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# Effect of Modified Lumbar Sustained Natural Apophyseal Glide on Low Back Pain in Postnatal Women

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## ABSTRACT

**Background:** Postnatal low back pain (LBP) is identified as pain that begins shortly after childbirth. It is located above the gluteal folds and below the costal borders. LBP negatively impacts women's quality of life. Sustained Natural Apophyseal Glide (SNAG) technique can improve spinal ROM and decrease pain.

**Purpose:** To explore the efficacy of modified lumbar SNAG on postpartum LBP.

**Methods:** Sixty participants between the ages of 20 and 35 who had been experiencing LBP postnatally for at least three months and whose BMI was < 30 kg/m² were chosen from the Kasr El Ainy University Hospitals' outpatient clinics. They were distributed into two equal-number groups at random; the control group (A) (n=30) performed only traditional exercises (strengthening and stretching exercises for back and abdominal muscles) for 30 min/session, trice weekly for four weeks. Study group (B) (n=30) received Modified "SNAGs" on the affected lumbar level (L4-L5) for 10 sec for 3 sets/session, trice weekly for four weeks, plus the same exercise program as group (A). The two groups' participants were assessed before and after treatment utilizing the visual analogue scale (VAS) to determine pain severity and the Oswestry Disability Index (ODI) to assess functional disability.

**Results:** The mean values of pain severity and functional disability in both groups decreased statistically significantly after treatment, with group (B) showing the greatest improvement.

**Conclusion:** The use of modified SNAGs was beneficial in treating postpartum LBP, and its integration with traditional exercises was more beneficial than traditional exercises alone.

***Keywords:*** *Modified lumbar Sustained Natural Apophyseal Glide, Postnatal Period, Low Back Pain.*

## 1. INTRODUCTION

The postpartum period lasts roughly six weeks and starts as soon as the baby is born [1]. It is classified into the immediate puerperium, which lasts for the first 24 hours after giving birth, during which there may be acute post-anesthesia or after-delivery problems; the early puerperium, which lasts till the first week after giving birth; and the remote puerperium, which covers the roughly 6-week period needed for the genital organs to involute and for menstruation to resume [2].

Women frequently have lower back and/or pelvic girdle pain (PGP) throughout and following pregnancy [3]. Back pain during pregnancy is a serious issue since it can last into the postpartum phase and affect the recovery process [4].

Postpartum low back pain (LBP) is identified by pain that begins shortly after delivery, is localized over the gluteal folds and beneath the costal margin, and is exacerbated by exertion and alleviated by rest. Extended periods of sitting make this pain more severe, and lifting the baby makes it worse. The mother may be compelled to lie flat and rest if the pain radiates to both legs [5]. After giving birth, over 67% of women report having acute LBP [6].

Mental health and quality of life are impacted by postnatal LBP. It restricts work and social interactions with friends and relatives. LBP is frequently linked to decreased productivity at work. Thus, postpartum LBP is a leading cause of lost productivity and limited participation globally. Additionally, it results in discomfort, poor mood, and sleep issues. Postnatal LPB is categorized into acute (< 6 weeks), subacute (6-12 weeks), and chronic (>12 weeks) [7].

The underlying causes of postnatal LBP can be clarified by different explanations, such as the increased strain on the back from the weight of the fetus and the total weight obtained throughout pregnancy, hormonal fluctuations throughout pregnancy that cause the spine and sacroiliac joints to become unstable due to the spinal and pelvic ligamentous laxity, direct compression on the lumbosacral nerve roots because of the uterus increased sizes, muscular fatigue, and pulling or stress on musculoskeletal structures [8].

Numerous exercise modalities, such as low-to-moderate intensity aerobic exercise [9], high-intensity aerobic activity [10], core stability and strengthening exercises [11], and flexibility programs, have been investigated to treat postnatal LBP. [12].

A modified lumbar sustained natural apophyseal glide (SNAG) is a popular Mulligan mobilization method that uses joint glide and natural spinal motion. While the patient is engaging in active activity, the glide can be delivered unilaterally across the transverse processes, to the facets, or to the spinous processes [13].

This technique can improve spinal ROM and decrease pain through the correction of positional faults existing between the surfaces of the involved facet joints [14]. Also, it activates the pain inhibitory pathway, which suppresses pain. In addition, researchers have indicated that during mobilization, specific brain areas involved in pain perception are inhibited [15].

The majority of previous research was concerned with the modified SNAG technique used for peripheral joints [16], the cervical region [17], and the thoracic region [18].

The impact of modified "SNAGS" on the lumbar segments has not been extensively studied [19]. This study was therefore carried out to examine its impact on LBP in postpartum women with the goals of enhancing their ability to carry out routine activities and minimizing the adverse effects of medical treatments.

## 2. MATERIALS AND METHODS

It was a prospective, pre-post-test randomized controlled trial. It was authorized by the research ethics committee of Cairo University's Faculty of Physical Therapy on March 13, 2023 (No:P.T.REC/012/004494). The study was also registered at CinicalTrial.gov (NCT06427434). The study ran from June 2024 to December 2024 for seven months. The SPSS (version 23 for Windows) software was used to produce a computer-generated randomized table before data collection to achieve randomization. Every individual was assigned a distinct identifying number. Following the randomization of these numbers (n=30) into two equal groups, index cards with consecutive and distinctive numbers were placed into transparent envelopes, and each participant was given a hand-selected envelope by an unbiased and blinded research assistant.

***Participants:***

Sixty participants had been clinically diagnosed with LBP for at least three months following birth and were chosen from Kasr El-Einy University Hospitals. They were divided into two groups of equal numbers randomly. Group (A) control group (n = 30) only engaged in muscle-strengthening exercises for back extensor, hamstring, and abdominal muscles for 30 minutes, trice weekly for four weeks. Group (B): The study group (n = 30) gained modified SNAG on the lumbosacral area (L4-L5) for 10 seconds for 3 sets/session, three times weekly for four weeks, plus the same exercise program as group (A).

***1- Control group (A)*:**

It comprised 30 participants, aged between 20 and 35 years, with heights ranging from 158 cm to 178 cm, weights ranging from 65 kg to 88 kg, and BMIs ranging from 20 to 30 kg/m². They performed only stretching exercises for back extensors, hamstrings, and calf muscles and strengthening exercises for abdominal and back muscles for 30 minutes/session, trice weekly, for four weeks.

***2- Study group (B)*:**

It comprised 30 subjects with ages ranging from 20 to 35, heights between 160 and 180 cm, weights between 62 and 90 kg, and BMIs between 20 and 30 kg/m². In addition to the same exercise program as group (A), they underwent modified "SNAGs" on the lumbar region (L4-L5) for 10 seconds for three sets per session, trice weekly for four weeks.

***Inclusion criteria***

Sixty participants were diagnosed with LBP for at least 3 months after delivery.

1. They were between the ages of 20 and 35.
2. They had a BMI of less than 30 kg/m2.

3. They had parity between two and four children.
4. All participants had cesarean section delivery.
5. All of them had similar lifestyles.

***Exclusion criteria:***

Participants weren't included if they had:

1. A fractured spine or any other neurological condition.
2. Lumbar spinal stenosis brought on by spondylolisthesis, degenerative joint disorders, or lumbar disc herniation.
3. Pelvic pathologies such as endometriosis, adenomyosis, leiomyoma, and cystitis.
4. Skin disease interferes with mobilization application such as herpes zoster.
5. Gynecological conditions, including retroverted-retroflexed uterus, uterine prolapse, and persistent pelvic pain.

***II- Instrumentation*:**

***Evaluative instruments:***

***1- Recording data sheet:***

It was utilized to document every participant's personal, past, and menstrual history in the two groups (A and B).

**2- *Standard weight and height scale*:**

Before the study started, each participant in both groups had their height and weight measured to determine their BMI.

**3- *Visual analogue scale (VAS)*:**

The 10 cm calibrated line, where 0 (zero) indicates no pain and 10 indicates the worst pain, was used for assessing each participant's level of pain prior to and following treatment in both groups (A&B) [20].

**4- *Oswestry disability index (ODI)*:**

Prior to and following the completion of treatment, it was utilized to evaluate functional impairment for every participant in both groups (A&B). It is divided into ten categories that evaluate personal care, lifting, walking, sitting, standing, sleeping, sexual life, social life, pain, and travel. Ten multiple-choice questions make up this test. Out of six possible sentences, the participants choose one that best expresses how they are feeling. The sum of the scores for each section yields a potential score of 50. It is interpreted as 0–4 no disability, 5–14 mild disability, 15–24 moderate disability, 25–34 severe disability, and greater than 35 considered complete disability. Increased scores signify a decline in function level [21].

***III- Procedures:***

***A) Evaluative procedures:***

***1- History taking:***

Before the study began, a complete history was obtained from every participant in the two groups, and the information was entered into a data sheet.

***2- Weight and Height measurement:***

Before the study started, each participant in both groups had their height and weight assessed after the calibration of the weight-height scale. After taking off all bulky clothing and footwear, each participant was instructed to stand upright in the middle of the scale. The therapist noted the weight on the scale after waiting for the figure to be presented. The therapist placed the scale's ruler squarely on the patient's head, making sure it was level and not tilted. Then, the therapist noted the ruler's top and used a tape measure to quantify the distance from the floor to the head label. The BMI was then computed by dividing the weight in kg by the height in $m^2$ [22].

***3- Pain intensity measurement:***

Each participant's level of pain was identified utilizing VAS in the two groups. Both before and after treatment, every participant was instructed to indicate a point on the scale between two extremes that corresponded to her present level of pain [20].

***4- Functional disability measurement:***

The ODI was utilized to determine functional disability for all participants in the two groups. It was created as a clinical evaluation tool to give disability estimation in the form of a percentage score. Each participant in this study was requested to answer a comprehensive questionnaire on their own at the start of the trial and the conclusion of the twelve therapeutic sessions using an Arabic version of the ODI [21].

***B) Treatment procedures:***

To ensure their cooperation and confidence throughout the study, every participant in the two groups was given brief and clear instructions regarding the nature of therapeutic activities and their effects, and they signed an informed consent form.

***I- Stretching and strengthening exercises:***

Each participant in both groups was engaged in a program of stretching exercises for back extensors, hamstrings, and calf muscles and strengthening exercises for abdominal and back muscles for 30 min/session, thrice weekly for four weeks.

***A- Stretching exercises for back muscles:***

The participant was told to assume a prone kneeling position with her hand extended and stretched forward, holding this position for 30 seconds then relaxing for 30 seconds, repeating the exercise 4-5 times [23].

***B- Stretching exercises for hamstring and calf muscles:***

Assuming a long sitting position, the participant was told to touch her toes with her fingers by flexing the trunk while keeping the knee extended within the limit of pain. The participant repeated it three times per session, holding each time for 30 seconds and then relaxing for another 30 seconds [24].

***II- Strengthening exercises:***

***A- Bridging exercises:***

From the crock lying position, the participant was instructed to elevate her buttocks off the plinth; the exercise was done three times, holding for 6 seconds at the range's end [25].

***B- Back strengthening exercise:***

From a prone lying position with arms resting beside the trunk, the participant was asked to lift her head, shoulders, and upper back as much as she could and lower limbs supported; the exercise was performed three times, holding for 6 seconds at the range's end [26].

***C- Abdominal strengthening exercise:***

The knee-to-chest exercise was done in the crook lying position; each participant was told to pull in the abdomen and flex both hips, and the exercise was repeated ten times for three sets [27].

***D- Pelvic rocking exercises:***

Assuming a prone kneeling (quadruped) stance, the participant was instructed to place their hands palm down beneath their shoulders and space their knees widely apart and was asked to lift her lower back up towards the ceiling (A), holding for 30 seconds and then relaxing for another 30 seconds and then straightening her back (B), repeating the exercise 3 times in the session [28].

***Modified Lumbar SNAGs:***

Each participant in the study group (B) received Modified lumbar "SNAGs" on the affected lumbar region (L4 - L5) three times per week for 4 weeks. Each participant in this group was asked to assume prone lying (quadruped position) with her palm down under the shoulders and knees well apart while stretching out the spine. The participant completed the stretch three times with a 10-second holding as the therapist stood to one side of them and delivered a modified SNAG directly to the spinous process in a manner parallel to the L4-L5 lumbar facet joint plane. The participant's upper body is stabilized by the therapist's arm encircling her trunk, while the therapist's hand's medial border is hooked beneath the lower abdominal portion [29].

***Statistical design and data analysis:***

The mean ± SD was used to express the data. The unpaired t-test was applied to compare participants' traits shared among both groups. The normality of the data distribution was examined using the Shapiro-Wilk and Kolmogorov-Smirnov tests. The baseline and post-treatment findings for VAS and ODI were compared utilizing the paired T-test, whereas the two groups were verified utilizing the unpaired T-test. Data analysis was done by the statistical package for the social sciences computer program (SPSS Inc., Chicago, Illinois, USA; version 23 for Windows). Every statistically significant difference was identified with a P value $\leq 0.05$ and a 95% confidence interval.

## 3. GENERAL CHARACTERISTICS OF THE PARTICIPANTS

Group (A): This group comprised thirty multiparous women who experienced LBP for at least three months following birth. Their mean ± SD of age, height, weight, and BMI were 27.9 ± 2.87 years, 169 ± 5.88 cm, 78.23 ± 7.4 kg, and 27.08 ± 1.86 kg/m², respectively (Table 1) and (Figs 1, 2, 3, 4).

Group (B): This group comprised thirty multiparous women who experienced LBP for at least three months following birth. Their mean ± SD of age, height, weight, and BMI were 28.1 ± 1.94 years, 170 ± 4.68cm, 78.43 ± 5.82 kg, and 27.14 ± 1.83 kg/m², respectively (Table 1) and (Figs 1, 2, 3, 4).

**Table (1): Mean values of physical characteristics of both groups (A&B).**

| Variable | Groups | $\overline{X}$ ± SD | t-value | p-value |
|---|---|---|---|---|
| **Age (years)** | **Group (A)** | 27.9 ± 2.87 | 0.32 | 0.753 (NS) |
| | **Group (B)** | 28.1 ± 1.94 | | |
| **Height (cm)** | **Group (A)** | 169 ± 5.88 | 0.24 | 0.809 (NS) |
| | **Group (B)** | 170 ± 4.68 | | |
| **Weight (kg)** | **Group (A)** | 78.23 ± 7.4 | 0.12 | 0.908 (NS) |
| | **Group (B)** | 78.43 ± 5.82 | | |
| **BMI (kg/m²)** | **Group (A)** | 27.08 ± 1.86 | 0.13 | 0.901 (NS) |
| | **Group (B)** | 27.14 ± 1.83 | | |

Data were expressed as mean ± standard deviation, p- value, significance

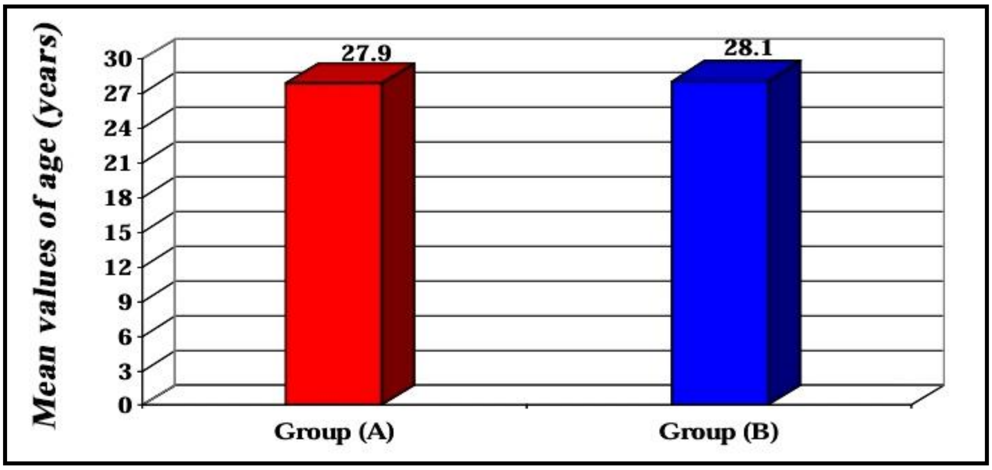


**Fig. (1): Mean values of age in both groups.**

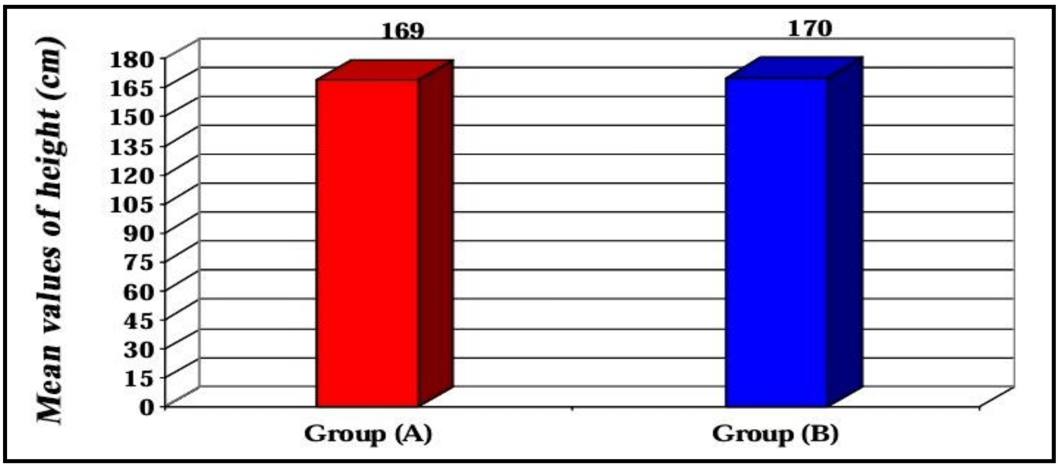


**Fig. (2): Mean values of height in both groups.**

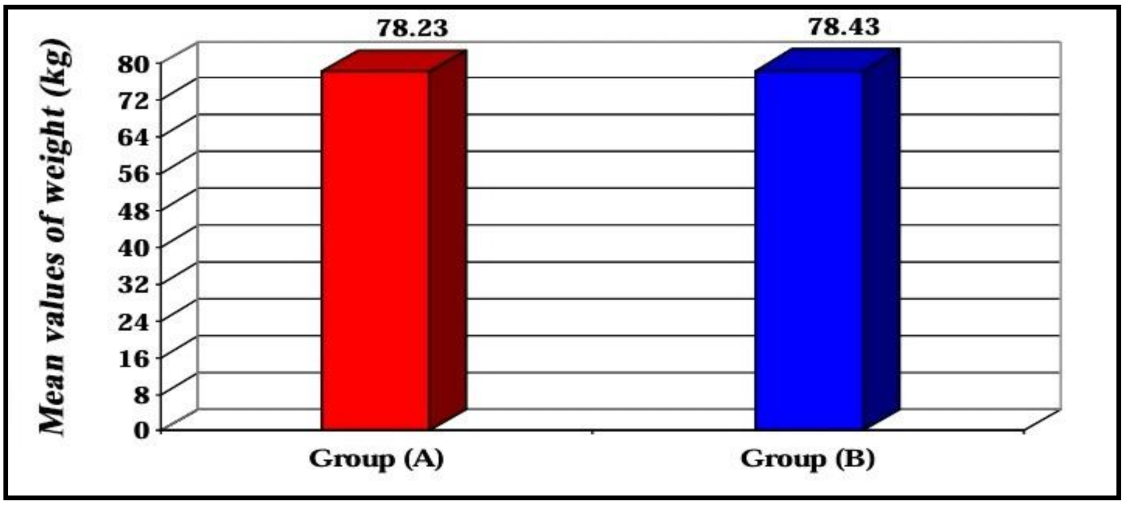


**Fig. (3): Mean values of weight in both groups.**

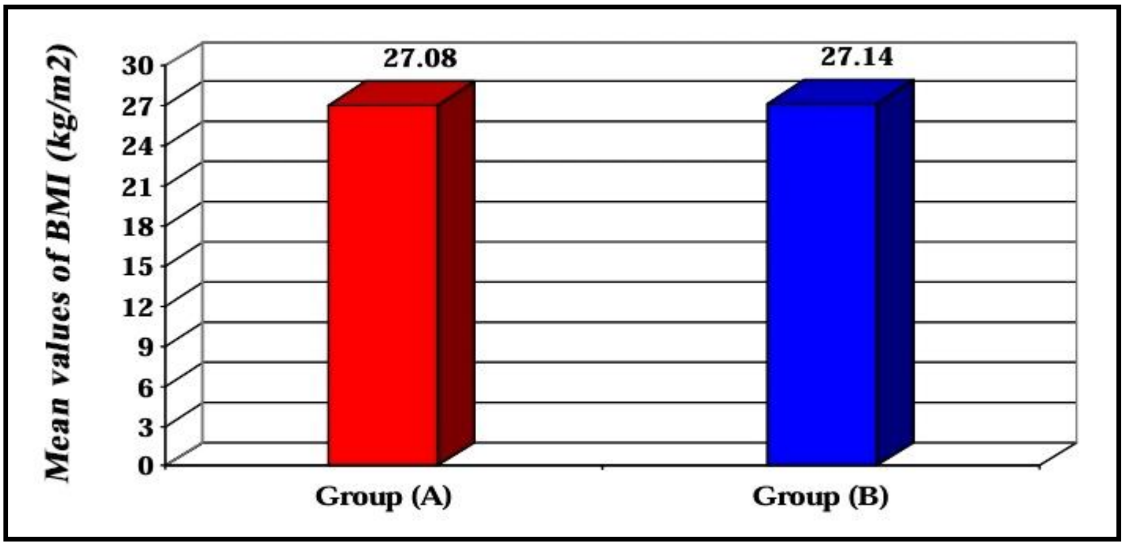


**Fig. (4): Mean values of BMI in both groups.**

***1-Measurement of pain intensity (VAS):***

Table (2) and Fig. (5) represent the mean values, SD, and percentage of improvement of pain severity before and after treatment for both groups.

***(a) Within-group comparison:***

In group (A), the mean pain severity value after treatment (5.1±1.21) was statistically significantly lower than its corresponding value before treatment (8.5±1.17) (t-value = 20.82; P-value = 0.0001) (Table 2, Fig. (5).

Additionally, in group (B), the mean pain severity value after treatment (2.2±0.81) was statistically significantly lower than its corresponding value before treatment (8.3±1.2) with (a t-value of 27.53 and a P-value of 0.0001) (Table 2, Fig. (5).

The reduction percent of pain severity mean value in groups A& B was 40% and 73.49% respectively.

**Table (2): Mean values of pain severity measured before and after treatment in both groups.**

| Visual analogue scale (VAS) | Group (A) | | Group (B) | |
|---|---|---|---|---|
| | Pre-treatment | Post-treatment | Pre-treatment | Post-Treatment |
| $\overline{X}$ ± SD | 8.5 ± 1.17 | 5.1 ± 1.21 | 8.3 ± 1.21 | 2.2 ± 0.81 |
| MD | 3.4 | | 6.1 | |
| % of improvement | 40 % | | 73.49 % | |
| t-value | 20.82 | | 27.53 | |
| p-value | 0.0001 (S) | | 0.0001 (S) | |

Data were expressed as mean ± SD.

t-value: Paired and Un-paired t- test. p-value: Probability value. S: Significant.

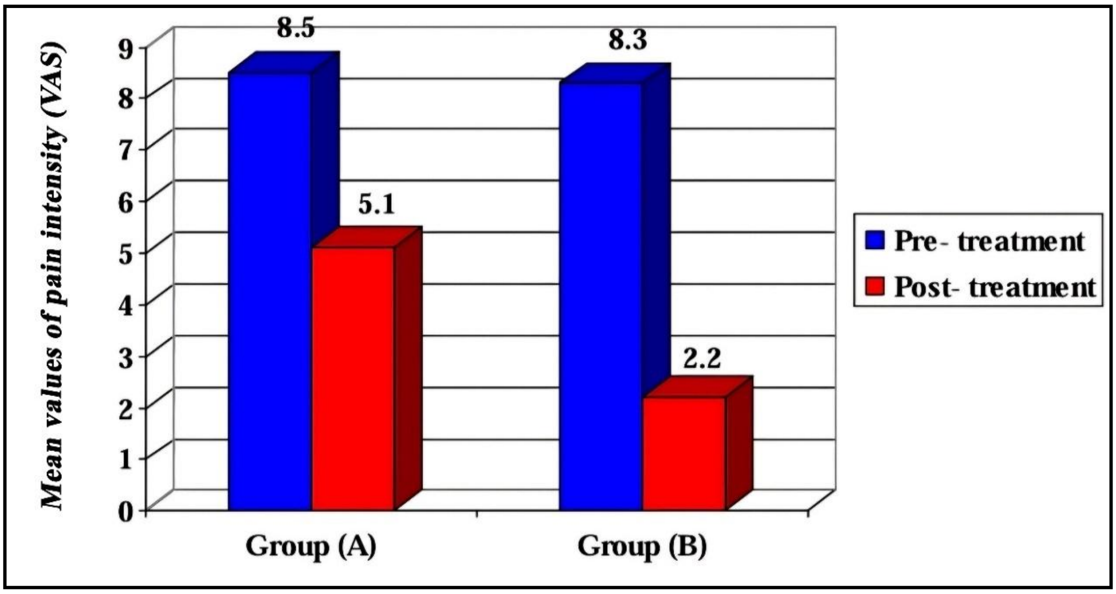


**Fig. (5): Mean values of pain intensity measured before and after treatment in both groups.**

***(b) Between group comparison:***

The mean (±SD) pain severity values in groups (A) and (B) before treatment were 8.51 ± 1.17 and 8.31 ± 1.21, respectively. Across the two groups, no statistically significant change was detected (p=0.517) (Table 3, Fig. (6).

To compare the two groups' after-treatment data, an unpaired T-test was employed. According to the pain intensity data, group (B) indicated a significant reduction in pain severity (2.2 ± 0.81) compared to group (A) (5.11 ± 1.21) (p=0.0001) in favor of group (B) (Table 3, Fig. (6).

**Table (3): Mean values of pain severity measured before and after treatment across both groups.**

| Two Groups | Visual analogue scale (VAS) | | | |
|---|---|---|---|---|
| | Pre- treatment | | Post- treatment | |
| | Group (A) | Group (B) | Group (A) | Group (B) |
| $\overline{X}$ ± SD | 8.5 ± 1.17 | 8.3 ± 1.21 | 5.1 ± 1.21 | 2.2 ± 0.81 |

| | | |
|---|---|---|
| **MD** | 0.2 | 2.9 |
| **% of improvement** | – | 56.86 % |
| **t-value** | 0.65 | 10.91 |
| **p-value** | 0.517 | 0.0001 |
| **Level of Significant** | NS | S |

Data were expressed as mean ± SD.

t-value: Paired and Un-paired t- test. p-value: Probability value.

S= P≤0.05 = Significant. NS= P> 0.05 =Not Significant.

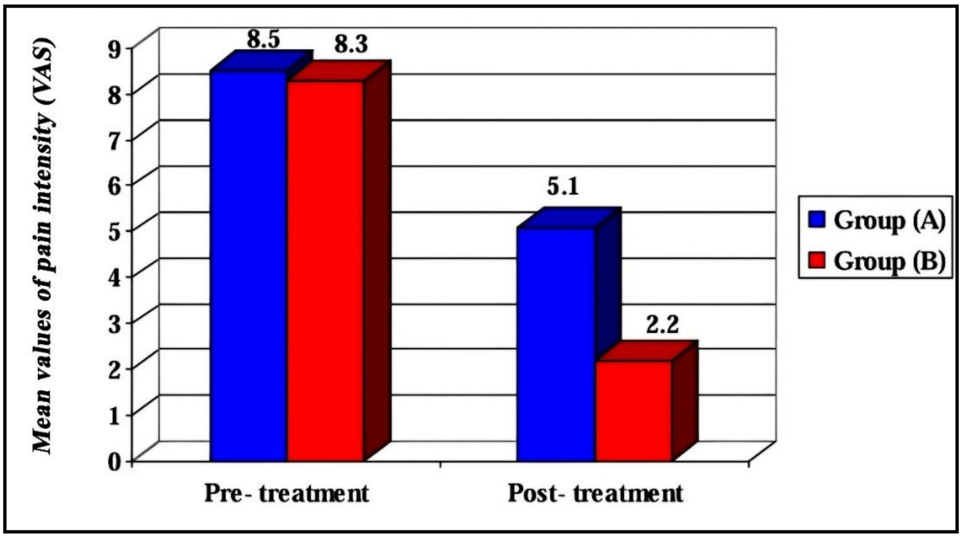


**Fig. (6): Mean values of pain severity measured before and after treatment across both groups**

***2-Measurement of function disability (ODI):***

Table (4) and Fig. (21) represent the mean values, SD, and percentage of improvement of function disability before and after treatment across both groups.

***(a) Within-group comparison:***

The mean function disability value in the group (A) was statistically significantly lower after treatment (24.13 ± 4.38) than before treatment (36.1 ± 4.96), with (a t-value of 13.71 and a P-value of 0.0001) (Table 4, Fig. (7).

In group (B), the mean function disability value after treatment (9.17 ± 4.83) was statistically significantly lower than its corresponding value before treatment (37.47 ± 6.04), with (a t-value of 27.43 and a P-value of 0.0001) (Table 4, Fig. (7).

The percentage of decrease in function disability mean value in the two groups (A&B) was 33.16 % and 75.53 % respectively.

**Table (4): Mean values of function disability measured before and after treatment in both groups.**

| **Oswestery disability index (ODI)** | **Group (A)** | | **Group (B)** | |
|---|---|---|---|---|
| | **Pre-treatment** | **Post-treatment** | **Pre-treatment** | **Post-Treatment** |
| $\overline{X}$ **± SD** | 36.1 ± 4.96 | 24.13 ± 4.38 | 37.47 ± 6.04 | 9.17 ± 4.83 |
| **MD** | 11.97 | | 28.13 | |

| | | |
|---|---|---|
| **% of improvement** | 33.16 % | 75.53 % |
| **t-value** | 13.71 | 27.43 |
| **p-value** | 0.0001 | 0.0001 |
| **Level of Significant** | S | S |

Data were expressed as mean ± SD.t-value: Paired and Un-paired t- test. p-value: Probability value. S: Significant.

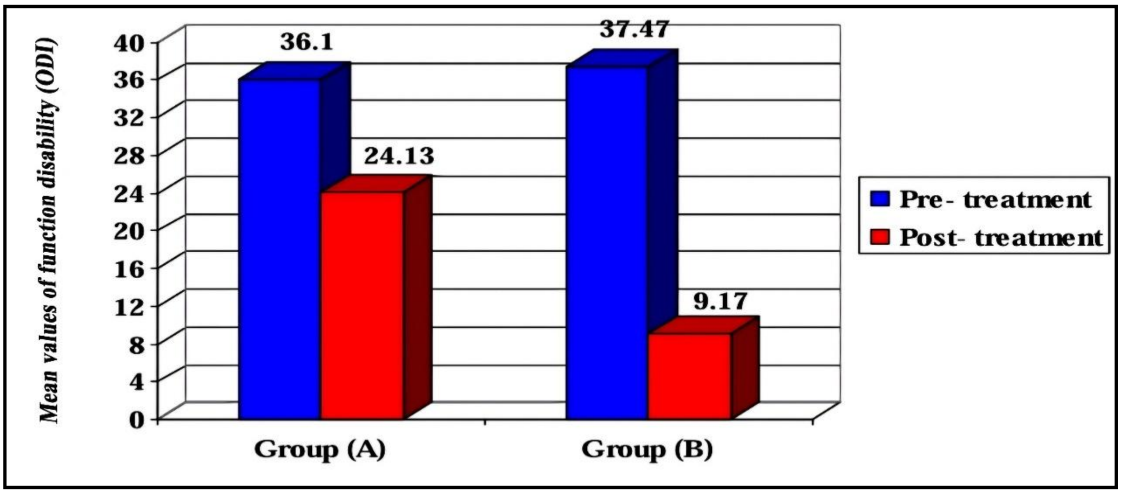


**Fig. (7): Mean values of function disability measured before and after treatment in both groups.**

***(b) Between group comparison:***

In groups (A) and (B), the mean values (±SD) of function disability before treatment were (36.1 ± 4.96) and (37.47 ± 6.04) respectively. No statistically significant change was indicated across the two groups (p=0.342) (Table 5, Fig. (8).

An unpaired T-test was utilized to compare the after-treatment results of the two groups. The findings of function disability indicated a statistically significant reduction in its level in group (B) (9.17 ± 4.83) when compared to that of group (A) (24.13 ± 4.38) (p=0.0001) in favor of group (B) (Table 3, Fig. (8).

**Table (5): Mean values of function disability measured before and after treatment across both groups.**

| **Two Groups** | **Oswestery disability index (ODI)** | | | |
|---|---|---|---|---|
| | **Pre- treatment** | | **Post- treatment** | |
| | **Group (A)** | **Group (B)** | **Group (A)** | **Group (B)** |
| $\overline{X}$ **± SD** | 36.1 ± 4.96 | 37.47 ± 6.04 | 24.13 ± 4.38 | 9.17 ± 4.83 |
| **MD** | 1.37 | | 14.96 | |
| **% of improvement** | – | | 61.99 % | |
| **t-value** | 0.96 | | 12.57 | |
| **p-value** | 0.342 | | 0.0001 | |
| **Level of Significant** | NS | | S | |

Data were expressed as mean ± SD.

t-value: Paired and Un-paired t- test. p-value: Probability value.

S= P≤0.05 = Significant. NS= P> 0.05 =Not Significant.

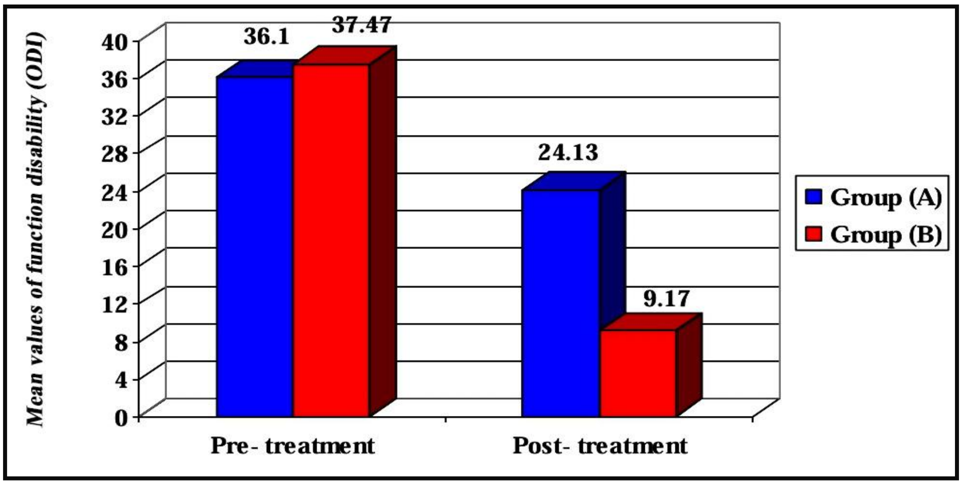


**Fig. (8): Mean values of function disability measured pre and post treatment across both groups.**

## 4. DISCUSSION

After labor, one of the most frequent reasons for improper back functioning is postnatal LBP [30]. Beginning soon after delivery, back discomfort is a dull soreness that becomes worse with effort and goes away with rest. After sitting for a long time, this ache gets worse. On each occasion, lifting the baby causes discomfort. The pain is so intense that it prompts the woman to lie down and rest on both legs [31].

After giving birth and throughout their lives, 50–80% of women suffer from postpartum LBP. Physical and psychological issues, disability, and a decline in quality of life (QOL) are potential consequences. Long-term pain interferes with the patient's ability to do everyday tasks [32].

Pain relief, improved mobility, avoidance of physical incapacity, and improvement of bodily functioning and QoL are the objectives of treatment for postpartum LBP. Numerous therapy plans are recommended to achieve these objectives. The most commonly used treatments include medical care, therapeutic modalities, massage, traction, manipulation, and therapeutic exercises [33].

SNAG has an instant impact on pain reduction, lumbar ROM, and back functioning by combining sympatho-excitation, non-opioid hypoalgesia, and enhancements in motor function. Additionally, the SNAGs treatment method fixes joint positioning errors that arise after strains or injuries. It is suggested that the biomechanical joint issues causing the symptoms can be resolved by integrating this joint glide with physiological spinal mobility (lumbar flexion). This resulted in improved mobility, a lowering in the pain level, and an indirect reduction in function impairment. Additionally, mobilization improves mobility and QoL while reducing joint stiffness, edema, and muscle spasms [34].

Thus, this study aimed to ascertain how modified lumbar SNAGs affected the management of LBP in postpartum women. From June 2024 to December 2024, this study was carried out at Kasr El Ainy University Hospital. This study included sixty patients who experienced LBP for at least three months following childbirth. They were distributed into two equal groups at random; group (A) (control) had 30 participants who performed only back extensor, hamstring, and calf stretching exercises and abdominal and back muscle strengthening exercises for 30 minutes per session, trice weekly for four weeks, while group (B) (study group) had 30 participants who received Modified "SNAGs" on the lumbar level (L4-L5) for 10 seconds per set, trice weekly for four weeks, along with the same exercise regimen as group (A).

Each participant was evaluated pre- and after the treatment program. The VAS was utilized to determine pain severity, and the ODI was utilized to detect functional disability.

The study's findings indicated that after treatment, the mean value of pain severity in both groups decreased statistically significantly. Additionally, it revealed a statistically significant lowering across the two groups after treatment, favoring group (B), where the percentage of improvement was 73.49%, whereas the change across the two groups was statistically non-significant before treatment (p=0.0001).

After treatment, there was also a significant reduction in the mean function disability score for both groups. Additionally, it indicated a statistically significant decrease across the two groups after treatment, favoring group (B), where the percentage of improvement was 75.53 percent, whereas the difference among both groups was statistically non-significant before treatment (p=0.0001).

The participants' enhanced functional ability, which demonstrated that stretching exercises led to a considerable improvement in participants' functional ability, is the reason for the notable decrease in pain intensity [35].

Additionally, strengthening activities for the lower back muscles strengthened weak muscles, which improved spine stability and decreased pain [36]. Strengthening exercises have been shown to affect the fluid dynamics of the damaged area, including fluid stasis, and change the tissue's chemical milieu, which activates the nociceptor and reduces pain [37].

Following stretching exercises, lengthening of the muscle-tendon unit, a decline in peak force, a reduction in the rate of tensile stress on the muscle-tendon unit, and a change in its viscoelastic property, which results in reduced tissue tightness, have all been linked to minimizing LBP and the subsequent enhancement in function [38].

Because of the non-opioid endogenous pain inhibition mechanisms, SNAGs provide instant pain alleviation. By preventing the presynaptic nerve terminals from transferring pain signals, gradual mobilization can lessen discomfort and desensitize the nervous system through habituation [39].

The theories of extinction and habituation might also provide a useful explanation. Patients who typically feel pain when performing flexion movements are likely to have conditional anxiety about any activity that involves that specific motion. Patients receiving "SNAG" treatment were gradually exposed to this fearful motion, which caused no pain or even instant relief. The unpleasant memory (painful trunk flexion) becomes habitual and eventually disappears when the flexion movement is successfully repeated [40].

SNAG activation of the CNS can lead to a hypoalgesic effect and may stimulate other neural systems such as the sympathetic nervous system, so the descending mechanisms can be considered as a factor contributing to the improvement. These mechanisms can be thought of as possible alternative neurophysiological models in which "SNAG", as a manual technique, stimulates areas within the CNS that lead to the improvement in position sense [41].

The following explanation could account for the notable improvement in functional impairment with SNAGs: First, it can be because the lumbar facet joint's positional fault has been fixed, restoring normal function and releasing the muscles that protect the joint. Second, the severity of the conditioned reaction may have decreased through extinction as a result of repeated painful motions that were neither painful nor dangerous; hence, the impairment is lessened [29].

The present results were supported by Khalil et al. [42], who evaluated the effectiveness of using a systematic stretching maneuver in the management of CLBP patients and revealed that patients in the stretching group had a significant decrease in pain intensity compared to those experienced by the control group.

The current findings are corroborated by those of Handa et al. [43], who looked into the impact of trunk-strengthening exercise in women with CLBP. Exercises that strengthen the trunk extensors have been shown to help LBP patients feel less pain and have stronger muscles.

Additionally, Amit et al. [44] proposed that exercises that strengthen the deep abdominal muscles, such as the multifidus, transversus abdominis, and superficial muscles, are crucial for lowering LBP.

Also, Bentsen et al. [36] found that spinal flexion and extension exercises significantly reduced the severity of LBP in individuals with chronic postnatal LBP; lumbar flexion and extension exercises aid in pain relief.

Moreover, Magnusson et al. [45] discovered that strength and flexibility exercises enhanced lumbar functional ability and ROM. This was because stronger muscles resulted in less pain, more flexibility, and better motor control abilities.

Furthermore, Sullivan et al. [46] showed that the group receiving conventional exercise had a statistically significant reduction in functional impairment after treatment. Additionally, they found that reducing disability and increasing ROM in postnatal LBP patients were caused by enhancing the patients' physical function and relieving pain.

However, the current findings contradicted those of Koumantakis et al. [47], who discovered that lumbar pain alleviation did not always follow an increase in lumbar muscle strength. This suggests that pain treatment requires strength and flexibility training in addition to other tactics.

A statistically significant reduction in pain severity and functional disability as assessed by VAS and ODI was indicated in the study group (B), which received treatment with modified "SNAGs" in addition to conventional exercises. These findings concurred with those of Seo et al. [48], who used modified lumbar SNAGS to treat postnatal persistent LBP patients who had flexion deficits and found that pain intensity and functional impairment significantly decreased.

These results were corroborated with Çirak et al. [49], who showed that the Mulligan SNAG approach when used for LBP, improved trunk muscular endurance, reduced pain, and prevented facet joint stiffness in women with nonspecific LBP.

Also, Bedard et al. [50] used modified Mulligan’s SNAG technique on lumbar facet dysfunction and concluded that facet joints respond well to Mulligan SNAG technique.

The study's results concurred with those of Hidalgo et al. [51], who proved the usefulness of Mulligan's lumbar "SNAG" in reducing functional disability and improving the functional level measured by ODI.

Contrary, the current results contradicted those of the earlier studies, which reported a non-significant change in functional disability, pain severity, and lumbar flexion and extension ROM after using modified SNAG in CLBP patients (Jackson et al. [52], Frederikke [53] and Petty [54]). This contradiction could be explained by the short treatment period they used in their studies compared with the duration of treatment used in our study (4 weeks).

This study indicated that both traditional exercises and modified lumbar SNAGs were effective approaches for relieving postnatal LBP due to significant decrease in pain degree and functional disability.

## 5. CONCLUSION

The use of modified SNAGs was indicated to be beneficial in treating lower back pain in postpartum women, and its combination with traditional exercises were more successful than traditional exercises alone.

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