lower abdominal or back pain. Pelvic inflammatory disease, an infection of the female reproductive organs, can result in lower abdominal pain, fever, and abnormal vaginal discharge. Therefore, a comprehensive assessment is crucial to differentiate SIJ dysfunction from these other conditions [13].

Pathomechanics

Sacroiliac Joint Dysfunction (SIJD) often arises when the body's center of gravity shifts anteriorly such as during trunk flexion for lifting or bending. This forward movement causes the pelvis to rotate downward and anteriorly, or obliquely around the acetabula. The severity of SIJD increases with the speed of this weight transfer and the added load on the upper trunk. As the innominate bones move anteriorly on the sacrum, the posterior sacroiliac ligaments loosen, and the anterior sacroiliac ligaments, being thin and weak, provide minimal support. This biomechanical imbalance renders the SI joint vulnerable to injury [5].

Etiology

Approximately 88% of Sacroiliac Joint Dysfunction (SIJD) cases result from repetitive microtrauma or acute trauma, such as falls onto the buttocks. Athletes are particularly susceptible due to activities involving repetitive or asymmetric loading, including kicking, throwing, single-leg stances, gymnastics, powerlifting, basketball, golf, and rowing. Additional risk factors encompass systemic inflammatory conditions, leg

length discrepancies, hypermobility, obesity, scoliosis, direct trauma, degenerative joint disease, and postural changes [9].

Approximately 20% of Sacroiliac Joint Dysfunction (SIJD) cases are pregnancy-related. Hormonal changes during pregnancy, particularly the release of relaxin, relax the sacroiliac ligaments, leading to hypermobility of the joint. This increased mobility can result in pain and discomfort. Another 4% of SIJD cases are idiopathic, with no identifiable cause. Additionally, abnormalities in the sacrum bone, detectable through imaging, can contribute to SIJD. Degenerative joint disease is also a common cause, particularly in older adults, where wear and tear of the joint structures lead to pain and stiffness [17].

Evidence-based treatments for Sacroiliac Joint (SIJ) dysfunction include rest, activity modification, and avoidance of aggravating activities. Engaging in single-leg stances should be avoided, as these can exacerbate pain in the SIJ. Therapeutic interventions encompass taping, enhancing mobility of the hypomobile joint, stretching, strengthening, and correcting any muscular asymmetries or hyperactivity. Manual manipulation serves as another conservative approach for managing SIJ dysfunction. Modalities such as ultrasound, diathermy, moist heat or cold applications, TENS, IFT, and laser therapy may be utilized to alleviate SIJ pain [6].

Kinesio Tex Gold Tape is designed with a specialized weave and viscosity, enhancing breathability and water resistance while minimizing skin discomfort. Its proposed mechanisms include improving circulation by lifting the skin, thereby reducing pressure on underlying tissues. This action may alleviate pain through neurological suppression and assist in repositioning subluxed joints by relieving abnormal muscle tension. Additionally, the tape is believed to support the function of fascia and muscles, contributing to overall musculoskeletal health [18].

Kinesio Tex Gold Tape interacts directly with skin receptors such as Ruffini's, pain, and deep sensory receptors and indirectly influences the lymphatic system, fascia, muscles, and ligaments. Its medical-grade acrylic adhesive is activated by heat and does not permeate the vascular system, making it safe for use during pregnancy.

For bilateral paraspinal muscle application, two 40 cm strips of tape are recommended. Prior to application, the skin should be sanitized with alcohol-based wipes. The participant should stand, and the distal end of each tape strip should be applied 5 cm below the superior iliac crest [19].

The Pelvic Girdle Questionnaire (PGQ) is a condition-specific tool designed to assess activity limitations and symptoms in individuals with pelvic girdle pain during pregnancy and postpartum. It comprises 20 items evaluating activity limitations and 5 items assessing symptoms, each scored on a 4-point scale from 0 (no problem) to 3 (severe problem). To calculate the total PGQ score, sum the individual item scores. The maximum possible score is 75, with 60 points allocated to activity limitations and 15 points to symptoms. If a respondent selects "not applicable" for any item, 3 points are subtracted from the total possible score. The total score is then divided by 75 and multiplied by 100 to obtain a percentage, ranging from 0% (no disability) to 100% (severe disability). This scoring method provides a standardized assessment of the severity of pelvic girdle pain and its impact on daily activities and symptoms [20].

The Visual Analog Scale (VAS) for pain assessment is a 100 mm horizontal line with endpoints labeled "no pain" on the left and "worst imaginable pain" on the right. Patients mark a point on the line that corresponds to their perceived pain intensity. The distance from the "no pain" end to the patient's mark is measured in millimeters to quantify pain intensity. VAS scores are interpreted as follows: 0-4 mm indicates no pain, 5-44 mm mild pain, 45-74 mm moderate pain, and 75-100 mm severe pain. This scale provides a simple and effective method for assessing pain intensity in clinical settings [21].

The Oswestry Disability Index (ODI) is a 10-item questionnaire assessing the impact of low back pain on daily activities. Each item is scored from 0 to 5, with higher scores indicating greater disability. The total score is doubled and expressed as a percentage, ranging from 0% (no disability) to 100% (maximum disability).

The ODI is widely used in clinical practice and research for evaluating functional disability due to low back pain. It is brief, taking 3-5 minutes to complete, and has demonstrated good reliability and validity. However, it may not fully capture all aspects of disability or quality of life affected by low back pain, such as emotional, social, or psychological factors. Despite this, the ODI remains a cornerstone in both clinical practice and research for evaluating the severity of disability related to low back pain [22].

Pressure pain algometer: Algometer is used to identify the pressure-pain threshold. The handheld algometer has a 1cm-2 pressure application surface with round rubber application surface connected to manometer. The display of readings will be in newtons or kilograms of force. The force application should be perpendicular to the body surface and the rate should be constant at an approximate rate of 1 kg-2 s-1. The applied force is pointed on the shield of the algometer the pointer holds the maximum applied force until reset [23].

To assess the effectiveness of Kinesio taping on pregnant women suffering from sacroiliac joint dysfunction induced pain.

- **Null hypothesis:** There is no significant effect of Kinesio taping on pregnant women suffering from sacroiliac joint dysfunction induced pain.
- **Alternative hypothesis:** There is significant effect of Kinesio taping on pregnant women suffering from sacroiliac joint dysfunction induced pain.

2. Materials and Methods

2.1 Method of data collection

- **Study design:** Pre and Post-test study design
- **Sampling size:** 30
- **Sampling method:** Convenient sampling
- **Study duration:** 12 months

2.2 Materials used

- Kinesio tape
- Scissors
- Cotton
- Towel
- Alcohol wipes
- Treatment Couch
- Assessment sheet
- Measuring tape
- Consent form
- Pelvic gridle Questionnaire
- Oswestry Disability Scale
- VAS 36
- Pressure Pain Algometer
- Pillow

2.3 Inclusion criteria

- **Age:** 20-40 years old;
- 18th-34th week of pregnancy
- At least one positive test out of three applied in the diagnoses of Sacroiliac joint dysfunction:

1) Long Dorsal Ligament Test (LDSL) (modified for pregnant women)
2) Posterior Pelvic Pain Provocation (4P).
3) Trendelenburg test (modified for pregnant women).

- Negative Straight Leg Rise test.
- Bi-lateral sacroiliac joint dysfunction

2.4 Exclusion criteria

- History of prior pelvic injury
- Skin lesions in the lumbosacral area
- Negative diagnostic tests for pelvic girdle pain
- Positive Straight Leg Rise test
- Chronic pelvic diseases
- History of allergies to acrylic copolymer
- Women in labour
- Any patient less than 18 weeks or more than 34 weeks of pregnancy
- Any patient less than 20 years and more than 40 years of age are excluded
- Scoliosis
- Foetal Anomaly
- Ankylosing Spondylitis
- Twin Pregnancy

2.5 Outcome measures

Evaluation tools

- Pelvic girdle questionnaire
- VAS
- Oswestry disability scale
- Pressure pain algometer

Pelvic girdle questionnaire

The Pelvic Girdle Questionnaire (PGQ) is a condition-specific tool designed to evaluate activity limitations (20 items) and symptoms (5 items) in women experiencing Pelvic Girdle Pain (PGP) during pregnancy and after childbirth. Each item is rated on a 4-point scale (0 to 3). To determine the total PGQ score, the item scores are summed and divided by the maximum possible score of 75 comprising 60 points for activity-related items and 15 for symptom-related items. This value is then converted into a percentage, yielding scores from 0% (indicating no disability) to 100% (indicating severe disability). If a respondent selects “not applicable” for an item, 3 points are subtracted from the maximum possible score accordingly [20].

Visual analog scale

Pain intensity was measured using a Visual Analogue Scale (VAS), represented by a 100 mm horizontal line. The endpoints were labeled "no pain" and "maximum pain," with descriptors such as "slight," "moderate," and "severe" distributed along the line. "Maximum pain" referred to the most intense pain the patient had ever experienced [21].

Oswestry disability scale

The Oswestry Disability Index (ODI) is a concise, 10-item questionnaire that evaluates how pain affects various aspects of daily living, including personal care, lifting, walking, sitting, standing, sleeping, sexual activity, social life, and travel. The total score ranges from 0% to 100%, indicating the level of disability. Widely regarded as a gold standard, the ODI is one of the most frequently used patient-reported outcome measures in research involving individuals with spinal pain [22].

Pressure pain algometer

An algometer is used to measure the pressure-pain threshold. This handheld device features a round rubber tip with a 1 cm² to 2 cm² application surface, connected to a manometer that displays readings in newtons or kilograms of force. Pressure should be applied perpendicularly to the body surface at a consistent rate, approximately 1 kg per 2 seconds. The device’s pointer indicates the peak force applied and holds that value until it is manually reset [23].

2.6 Procedure

The patient will be positioned either in a side-lying posture or in a relaxed stoop standing position. Five specific points on the skin will be marked based on the localization of sacroiliac joint pain. The first point is located 1 cm medial and caudal to the Posterior Superior Iliac Spine (PSIS). The second point is laterally positioned near the PSIS at the insertion of the gluteus maximus muscle on the iliac crest. The third point is 2 cm cranial to the PSIS, while the fourth is over the erector spinae muscle and the deeper posterior sacroiliac ligament. The fifth and final point is a caudal location at the attachment of the gluteus maximus. Pressure will be gradually applied to each point using an algometer until the patient reports pain. A higher algometer reading indicates greater pressure tolerance and, therefore, less tenderness, while a lower reading indicates reduced pressure tolerance and greater tenderness.

Measuring pain threshold using an algometer - treatment procedure

Subjects diagnosed with sacroiliac joint dysfunction were included in the study. All participants were informed in advance about the study, and the purpose was clearly explained to those who volunteered to participate. A total of 30 individuals diagnosed with sacroiliac joint dysfunction were assessed and selected for inclusion in the study.

The study was conducted in three phases:

Phase 1 - Informed consent and pre-test data collection

Participants were first informed about the study and provided written consent to take part. Before data collection, all subjects completed a demographic and general health screening questionnaire. Following this, they were given the Visual Analogue Scale (VAS), Oswestry Disability Index (ODI), and Pelvic Girdle Questionnaire (PGQ). The purpose of each questionnaire and the procedure for completing them were clearly explained.

2.7 Methodology

Testing procedure and intervention

Patients were informed about the intervention, including its purpose and potential effects. Written consent was obtained from those willing to participate. Demographic information and relevant history including medical, personal, past, and gestational details were collected. Participants were then asked to complete the Pelvic Girdle Questionnaire (PGQ), Oswestry Disability Index (ODI), and Visual Analogue Scale (VAS). Additionally, the objective intensity of pain was measured using a Pressure Pain Algometer.

Kinesio taping procedure

The treatment will be administered over five days using two 40 cm Kinesio tapes for bilateral application on the paraspinal muscles. Before application, the skin in the taped area will be cleaned using alcohol-based wipes.

The patient will be instructed to stand, and the distal end of each tape will be anchored 5 cm below the Posterior Superior Iliac Spine (PSIS). While the patient performs maximum spinal flexion ensuring the back extensor muscles are stretched the tape will be applied with approximately 10% stretch, running upward along the spine to the level of the inferior angle of the scapula on both the right and left sides. Once the patient returns to an upright position, the characteristic convolutions or skin folds typical of Kinesio taping will become visible.

Additionally, a Ligament Application I will be performed using a single 20 cm tape. This tape will be applied perpendicularly across the previous paraspinal tapes at the level of the sacroiliac joints, with 50% stretch to provide targeted support [19].

Post-test data collection: Outcome measurements, requiring minimal assistance will be taken on 5th day of commencing treatment.

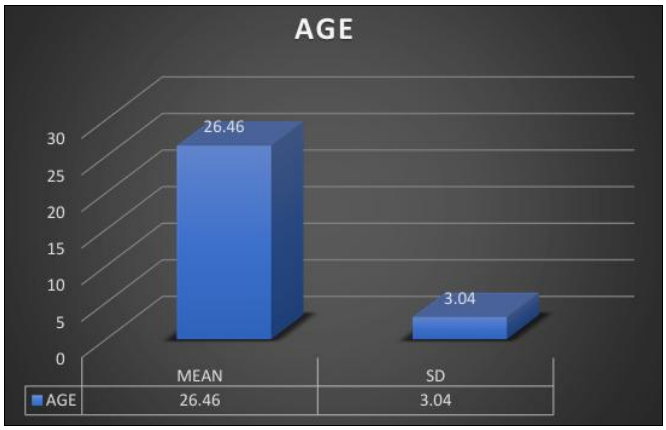
2.8 Statistical analysis

- Data was analysed using the statistical package SPSS 26.0 (SPSS Inc., Chicago, IL) and level of significance was set at $p<0.05$.
- Descriptive statistics was performed to assess the mean and standard deviation
- of the respective groups.
- Normality of the data was assessed using Shapiro Wilkinson test.
- Inferential statistics to find out the difference within group analysis was done using paired T test/Wilcoxon sign rank test

3. Results and Discussion

Table 3.1: Age and age group

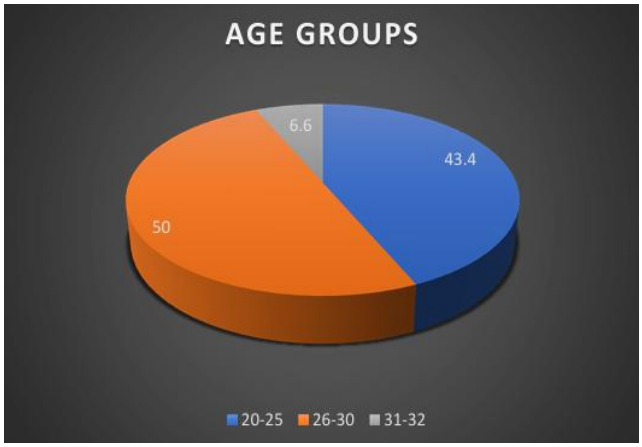
	Mean	SD
Age	26.46	3.04



Interpretation: the mean age of 30 subject chosen for the study were 24.46 and SD 3.04

Table 3.2: Age group

	Number	Percentage
20-25	13	43.4
26-30	15	50
31-32	2	6.6

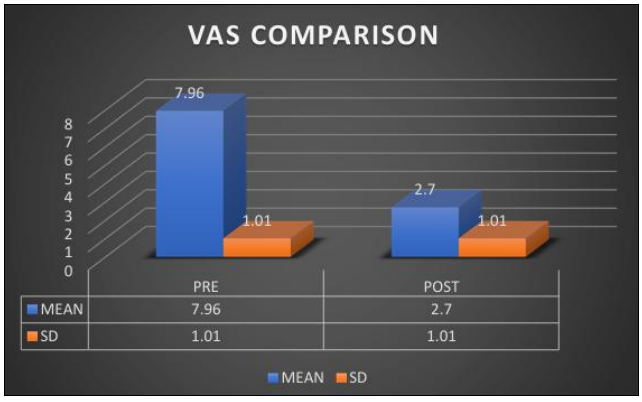


Interpretation: The table above shows the age wise distribution of the patients, where maximum percentage of 50% patients were of age group 26-30years.Followed by 43.4% of patients were of age group 20-25years.The least number of patients were of age group 31-32 presenting 6.6% of the population.

Table 3.3: Vas comparison (N=30)

Vas		Mean	SD
	Pre	2.96	1.01
	Post	2.7	1.02
% difference		66.1%	
Mean difference		5.26 ± 0.01	
t value		20.17	
p value (Paired t test)		0.0001*	

*$p<0.05$ is statistically significant

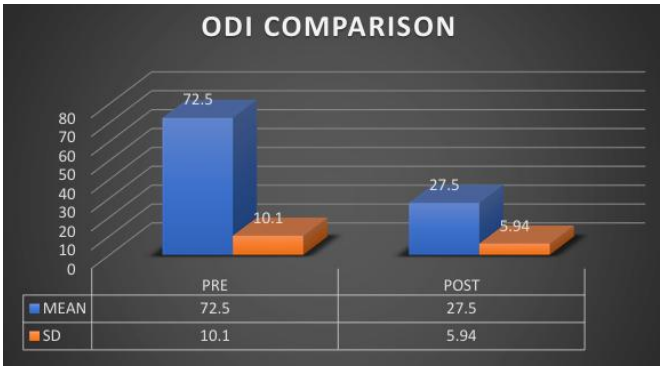


Interpretation: Regarding vas scale, paired t test analysis reported statistically significant mean value difference with respect to pre-post measurement ($p<0.05$). the mean difference reported was 5.26±1.01 and the percentage change from pre-post was 66.1%. Hence, we reject null hypothesis and accept the alternate hypothesis "There is significant effect of Kinesio Taping on pregnant women suffering from sacroiliac joint dysfunction induced pain".

Table 3.4: ODI comparison, (N=30)

ODI		Mean	SD
	Pre	72.5	10.1
	Post	27.5	5.94
% Difference		62.1%	
Mean Difference		45 ± 4.7	
Z value		22.04	
p value (Wilcoxon sign rank test)		0.0001*	

*$p<0.05$ is statistically significant

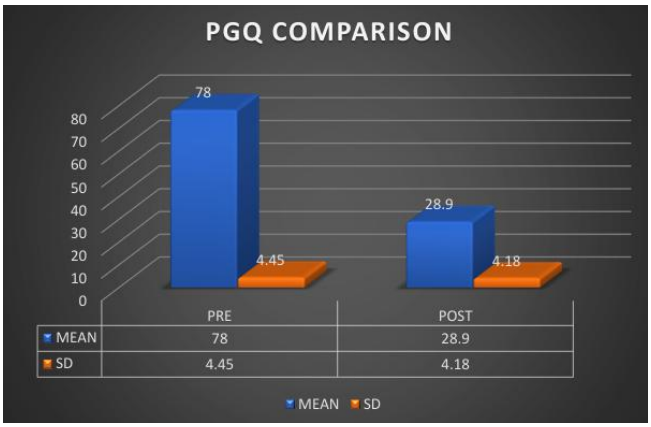


Interpretation: Regarding ODI scale, wilcoxon sign rank test analysis reported statistically significant mean value difference with respect to pre-post measurement (p<0.05). the mean difference reported was 45±4.7 and the percentage change from pre post was 62.1%. Hence, we reject null hypothesis and accept the alternate hypothesis "there is significant effect of Kinesio taping on pregnant women suffering from sacroiliac joint dysfunction induced pain".

Table 3.5: PGQ comparison

PGQ		Mean	SD
	Pre	78	4.45
	Post	28.9	4.18
% difference		62.9%	
Mean difference		49.1 ± 0.27	
Z value		44.71	
p value (Wilcoxon sign rank test)		0.0001*	

*p<0.05 is statistically significant

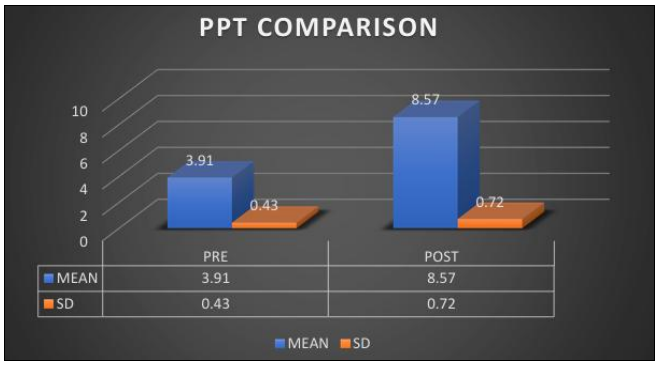


Interpretation: Regarding PGQ scale, Wilcoxon sign rank test analysis reported statistically significant mean value difference with respect to pre-post measurement (p<0.05). the mean difference reported was 49.1±0.27 and the percentage change from pre-post was 62.9%. Hence, we reject null hypothesis and accept the alternate hypothesis "There is significant effect of Kinesio taping on pregnant women suffering from sacroiliac joint dysfunction induced pain"

Table 3.6: PPT comparison

PPT		Mean	SD
	Pre	3.91	0.43
	Post	8.57	0.72
% difference		119.2%	
Mean difference		4.66 ± 0.29	
t value		30.43	
p value (Paired t test)		0.0001*	

*p<0.05 is statistically significant



Interpretation: Regarding PPT Scale, paired t test analysis reported statistically significant mean value difference with respect to pre-post measurement (p<0.05). the mean difference reported was 4.66±0.29 and the percentage change from pre-post was 119.2%. Hence, we reject null hypothesis and accept the alternate hypothesis "There is significant effect of Kinesio taping on pregnant women suffering from sacroiliac joint dysfunction induced pain".

3.7 Discussion

The sacroiliac joint is highly stable and allows only minimal movement. Its main function is to transfer the load from the upper body and torso through the sacroiliac joint to the lower limbs. Additionally, it serves as a shock absorber during the contact and stance phases of the gait cycle [1].

This exceptionally strong and complex ligament network is known to become notably more mobile only during pregnancy and labor a fact first observed by Hippocrates (460-377 BC). However, this unique characteristic of the sacroiliac joint comes with a drawback: sacroiliac joint dysfunction (SIJD), which often results in one of the most debilitating symptoms Pain.

This study was specifically designed to evaluate the effectiveness of Kinesio taping for pregnant women experiencing pain caused by sacroiliac joint dysfunction. Within-group analysis was performed using the Paired t-test or Wilcoxon Signed Rank test.

A total of 30 pregnant women aged 20 to 35 years with sacroiliac joint dysfunction participated in the study. Each subject received Kinesio taping treatment. Pre-treatment measurements were taken before the intervention using the Visual Analogue Scale (VAS), Oswestry Disability Index (ODI), Pelvic Girdle Questionnaire (PGQ), and Present Pain Intensity (PPI), with follow-up assessments recorded post-intervention.

The study included 30 women with a mean age of 26.46 years (SD = 3.04). Age distribution showed that 50% were between 26 and 30 years, 43.4% between 20 and 25 years, 6% between 31 and 35 years, and none between 36 and 40 years.

The Visual Analogue Scale (VAS) was used to assess pain and showed a significant improvement in pregnant women with SIJD-related pain. The average score decreased from 7.96 before treatment to 2.7 after intervention, representing a 66.1% reduction (p<0.0001). This aligns with Kalpan S *et al*., (2016), who found VAS effective for measuring pain intensity in pregnancy-related low back pain.

The Oswestry Disability Index (ODI), which assesses disability based on 10 daily activities (maximum score of 50), showed a significant reduction in disability. The mean pre-test score was 72.5, decreasing to 27.5 post-treatment, a 62.1% improvement (p<0.0001). Copay AG *et al*., (2015) found ODI to be a superior tool for measuring disability in pregnant women compared to other scales like VAS, SF-36, and EuroQol-5D.

The Pelvic Girdle Questionnaire (PGQ), which measures activity limitation and symptoms with a maximum score of 75, showed significant improvement. The mean score decreased from 78 pre-treatment to 28.9 post-treatment, a 62.9% reduction ($p<0.0001$). Grotle M *et al*., (2011) found that the PGQ is the only self-report tool with satisfactory discriminant validity, making it the most reliable and validated scale for pelvic girdle pain.

The final objective outcome measure was the Pain Pressure Threshold (PPT), assessed using a handheld algometer. The mean PPT increased significantly from 3.91 before treatment to 8.57 after intervention, showing a 119.2% improvement ($p<0.0001$). Van Leeuwen RJ *et al*., (2016) confirmed that pressure pain algometry is a reliable tool for objectively measuring pain intensity in patients with sacroiliac joint pathology.

Limitation of the study

1) Sample size was small
2) Lack of control group
3) Duration of the study was short

Recommendation/suggestions

1) Larger population can be taken
2) Taping could be augmented with another treatment
3) Subjects follow up after treatment could be done to know the effectiveness of treatment.
4) There could be control group to compare the effectiveness of Kinesio taping with other physiotherapy intervention.

4. Conclusion

This study evaluated the effectiveness of Kinesio taping in pregnant women with sacroiliac joint dysfunction-induced pain. Significant improvements were observed in VAS, ODI, PGQ, and PPT scores. Percentage comparisons before and after intervention showed notable positive changes following Kinesio taping. Assessments included subjective measures Visual Analogue Scale, Oswestry Disability Index, Pelvic Girdle Questionnaire, and Pain Pressure Threshold using an algometer and objective pain measurement via algometry. Based on these results, the null hypothesis was rejected, supporting the alternative hypothesis that Kinesio taping has a significant effect on sacroiliac joint dysfunction in pregnant women.

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