# EFFECT OF CORE STABILITY EXERCISES VERSUS ISOMETRIC EXERCISES ON PAIN AND QUALITY OF LIFE IN WOMEN WITH DYSMENORRHEA: AN EXPERIMENTAL STUDY

By

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**MASTER OF PHYSIOTHERAPY (M.P.T)**

In

**ORTHOPAEDICS**

Under the Guidance of

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**ABHINAV BINDRA SPORTS MEDICINE & RESEARCH INSTITUTE**

**BHUBANESWAR, ODISHA**

**2023-2025**

**Odisha University of Health Sciences**

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# LIST OF ABBREVIATIONS

1. MCS – Mental Component Summary
2. NPRS – Numeric Pain Rating Scale
3. PCS – Physical Component Summary
4. PD – Primary Dysmenorrhea
5. SD – Secondary Dysmenorrhea
6. SPSS – Statistical Package of Social Sciences

# ABSTRACT

**Background:** Primary dysmenorrhea is a common gynaecological condition that affects women's quality of life. Exercise interventions have been identified as safe and effective strategies for managing symptoms.

**Objective**: This study aimed to compare the effects of core stability exercises with active stretching and isometric exercises with active stretching on pain intensity and quality of life in women with primary dysmenorrhea.

**Methods**: Thirty-two women with dysmenorrhea were assigned to two groups: a core stability group (n = 16) and an isometric group (n = 16). Each group performed its respective exercise program for 25–30 minutes, five sessions per week, for four weeks. Pain intensity was assessed using the Numerical Pain Rating Scale (NPRS), and quality of life was measured using the SF-12 Health Survey, which includes the Physical Component Summary (PCS) and Mental Component Summary (MCS).

**Results**: Within-group analysis showed significant improvements in both groups for NPRS and PCS ($p < 0.05$). In the core stability group, NPRS, PCS, and MCS all improved significantly ($p < 0.05$). In the isometric group, NPRS and PCS improved significantly ($p < 0.05$), while MCS did not show a significant change ($p > 0.05$). Between-group analysis showed no statistically significant differences in NPRS, PCS, or MCS between the two groups ($p > 0.05$).

**Conclusion**: Both core stability and isometric exercises were effective in reducing pain and improving the physical component of quality of life in women with dysmenorrhea. Core stability exercises provided additional benefits by also improving mental health outcomes. These findings support the use of exercise as a non-pharmacological management strategy, with core stability training offering broader advantages when psychological well-being is considered.

**KEYWORDS**: Dysmenorrhea/therapy; Exercise Therapy/methods; Isometric exercise; Core Stability Exercise; Pain Measurement; Quality of Life

# TABLE OF CONTENTS

# LIST OF TABLES

# LIST OF FIGURES

# LIST OF GRAPHS

# INTRODUCTION

Menstruation, also called a period, refers to the monthly discharge of blood and other material from the lining of the uterus for about every lunar month from puberty until menopause, except for pregnancy [1]. The menstrual cycle is typically divided into four different phases, namely the menstrual phase, follicular phase, ovulatory phase, and luteal phase [2]. Dysmenorrhea is defined as a recurrent, cyclic pelvic pain that is associated with the menstrual period [3]. The ICD-10 coding divides dysmenorrhea into two distinct categories: primary dysmenorrhea and secondary dysmenorrhea. Typically, primary dysmenorrhea first manifests between six to twelve months following menarche. The pain of dysmenorrhea is characterized by a clear and cyclical pattern that usually occurs on the first day of menses and lasts for a maximum of seventy-two hours [4]. Seeing that most young women would prefer to endure in agony in silence without going to the doctor, it is often neglected and even overlooked despite its high incidence and influence on daily activities [5]. High prostaglandin levels induce spasms of uterine smooth muscle and vasoconstriction, which are the primary etiologies of primary dysmenorrhea and are not associated with organic lesions [6]. Secondary dysmenorrhea results from a pathological process like endometriosis, chronic pelvic inflammatory disease, adenomyosis, endometrial polyps, an

ovarian cyst, congenital anomalies, or complications with intrauterine contraceptive devices [7]. Women with secondary dysmenorrhea often have clinical features that differentiate their illness from that of primary dysmenorrhea. These features include an elongated uterus, pain on sexual intercourse, and resistance to successful treatment. Endometriosis is a frequent cause of secondary dysmenorrhea and is defined by the presence of endometrial tissue outside the uterus. The diagnosis and treatment of secondary dysmenorrhea, therefore, depend on the specific underlying pelvic disorder [7]. Primary dysmenorrhea, on the other hand, refers to menstrual cramps and symptoms such as bloating or nausea that occur at or before menstruation in the absence of any identifiable medical condition. The pain is recurrent, usually located in the lower and midline abdomen, and may radiate to the lumbar, inguinal, or thigh regions [4]. It is a highly prevalent gynaecological condition, affecting between 16% and 91% of women of reproductive age [8]. Symptoms such as muscle stiffness, lower back pain, cramps, and fatigue frequently lead to absence from work or school [9]. The most commonly reported menstruation-related symptoms include lower abdominal pain (83.1%), lower back pain (59.3%), tiredness (47.5%), breast tenderness (50.8%), mood changes (71.2%), and increased appetite (52.5%) [8].

Its prevalence, which lies between 24 and 92% at the global level, is wide-ranging. High prevalence notwithstanding, the

diagnostic process is generally not proper, and hence, numerous patients do not go for medical consultation [5]. It can also lead to serious social and economic hardship [6]. The population selected, age, ethnicity, and differences in pain perception among communities, and the differences in the methodology employed to assess primary dysmenorrhea may all contribute to this difference in the rates [8]. Overall, the young women (below 24 years) had a more prevalent rate (70%-90%) [10]. Dysmenorrhea is often associated with common symptoms that can be classed into two primary categories, psychological and physical, in addition to lower abdominal/pelvic pain [6.] It is not uncommon to find physical signs that are systemic, gastrointestinal, or associated with the elimination process. Systemic physical symptoms often include headache, lethargy, fatigue, sleepiness or insomnia, pain in the breast, lower abdomen felt as heavy or achy, and backache. Remedies for common cycle-related aches, like painful knees and inner thighs, myalgia, arthralgia, and swollen legs, would also fit into the physical symptoms [4]. In the context of psychological symptoms, patients may experience mood disorders such as anxiety, depression, irritability, and nervousness [12].

Different risk factors for primary dysmenorrhea have the following associations: a history of smoking, those with a lower body mass index (BMI) of 20, younger age with 30 years, earlier onset of menarche at 12 years old, longer duration of bleeding or

menstrual cycles (Irregular or heavy menstrual bleeding was previously mentioned as a factor), history of sexual assault, and if family members have a history of dysmenorrhea [4]. The pathophysiology of dysmenorrhea is due to the uterus producing more prostaglandin F2α (PGF2α) and prostaglandin E2 (PGE2) during the breakdown of the endometrium. These prostaglandins cause blood vessels to constrict and stimulate contractions of the myometrial muscle, which leads to anaerobic metabolites, generating uterine ischemia. This leads to hypersensitivity of pain fibers, which results in pelvic pain later [6]. Prostaglandins are generated via the arachidonic acid cascade mediated by the cyclooxygenase (COX) pathway. Levels of progesterone control arachidonic acid synthesis through the lysosomal enzyme phospholipase A2 [13]. The peak of progesterone occurs in the middle of the luteal phase, which is in the second half of the menstrual cycle after ovulation. If conception does not occur, the corpus luteum degenerates and blood levels of progesterone drop. This rapid decline in progesterone levels is associated with menstrual bleeding, endometrial sloughing, and the release of lysosomal enzymes. These events result in the production of arachidonic acid and then prostaglandin [6]. In the late luteal phase, women with typical menstrual cycles exhibit increased endometrial concentrations of prostaglandins. There is evidence from recent studies evaluating prostaglandin levels in the luteal phase using endometrial biopsy and menstrual fluids that women

who experience dysmenorrhea have higher prostaglandin levels than eumenorrheic women with regular menstrual cycles who have painful cramps. These findings indicated that elevated PGF2α and PGE2 concentrations in the endometrium correlate with menstrual cramping, pain severity, and associated symptoms [6]. Diagnosis of primary dysmenorrhea is made primarily by obtaining a targeted medical history and performing a physical exam to rule out pelvic pathology 7. The initial evaluation of primary dysmenorrhea will obtain relevant medical, menstrual, gynaecological, and sexual history. The focused medical history also should include: age at menarche, regularity and duration of menstrual bleeding, abnormal vaginal discharge, onset and duration of symptoms associated with the age of menarche, and the menstrual cycle, location of pain, and any associated systemic symptoms [4]. Sexual behaviour and history of sexually transmitted infections should also be taken into account. If dysmenorrhea occurs after the start of menarche, the symptoms are severe, the bleeding is irregular, the patient has dyspareunia, there is a family history of endometriosis, or the patient responds poorly to the treatment employed, secondary dysmenorrhea should be suspected [7]. In the case of primary dysmenorrhea treatment, a key aim is to provide sufficient pain relief for women suffering from dysmenorrhea to perform their usual activities, improve quality of life, and decrease absenteeism from work or school [4]. Exercise produces several

physiological results in primary dysmenorrhea. Effects of exercise may include increased blood flow to various parts of the body, dilation of blood vessels, and improved pain threshold. Exercise induces the release of endorphins and the polarization of macrophages, leading to a change from producing pro-inflammatory cytokines such as IL-1β to anti-inflammatory cytokines such as IL-10. These physiological changes have an analgesic effect and engage mechanisms reducing pain [8,9] Additionally, exercise can create a psychological factor with techniques including diversion, redirection of cognitive attention, reduced stress, enhanced mood, and developing a sense of control and empowerment to lessen pain. [8]

There are many physiotherapy approaches for pain relief. Topical heat is the technique of heating the suprapubic area (applying heat directly to the suprapubic area), and is a natural, cheap, and effective approach [4]. Transcutaneous Electrical Nerve Stimulation (TENS) provides mechanisms for pain relief that include two mechanisms of action. The first mechanism is that the afferent impulses pass through the large-diameter sensory fibers originating from the same nerve root. The second mechanism of pain relief provides a pathway for partial pain relief via the spinal cord and peripheral nerves to stimulate the release of endorphins [6].

Core stability exercises are effective for pain relief in primary dysmenorrhea. The diaphragm (superior), the rectus abdominis,

the internal and external oblique (anterior-lateral), the multifidus and gluteus maximus, the gluteus medius and gluteus minimus (posterior), and the pelvic floor (inferior) muscles are examples of important core muscles [14]. These muscles, which involve both local and global muscles, provide stability to the trunk and spine, similar to a corset [15]. Overall, core stability exercises condition core muscles via improved neural drive and contraction efficiency [16]. Therefore, conditioning core muscles may ameliorate primary dysmenorrhea by enhancing pelvic circulation and metabolism. found that core stability exercise significantly increases HRQoL in women with primary dysmenorrhea while reducing low back pain and increasing back muscle endurance [17]. Therefore, the addition of core stability in women with primary dysmenorrhea is a beneficial non-pharmacological intervention for the prevention and treatment of dysmenorrhea symptoms [16], [17]. Isometric exercises refer to a type of exercise in which there is no change in muscle length and joint angle during muscle contraction 18. It is easy and safe for the sedentary population since the protocol is non-invasive and at low intensity, and is typically used in rehabilitation settings [19]. Moreover, it is cost-effective since it does not rely on any special settings or equipment, and can be scheduled into a short period of time. Therefore, isometric exercise seems to be an ideal candidate for a non-pharmacological method to diminish the intensity of primary dysmenorrhea pain. Exercise of an isometric

nature can also potentially work on the mechanism of pelvic muscle strengthening, facilitating bleeding, and discharging waste products with prostaglandins found in the body. Isometric exercise is also a proposed way of firing the continuous muscle, which is of δ-type and C fiber, and promotes inhibition to diminish and inhibit pain [20]. After all, usual levels of performance remedy stress and also decrease sympathetic nervous system activation, which causes contraction and pain in the uterine muscle [19]. Recent research has demonstrated that engaging in active stretching exercises can reduce symptoms associated with primary dysmenorrhea. The pain felt during menstruation is believed to be associated with contractions in the ligaments of the pelvic and abdominal area that stimulate nerve irritation due to compression of nerve pathways. Hence, it follows that applying active stretching to the pelvic and abdominal region relieves the compression on the nerves and results in an increase in uterine metabolism and blood flow, which alleviates dysmenorrhea symptoms [21].

In summary, primary dysmenorrhea is a prevalent condition with considerable physical, emotional, and social effects. Exercise-based interventions such as core stability, isometric, and stretching programs are safe, effective, and accessible methods for reducing pain, improving function, and enhancing quality of life. Promoting these exercises supports a proactive and holistic approach to care, shifting the focus from symptom control to

improving comfort, well-being, and confidence during the menstrual cycle.

# AIM & OBJECTIVE

**Aim**

To compare the effect of core stability with active stretching versus Isometric exercise with active stretching in women with dysmenorrhea

**Objective**

1. To study the effects of core stability exercise with active stretching using NPRS and SF-12 in women with dysmenorrhea.
2. To study the effects of isometric exercise with active stretching using NPRS and SF-12 in women with dysmenorrhea

# HYPOTHESIS

**Null Hypothesis ($H_0$):**

There will be no significant difference between core stability exercises and isometric exercises in reducing pain and improving quality of life in women with dysmenorrhea.

**Alternative Hypothesis ($H_1$):**

Core stability exercises will be more effective than isometric exercises in reducing pain and improving quality of life in women with dysmenorrhea.

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# REVIEW OF LITERATURE

1. **Efficacy of active stretching exercises against symptoms of primary dysmenorrhea in young adult females: A randomized controlled trial**

   *Ibrahim Z, Alharkan B, Alanzi E, Alnasban H, Alsuwailem M, Al Khalil W., 2023*

   this study aims to assess the efficacy of supervised and non-supervised active stretching exercises on pain intensity and menstrual characteristics in young adult females. Conclusion of the study is both supervised and non-supervised stretching programs significantly reduced menstrual pain, with greater improvement in the supervised group.

2. **The effect of stretching exercise on primary dysmenorrhea in adult girls**

   *Gamit KS, Sheth MS, Vyas NJ., 2014*

   this study aims to evaluate the effectiveness of stretching exercises in reducing menstrual pain in young women. Conclusion of the study is Stretching exercises significantly reduced pain, supporting their use as an effective, non-pharmacological intervention.

3. **The difference in the effectiveness of warm compress and active stretching exercise in reducing dysmenorrhea pain**

   *Tianing NW, Nugraha MHS, Indrayani AW, Widyadharma E., 2021*

   this study aims to compare the effects of warm compresses and active stretching exercises in women with dysmenorrhea. Conclusion of the study is both interventions reduced pain, but stretching was more effective than warm compresses.

4. **Effects of stretching exercises on primary dysmenorrhea in adolescent girls**

   *Shahr-jerdy S, Hosseini RS, Eivazi MG., 2012*

   this study aims to examine the impact of stretching exercises on pain intensity, pain duration, and analgesic use in high school girls. Conclusion of the study is stretching exercises significantly reduced pain intensity, duration, and analgesic consumption compared to controls.

5. **Core stability exercise on low back ache, back endurance, and health-related quality of life in primary dysmenorrhea: A single-group experimental study**

   *Chodon L, Samuel J., 2024*

   this study aims to investigate the effect of core stability exercises on low back pain, endurance, and quality of life in women with primary dysmenorrhea.

   The conclusion of the study is that Core stability training improved

low back pain, back endurance, and health-related quality of life after intervention.

6. **Effect of core stability exercises on primary dysmenorrhea: A randomized controlled trial**

   *Shahrjerdi S, Mahmoudi F, Sheikhhoseini R, Shahrjerdi S., 2019*

   this study aims to determine the effect of core stability training on pain severity, pain duration, and drug consumption in primary dysmenorrhea.

   Conclusion of the study: Core stability training significantly decreased pain severity, duration, and medication usage compared to controls.

7. **Differences in abdominal musculature, pelvic tilt, and trunk mobility in women with primary dysmenorrhea: A cross-sectional observational study**

   *del Prado-Álvarez et al., year not specified*

   this study aims to assess abdominal muscle thickness, pelvic tilt, and trunk mobility differences in women with dysmenorrhea versus controls.

   The conclusion of the study is that women with dysmenorrhea had reduced rectus abdominis and external oblique thickness compared to controls, though pelvic tilt and trunk mobility showed no significant differences.

8. **The effect of isometric exercise on the intensity and duration of pain among physically inactive young females with primary dysmenorrhea**

   *Zaid NSN, Muhamad AS, Kuan G, Zon EM., 2022*

   this study aims to investigate the effect of isometric training on pain intensity and duration in young women with dysmenorrhea.
   The conclusion of the study is that isometric exercise significantly reduced both pain intensity and pain duration after eight weeks of intervention.

9. **Prevalence, risk factors, and characteristics of dysmenorrhea and its impact on quality of life using the DysmenQoL questionnaire**

   *Amza et al., 2024*

   this study aims to evaluate the prevalence, risk factors, and the impact of dysmenorrhea on quality of life using the DysmenQoL tool.
   Conclusion of the study id dysmenorrhea negatively affected the quality of life in 73.9% of women, with effects strongly correlated to pain severity.

10. **Dysmenorrhea and its impact on quality of life**

    *Tatyana A, Taiwo O, Chinedu N, Ufuoma A., 2019*

    this study aims to determine how dysmenorrhea interferes with daily

activities and quality of life.

The study concludes that dysmenorrhea significantly disrupts daily routines and reduces the quality of life in affected women.

11. **Prevalence of dysmenorrhea and its effect on the quality of life among female undergraduate students**

    *Esan DT, Ariyo SA, Akinlolu EF, Akingbade O, Olabisi OI, Olawade DB, et al., 2024*

    this study aims to determine the prevalence of dysmenorrhea and its effect on the quality of life in female undergraduate students.

    The study concludes that Dysmenorrhea was prevalent in 69.8% of participants, affecting routine work, sleep, and social interactions. Education on effective management strategies was recommended.

12. **Quality of life by dysmenorrhea severity in young and adult Japanese females: A cross-sectional study**

    *Mizuta R, Maeda N, Tashiro T, Suzuki Y, Oda S, Komiya M, Urabe Y., 2023*

    this study aims to assess the relationship between dysmenorrhea severity, coping strategies, and quality of life.

    The conclusion of the study is that Severe dysmenorrhea was

associated with significantly lower physical and psychological quality of life scores.

13. **The impact of dysmenorrhea on quality of life among Spanish female university students**

    *Fernández-Martínez E, Onieva-Zafra MD, Parra-Fernández ML., 2019*

    this study aims to examine prevalence, quality of life impact, and common management methods of dysmenorrhea in Spanish university students.

    The study concludes that Dysmenorrhea affected 76% of students, with negative impacts on quality of life. Pharmacological treatment and self-medication were highly common.

14. **Comparison of the effect of massage therapy and isometric exercises on primary dysmenorrhea: A randomized controlled trial**

    *Azima S, Bakhshayesh HR, Kaviani M, Abbasnia K, Sayadi M., 2015*

    this study aims to compare the effects of lavender oil massage and isometric exercise on pain and anxiety in students with dysmenorrhea.

    Conclusion of the study: Both interventions significantly reduced pain and anxiety, making them viable alternatives to pharmacological management.

15. **Benefits of core stability exercise and relaxation technique for primary dysmenorrhea:** A case report

    *Gopal SR, Premkumar M, Kavitha S, Shipnu P., 2024*

    this study aims to explore the combined effect of core stability and relaxation training in a woman with dysmenorrhea.

    The conclusion of the study is that the program led to a marked reduction in pain severity and dysmenorrhea severity scores, highlighting its potential benefits.

16. **Efficacy of physiotherapy treatment in primary dysmenorrhea: A systematic review and meta-analysis**

    *López-Liria R, Torres-Álamo L, Vega-Ramírez FA, García-Luengo AV, Aguilar-Parra JM, Trigueros-Ramos R, Rocamora-Pérez P., 2021*

    this study aims to evaluate the effects of physiotherapy modalities (core, isometric, Pilates, stretching) on pain and quality of life in women with dysmenorrhea.

    The conclusion of the study is that Exercise-based physiotherapy, especially core and Pilates, consistently reduced pain and improved quality of life.

17. **Comparison of the effect of stretching exercises and mefenamic acid on primary dysmenorrhea: A randomized clinical trial**

    *Motahari-Tabari N, Shirvani MA, Alipour A., 2017*

    this study aims to compare stretching exercises with mefenamic acid

for pain relief in primary dysmenorrhea.

Conclusion of the study is stretching reduces pain intensity as effectively as mefenamic acid, supporting it as a safe non-pharmacological alternative.

18. **Effects of stretching exercises on primary dysmenorrhea in adolescent girls**

    *Jeryd S, Hosseini RS, Gh ME., 2012*

    this study aims to assess the impact of an 8-week stretching program on dysmenorrhea pain in adolescents.

    Conclusion of the study Stretching significantly reduced pain intensity, duration, and sedative use among participants.

19. **Assessment of quality of life and effect of non-pharmacological management in dysmenorrhea**

    *Unnisa H, Annam P, Gubba NC, Begum A, Thatikonda K., 2022*

    this study aims to evaluate the quality of life and the effectiveness of non-pharmacological interventions in dysmenorrhea.

    Conclusion of the study: Non-pharmacological strategies such as rest, physical activity, and heat therapy significantly improved quality of life.

20. **Dysmenorrhea: Prevalence and impact on quality of life among young adult Jordanian females**

    *Al-Jefout M, Seham AF, Jameel H, Randa AQ, Ola AMA, Oday AMA, Luscombe G., 2015*

    this study aims to investigate the prevalence of dysmenorrhea and its effect on academic and social life among Jordanian students.

    Conclusion of the study is that Moderate to severe dysmenorrhea significantly affected academic attendance, social engagement, and physical activity.

21. **Effectiveness of exercise therapy on primary dysmenorrhea: A systematic review and meta-analysis**

    *Abaraogu UO, Tabansi-Ochuogu CS., 2016*

    this study aims to synthesize evidence on the effect of exercise therapy on pain and quality of life in dysmenorrhea.

    The conclusion of the study is that exercise therapy significantly reduced pain intensity and improved overall quality of life across included studies.

# METHODOLOGY & PROCEDURE

Study design: experimental Study

Study population: females with dysmenorrhea

Sampling technique: Purposive Sampling

Sample size: 32

Study setting: Abhinav Bindra Sports Medicine and Research Institute, Bhubaneswar, Odisha.

Study duration: 1 year

Ethical clearance: 6 months

Sample selection, data collection: 4 months

Statistical analysis, results, discussion: 2 months

**Participants:**

An experimental study was conducted on 32 women with dysmenorrhea selected from the Abhinav Bindra Sports Medicine and Research Institute in Bhubaneswar. Before the start of the study, ethical clearance to conduct the study was obtained from the institutional ethical committee, Abhinav Bindra

Sports Medicine and Research Institute (ABSMARI), Pahal, Bhubaneswar. The protocol ID for ethics approval was (ABS-IEC-2024-PHY-00). Initially, 50 women were screened according to established inclusion and exclusion criteria. Inclusion criteria for participants included having primary dysmenorrhea for over six months, being aged between 18 and 26 years, possessing a WaLIDD score of 5–7 (moderate) or 8–12 (severe), being free from gynaecological disorders, and completing McGill's torso muscular endurance test. Participants were selected using the purposive sampling method. Women with Secondary Dysmenorrhea, a history of any gynaecological disease, professional athletic females, and smokers were excluded from the study.

**Sample Size Calculation**: The sample size was calculated using G-Power software using a prior power analysis with effect size (0.272), alpha ($\alpha$=0.05), and power (0.8).

**Material used:**

- Gym ball
- Stopwatch
- Mat
- Board

**PROCEDURE**

An experimental investigation was conducted at the Abhinav Bindra Sports Medicine and Research Institute, Bhubaneswar. A total of 32 participants were

included, selected randomly based on the previously mentioned inclusion and exclusion criteria.

Short demographic data of all the participants were collected, written consent was obtained from all the participants, and the experimental protocol was explained in detail, with benefits and harms discussed. The total length of the study was 4 weeks, with 20 sessions of the experimental protocol included during this timeframe. The 32 participants who cleared the inclusion criteria were randomly separated into the Core Stability group and the Isometric group. Group A underwent core stability exercises with active stretching, and Group B underwent Isometric exercises with active stretching, five times a week for four consecutive weeks.

All subjects completed primary outcome measures of pain and quality of life, the numeric pain rating scale (NPRS), and the SF-12, before beginning the exercise protocol and again after four weeks.

There were no reported adverse effects during the protocol.

**Core stability exercises with active stretching**

The core stability exercises included 10 exercises, which were performed 5 times a week for 4 weeks with active stretching. The exercise protocol is explained in Table 1.

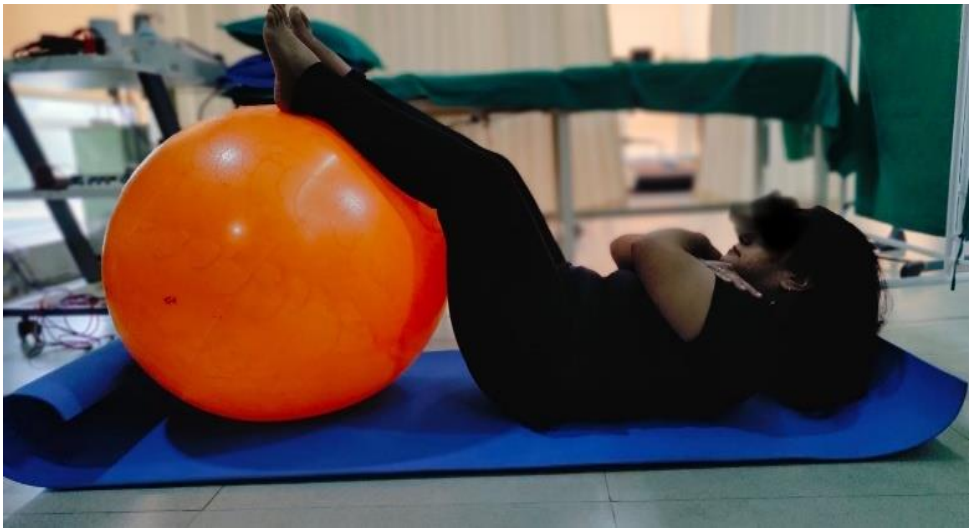
**Isometric Exercises with Active Stretching**

The Isometric Exercises Included 8 Exercises Which Were Performed 5 Times a Week For 4 Weeks with Active Stretching. The Exercise Protocol Explained in Table 1

**Picture-1 (Ball bridge t fall off)**

**Picture-2**

**In the supine position, bend your knees and thighs. Put a pillow between the knees and press the knees to each other. Hold for ten seconds and relax**



**Picture-3**

**Crunch with feet on the ball (legs elevated)**

**Picture-4**

**lower abdominal muscle stretch**

**Picture-5**

**Leg curl on the ball**

**Picture-6**

**Oblique ball crunches**

**Picture-7**

**Lie down in the supine position. Extend your feet next to each other and press them against each other. Hold for ten seconds and relax**

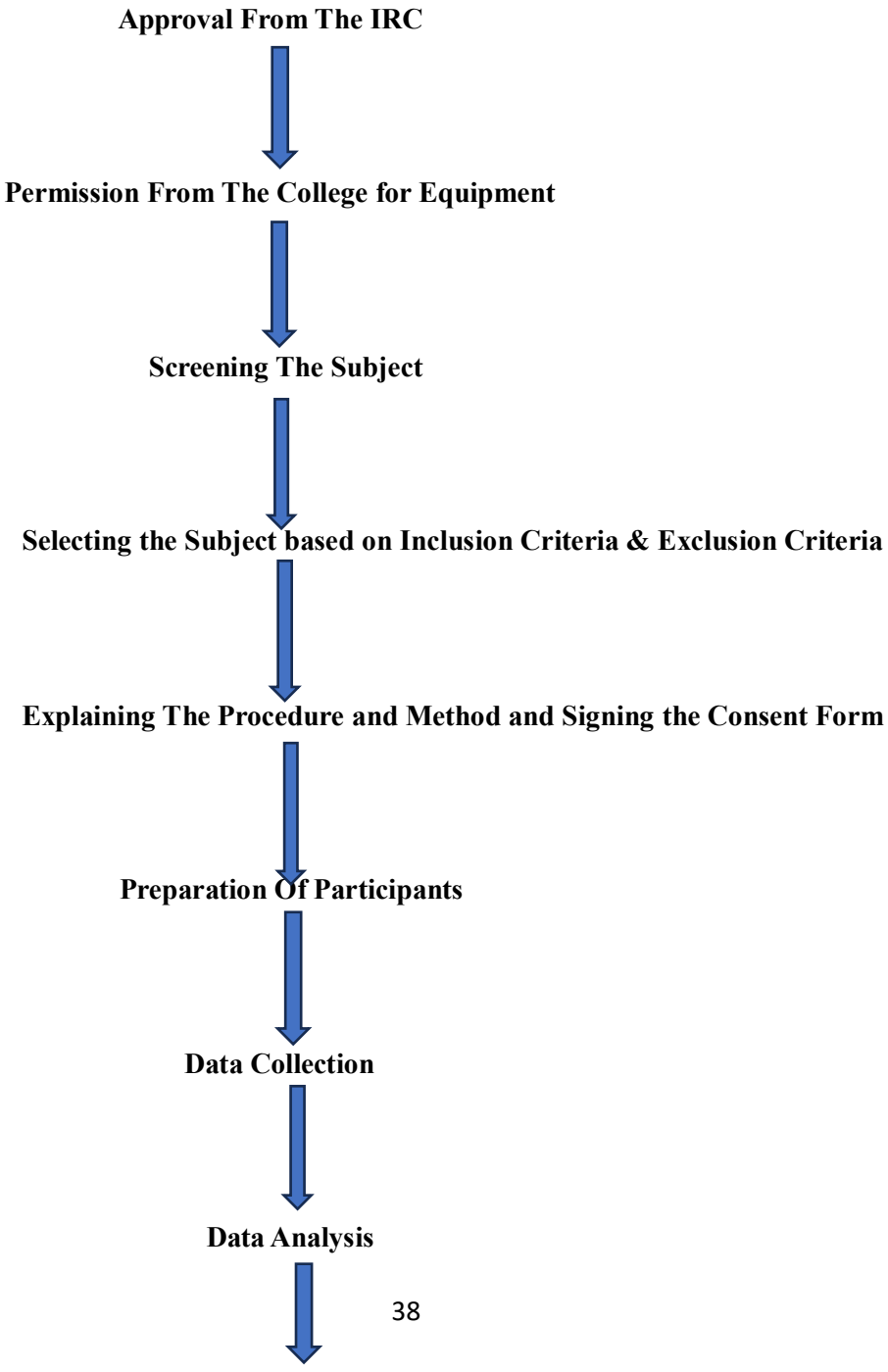
**Picture-8**

**Ball Squeeze**

**FIGURE-9**

**Hamstring stretching**

**Flow Chart**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Permission From The College for Equipment
Screening The Subject
Selecting the Subject based on Inclusion Criteria & Exclusion Criteria
Explaining The Procedure and Method and Signing the Consent Form
Preparation Of Participants
Data Collection
Data Analysis

## Result And Conclusion

**FIGURE-10**

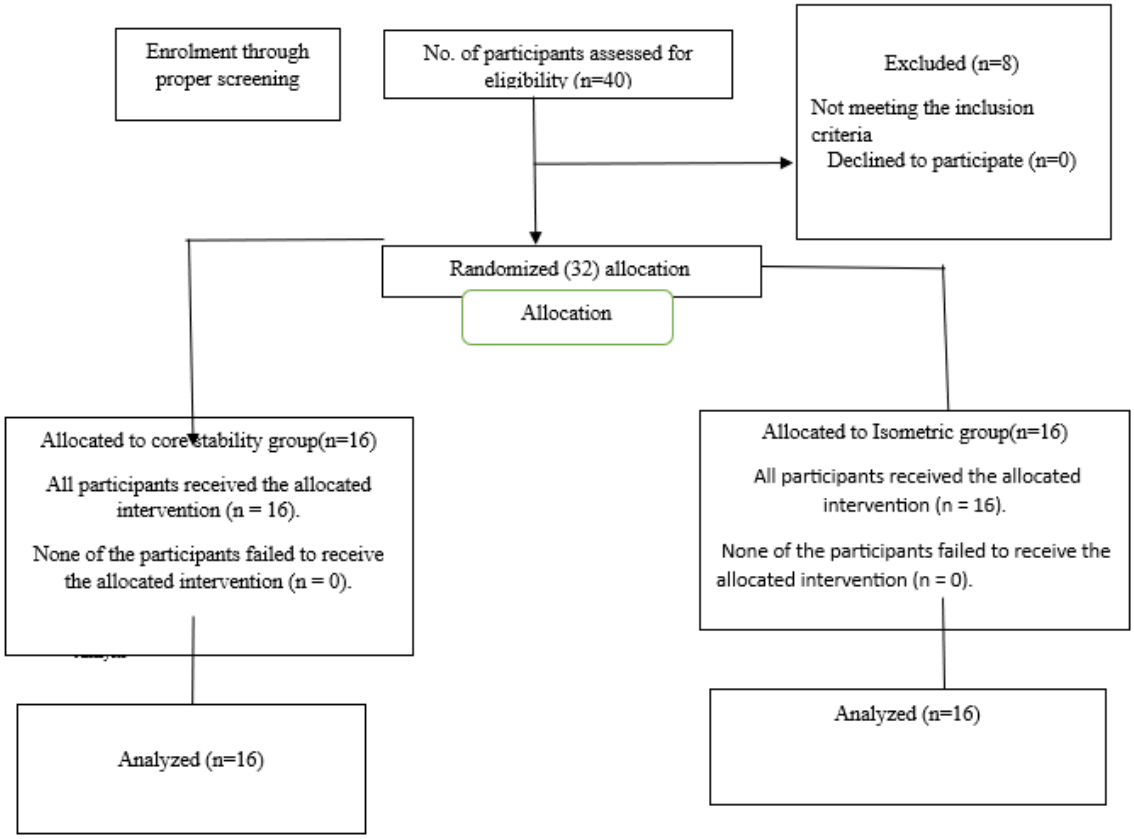



**FIGURE -11**

**Core Stability Exercises Protocol:**

- 4-week core stability exercise program.
- The program featured 10 stabilization exercises.
- (Dosage: 4 weeks, 5 days/week, 25-30 min/day, 10 seconds rest in between sets and 1 minute rest between exercises)

**Isometric Exercises Protocol:**

- 4-week isometric exercise program.
- The program featured 8 isometric exercises
- (Dosage: 4 weeks, 5 days/week, 20-25 min/day, 10 seconds rest in between sets and 1 minute rest between exercises)

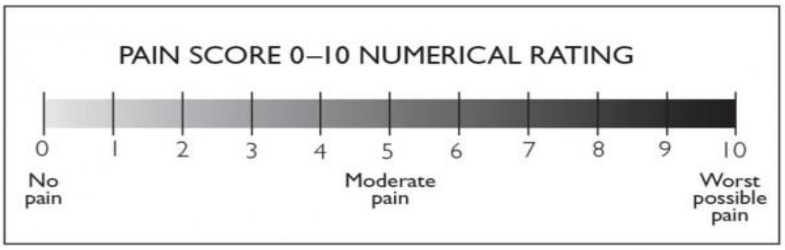
**Active Stretching Protocol:**

- Duration: 8-10 minutes
- Intensity: low-to-moderate intensity (more comfortable for the patient)
- Sets: 1 set
- Repetition: 2 repetitions

**TABLE 1**

**Outcome Measure**

**Numeric Pain Rating Scale:** The Numerical Pain Rating Scale (NPRS) is a widely used tool for assessing pain intensity and has well-established psychometric properties. It demonstrates strong test–retest reliability, with intraclass correlation coefficients ranging from 0.67 to 0.96, and high internal consistency (Cronbach's $\alpha > 0.80$), indicating stable and consistent results [23]. Its validity is supported by strong correlations with other established measures, such as the Visual Analog Scale and the Verbal Rating Scale, confirming both construct and criterion validity [24]. The NPRS is a numerical adaptation of the visual analog scale, allowing individuals to rate their pain on an 11-point scale from 0 to 10, where 0 represents "no pain" and 10 represents "the worst pain imaginable." The scale is usually displayed as a horizontal line or bar, making it simple for patients to select a whole number that best reflects their current pain intensity.




**PICTURE 12- NPRS SCALE**

**SF-12 Questionnaire:** The SF-12 Health Survey is a widely used tool for assessing health-related quality of life and is known for its strong reliability and validity. It demonstrates acceptable internal consistency, with Cronbach's alpha values exceeding 0.70 for both the Physical Component Summary (PCS) and Mental Component Summary (MCS). Test–retest reliability is also high, with correlations ranging from 0.76 to 0.89 (Ware et al., 1996). Validity is supported through strong correlations with the SF-36 ($r > 0.90$) and with various disease-specific measures, confirming both construct and convergent validity [25,26]. The

SF-12 is therefore a reliable and efficient instrument for evaluating how an individual's health influences daily functioning and overall quality of life.

The survey measures health in eight main areas of performance:

Physical Activities: To what extent do health problems limit your physical activities?

Social Activities: To what extent do physical/emotional problems interfere with your social life?

Daily Activities: To what extent do health problems limit your ability to carry out your usual day-to-day work or activities?

Pain: How has pain affected your life?

Mental Health: How is your mental health overall?

Emotional Problems: To what extent do emotional problems limit your ability to carry out your usual day-to-day work or activities?

Vitality: How is your energy level or fatigue experienced?

General Health: What is your overall assessment of your health?

After completion, the SF-12 survey responses are converted into two summary scores: the Physical Component Summary (PCS) and the Mental Component Summary (MCS). Both use a standardized scoring system, where a score of 50 represents the population average. Scores above 50 indicate better-than-average health-related quality of life, while scores below 50 reflect lower-than-average health status. This method provides a clear and practical way to assess and compare overall health

# STATISTICAL ANALYSIS

Analyses of the datasets were executed using SPSS Statistics version 27. The Shapiro-Wilk test was carried out to examine the normality of the data, which indicated normal distribution. Descriptive analysis was performed with inferential statistics via mean and standard deviation. Within- and between-group inferential statistics were analyzed using paired t-test and unpaired t-test, respectively. The level of significance (p-value) was accepted at $\leq 0.05$.

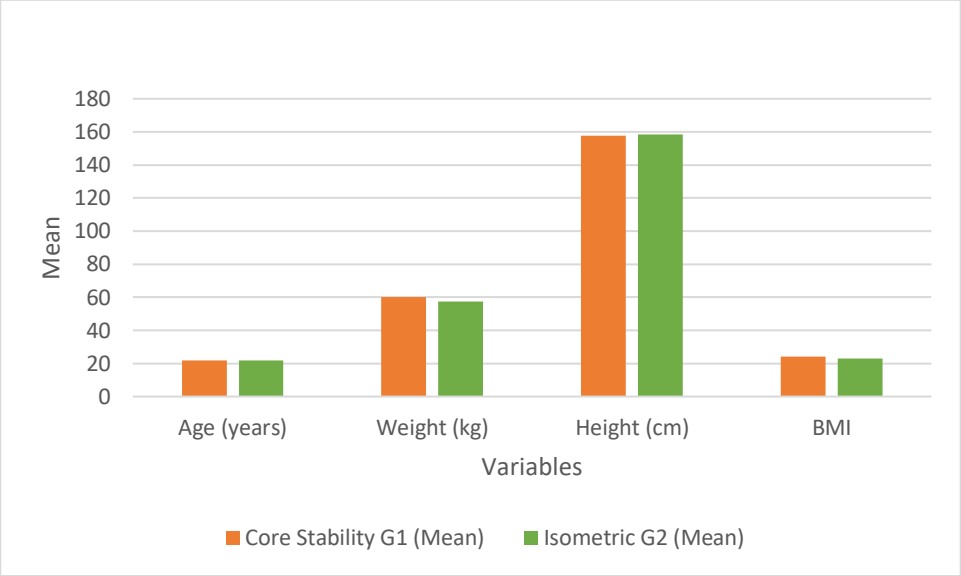
# RESULT

**INTERPRETATION**

A total of 32 participants between the ages of 18 and 26 years were included in the study sample. Demographic and baseline data are shown in TABLE 2. Data distribution for both the core stability and isometric group was found to be normally distributed ($p>0.05$). Demographic characteristics for both groups can be seen in GRAPH 1.

| VARIABLES | Core stability G1(Mean ± SD) | Isometric G2(Mean ± SD) | P- Value |
|---|---|---|---|
| AGE(YEARS) | 21.94 ±2.91 | 21.88 ±2.22 | 0.672 |
| WEIGHT(KG) | 60.00 ±11.94 | 57.50 ±7.59 | 0.276 |
| HEIGHT (CM) | 157.50 ±6.54 | 158.56 ±5.82 | 0.54 |
| BMI | 24.21 ±4.99 | 22.86 ±3.00 | 0.14 |

**TABLE- 2**



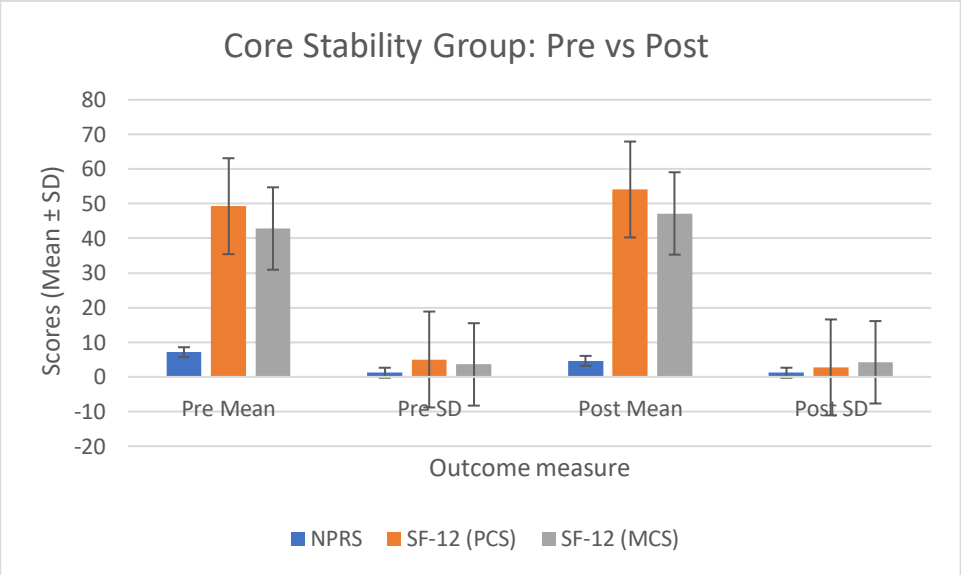

**GRAPH-1**

## INTERPRETATION

A within-group analysis comparing pre- and post-intervention findings of core stability exercises with active stretching on pain and quality of life identified a statistically significant difference in Group 1 ($p < 0.05$). These findings are presented in the Table and illustrated in Graph 2.

| CORE STABILITY (G1) | PRE (SD±MEAN) | POST(SD±MEAN) | P-VALUE |
|---|---|---|---|
| **NPRS** | 7.12 ± 1.20 | 4.62 ± 1.20 | 0.000 |
| **SF-12(PCS)** | 49.28 ± 5.02 | 54.10 ± 2.74 | <0.000 |
| **SF-12(MCS)** | 42.83 ± 3.60 | 47.18 ± 4.21 | 0.001 |

**TABLE-3**


Core Stability Group: Pre vs Post
Scores (Mean ± SD)
80
70
60
50
40
30
20
10
0
-10
-20
Pre Mean
Pre SD
Post Mean
Post SD
Outcome measure
NPRS
SF-12 (PCS)
SF-12 (MCS)

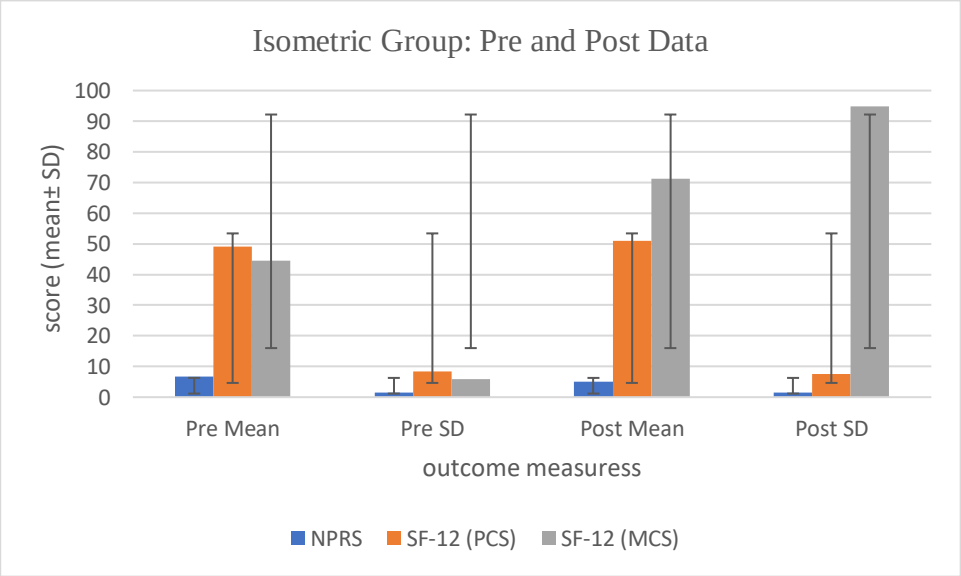
**GRAPH-2**

## INTERPRETATION

A within-group analysis comparing pre- and post-intervention findings of isometric exercises with active stretching on pain and quality of life identified a statistically significant difference in Group 2 ($p < 0.05$). These findings are presented in the Table and illustrated in GRAPH 3.

| **ISOMETRIC GROUP (G2)** | **PRE ((SD±MEAN)** | **POST ((SD±MEAN)** | **P-VALUE** |
|---|---|---|---|
| **NPRS** | 6.62 ± 1.54 | 5.12 ± 1.59 | 0.000 |
| **SF-12(PCS)** | 49.19 ± 8.30 | 51.08 ± 7.55 | 0.000 |
| **SF-12(MCS)** | 44.46 ± 5.98 | 71.14 ± 94.79 | <0.284 |

**TABLE-4**


Isometric Group: Pre and Post Data
score (mean± SD)
100
90
80
70
60
50
40
30
20
10
0
Pre Mean
Pre SD
Post Mean
Post SD
outcome measuress
NPRS
SF-12 (PCS)
SF-12 (MCS)

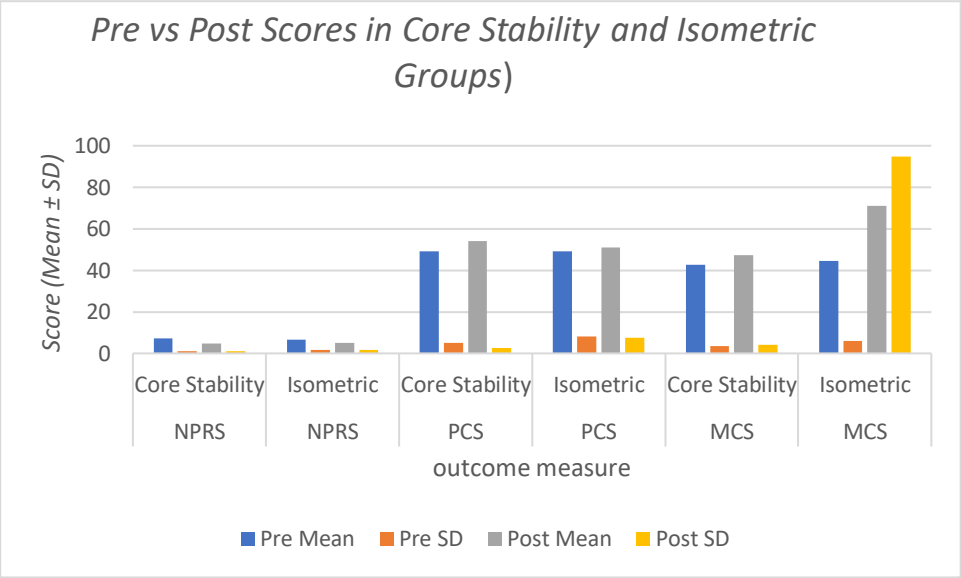
**GRAPH-3**

## INTERPRETATION

The between-group comparison of post-intervention results for the core stability group and isometric group in Table 6 and Graph 4 showed no statistically significant difference ($p>0.05$).

| OUTCOME | GROUP | PRE MEAN±SD | POST MEAN ±SD | P VALUE |
|---|---|---|---|---|
| NPRS | CORE STABILITY(G1) | 7.12±1.20 | 4.63±1.20 | 0.291 |
| | ISOMETRIC (G2) | 6.62± 1.54 | 5.13±1.59 | |
| PCS | CORE STABILITY(G1) | 49.28±5.02 | 54.10±2.74 | 0.114 |
| | ISOMETRIC (G2) | 49.19±8.30 | 51.08±7.55 | |
| MCS | CORE STABILITY(G1) | 42.83±3.60 | 47.19±4.22 | 0.332 |
| | ISOMETRIC (G2) | 44.46±5.98 | 71.14±94.79 | |

**TABLE-5**


Pre vs Post Scores in Core Stability and Isometric Groups)
Score (Mean ± SD)
100
80
60
40
20
0
Core Stability
Isometric
Core Stability
Isometric
Core Stability
Isometric
NPRS
NPRS
PCS
PCS
MCS
MCS
outcome measure
Pre Mean
Pre SD
Post Mean
Post SD

**GRAPH-4**

## INTERPRETATION

Within-group analysis showed that the Core Stability group demonstrated significant improvements in pain intensity (NPRS), physical health (PCS), and mental health (MCS), with all outcomes reaching statistical significance ($p < 0.05$). In the Isometric group, significant changes were observed in NPRS and PCS ($p < 0.05$), whereas MCS did not improve significantly ($p > 0.05$).

Between-group analysis indicated no statistically significant differences between the Core Stability and Isometric groups in NPRS, PCS, or MCS after the intervention (all $p > 0.05$). This suggests that both groups improved, but the extent of improvement was comparable, and neither intervention was superior overall.

# DISCUSSION

This study contributes to the existing research by directly comparing the effects of core stability exercises with active stretching and isometric exercises with active stretching in women with primary dysmenorrhea. Earlier studies have typically investigated these exercise methods in isolation, while this study evaluated them together in a structured four-week program. Both interventions produced significant improvements in reducing pain intensity and enhancing the physical component of quality of life (PCS) ($p < 0.05$). An important finding was that the core stability group also showed significant improvement in the mental component score (MCS) of the SF-12 questionnaire ($p < 0.05$), while the isometric group did not show a significant change in this measure ($p > 0.05$). When post-intervention outcomes were compared between the two groups, no significant differences were observed for pain, PCS, or MCS ($p > 0.05$). These findings confirm that both exercise approaches are effective, with core stability training offering additional psychological benefits not observed in the isometric group.

The hypotheses of this study were partially supported. The null hypothesis could not be completely rejected, since the between-group comparison did not reveal statistically significant differences ($p > 0.05$). However, this does not reduce the importance of the findings. On the contrary, it demonstrates that both interventions produced meaningful clinical outcomes. It is important to distinguish between statistical and clinical significance. Although the statistical superiority of one program over the other was not established, the within-group

improvements were large enough to indicate real and practical benefits. In particular, the significant improvement in MCS in the core stability group shows that this method not only reduces pain but also supports psychological well-being, which is a relevant factor in managing dysmenorrhea. These findings increase the value of the study, as they highlight that women can benefit from more than one effective, safe, and accessible exercise option, with core stability exercises providing additional advantages when improvements in mental health are also a priority.

The results are consistent with earlier studies. Previous articles reported that core stability training reduced pain severity and improved muscular endurance [19], while one meta-analysis found that stability-based programs enhanced both physical and psychological health in women with dysmenorrhea [27]. Another study also demonstrated that isometric training effectively reduces pain, although it showed little effect on mental health outcomes [28]. The present study supports and extends these findings, confirming that both types of exercise are effective for pain management and functional improvement, while core stability training appears to provide additional psychological benefits.

Overall, the study confirms the value of exercise as a safe, affordable, and effective non-pharmacological strategy for the management of dysmenorrhea. Both interventions provided meaningful benefits within four weeks, demonstrating their feasibility in practical settings. Reductions in pain and improvements in PCS were evident in both groups, while the significant improvement in MCS observed in the core stability group suggests wider holistic benefits. These findings indicate that exercise programs should be tailored to individual needs: isometric exercise offers simplicity and

accessibility, while core stability training may be recommended when both physical and psychological improvements are desired.

Several factors should be taken into account when interpreting these results. Participation in other forms of physical activity, like gym and occasional use of analgesics, may have influenced the outcomes. Psychological factors such as stress, motivation, and adherence to the exercise program could also have affected the results. The relatively small sample size limited statistical power, which may explain the lack of significant between-group differences. The absence of a non-exercise control group made it difficult to distinguish the specific effects of the interventions from natural variations in menstrual symptoms. In addition, individual variability in symptom severity from one cycle to another may have influenced NPRS and SF-12 scores.

# CONCLUSION

In conclusion, both core stability and isometric exercises significantly improved pain intensity and physical quality of life ($p < 0.05$). Core stability training also produced significant improvements in MCS ($p < 0.05$), while isometric training did not demonstrate a significant change in this area ($p > 0.05$). Although no statistically significant differences were found between the groups ($p > 0.05$), the within-group outcomes confirm that both approaches are clinically meaningful, with core stability training offering the added benefit of improved psychological well-being. These findings strengthen the practical importance of the study and support the use of structured exercise programs as part of non-pharmacological management for women with primary dysmenorrhea.

## Limitations and Recommendations for future study

**Limitation**

The study did not include a non-intervention control group. Including such a group could have helped to isolate better the specific effects of core stability and isometric exercises.

Occasional use of pain-relief medication by some participants may have acted as a confounding factor.

Psychological variables such as stress, adherence, and motivation may have contributed to internal variability in the results.

**Future scope**

Conduct studies with larger sample sizes to increase statistical power and strengthen the reliability of results.

Extend the duration of interventions to assess long-term effects on pain, PCS, and MCS.

Recruit participants from wider age groups (adolescents, older women) and different BMI categories to improve generalizability.

Incorporate additional outcome measures, such as sleep quality, psychological distress, and work/academic productivity, to capture broader effects

## SUMMARY

This thesis examined the effects of core stability exercises and isometric exercises, both combined with active stretching, on pain and quality of life in women with primary dysmenorrhea. Over four weeks, both interventions led to significant reductions in pain and improvements in physical health. Core stability exercises also produced significant gains in mental health, while isometric exercises did not show a change in this area. No significant differences were found between groups, indicating that both methods are effective. These findings highlight exercise as a safe, accessible, and cost-effective option for managing dysmenorrhea, with core stability training offering additional benefits for psychological well-being.

## STATEMENT OF FUNDING

The author(s) reported no source and nature of funding associated with the work featured in this dissertation.

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# ANNEXURES

**ANNEXURE:1**

**CONSENT FORM**

Study Title: Effect of core stability exercises with active stretching versus Isometric exercises with active stretching on Pain and Quality of Life in Women with Primary Dysmenorrhoea: Experimental Study

Study Number:

Participant 's Name: _____ Participants 's Initials: _____

Date of Birth / Age: _____

Address of the Subject_____

Qualification _____

Occupation: Student/Self-Employed/ Service/Housewife/Others (Please tick as appropriate)

Please initial the box
(Subject)

(i) I confirm that I have read and understood the information sheet dated _____ for the above study and have had the opportunity to ask questions.

(ii) I understand that my participation in the study is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal rights being affected.

(iii) I agree not to restrict the use of any data or results that arise from this study, provided such a use is only for scientific purposes.

(iv) I agree to take part in the above study.

Signature (or Thumb impression) of the Subject/Legally Acceptable Representative:

_____
_____

Date: _____/ ____/ _____

Signatory‘s Name:

_____

Signature of the Investigator:

_____

Date: Study Investigator‘s Name:

_____

Signature of the Witness: _____

Date: _____/ _____/ _____

Name of the Witness: _____

*A copy of the Patient Information Sheet and duly filled Informed Consent Form shall be handed over to the subject or his/her attendant.

## ANNEXURE:2

## ASSESSMENT FORM

### Demographic data

Name-

Age-

Gender-

Weight-

Height-

BMI-

Occupation-

Address-

Subject ID-

### Pre-intervention data

Menarche-

Previous Menstrual Cycle History-

Pain Duration-

Duration of Bleeding-

Last menstrual Cycle-

Previous Pain History:

### Pre and Post Intervention data

**Pain Intensity using NPRS**

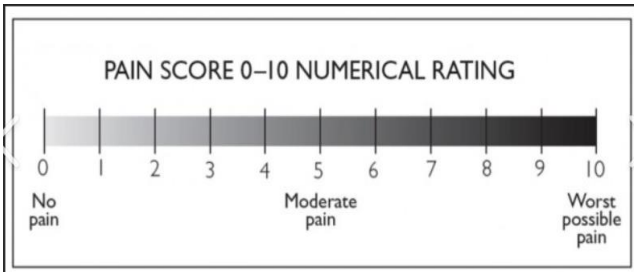
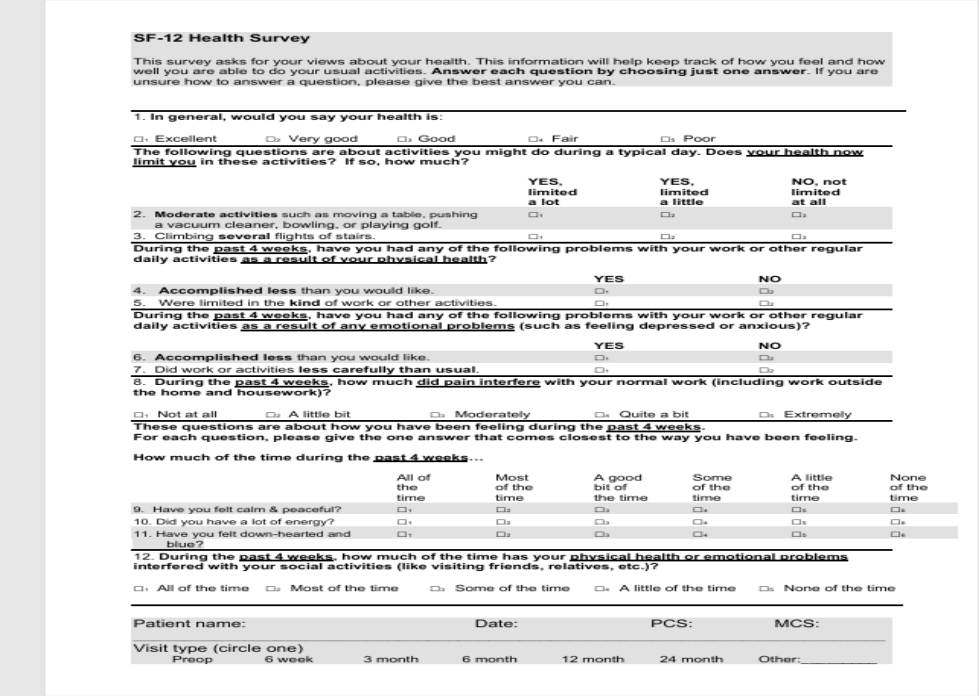



**FIGURE 13**

## Quality of Life by the SF-12 Questionnaire



**SF-12 Health Survey**

This survey asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities. **Answer each question by choosing just one answer**. If you are unsure how to answer a question, please give the best answer you can.

1. **In general, would you say your health is**:

□₁ Excellent □₂ Very good □₃ Good □₄ Fair □₅ Poor

**The following questions are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?**

| | YES, limited a lot | YES, limited a little | NO, not limited at all |
|---|---|---|---|
| 2. **Moderate activities** such as moving a table, pushing a vacuum cleaner, bowling, or playing golf. | □₁ | □₂ | □₃ |
| 3. Climbing **several** flights of stairs. | □₁ | □₂ | □₃ |

**During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?**

| | YES | NO |
|---|---|---|
| 4. **Accomplished less** than you would like. | □₁ | □₂ |
| 5. Were limited in the **kind** of work or other activities. | □₁ | □₂ |

**During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?**

| | YES | NO |
|---|---|---|
| 6. **Accomplished less** than you would like. | □₁ | □₂ |
| 7. Did work or activities **less carefully than usual**. | □₁ | □₂ |

8. **During the past 4 weeks, how much did pain interfere with your normal work (including work outside the home and housework)?**

□₁ Not at all □₂ A little bit □₃ Moderately □₄ Quite a bit □₅ Extremely

**These questions are about how you have been feeling during the past 4 weeks.**
**For each question, please give the one answer that comes closest to the way you have been feeling.**

**How much of the time during the past 4 weeks…**

| | All of the time | Most of the time | A good bit of the time | Some of the time | A little of the time | None of the time |
|---|---|---|---|---|---|---|
| 9. Have you felt calm & peaceful? | □₁ | □₂ | □₃ | □₄ | □₅ | □₆ |
| 10. Did you have a lot of energy? | □₁ | □₂ | □₃ | □₄ | □₅ | □₆ |
| 11. Have you felt down-hearted and blue? | □₁ | □₂ | □₃ | □₄ | □₅ | □₆ |

12. **During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives, etc.)?**

□₁ All of the time □₂ Most of the time □₃ Some of the time □₄ A little of the time □₅ None of the time

Patient name: Date: PCS: MCS:

Visit type (circle one)
Preop 6 week 3 month 6 month 12 month 24 month Other:_____

**FIGURE 14**

# Examination by-

## 1) WaLIDD questionnaire

**Table 1** WaLIDD score variables

| Working ability | Location | Intensity (Wong–Baker) | Days of pain |
|---|---|---|---|
| 0: None | 0: None | 0: Does not hurt | 0: 0 |
| 1: Almost never | 1: 1 site | 1: Hurts a little bit | 1: 1–2 |
| 2: Almost always | 2: 2–3 sites | 2: Hurts a little more – hurts even more | 2: 3–4 |
| 3: Always | 3: 4 sites | 3: Hurts a whole lot – hurts worst | 3: ≥5 |

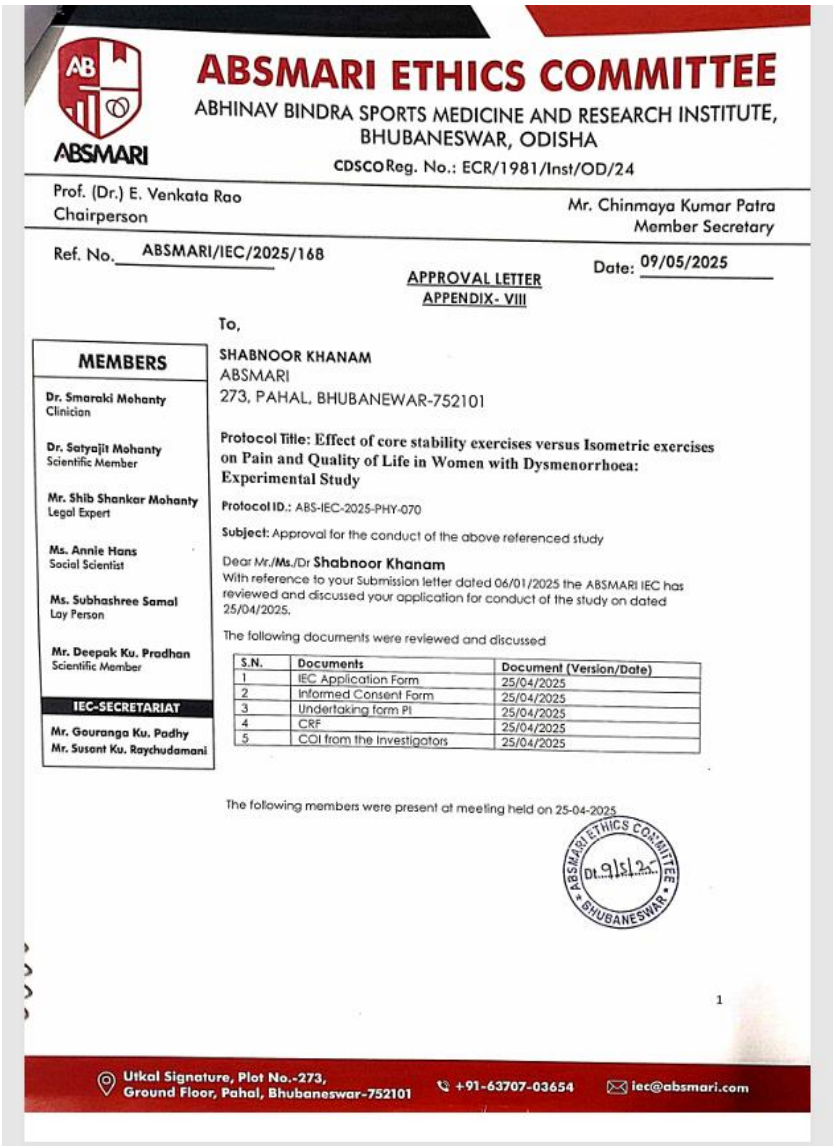
**Notes:** Score: 0 without dysmenorrhea, 1–4 mild dysmenorrhea, 5–7 moderate dysmenorrhea, 8–12 severe dysmenorrhea. Wong–Baker scale was reclassified to adjust a four-level scale.
**Abbreviation:** WaLIDD, working ability, location, intensity, days of pain, dysmenorrhea.

FIGURE 15

**2) McGill Torso Muscular Endurance Test Battery (commonly called the McGill Endurance Test or McGill's Core Endurance Tests)**

## ANNEXURE:3

## IEC APPROVAL LETTER



# ABSMARI ETHICS COMMITTEE

ABHINAV BINDRA SPORTS MEDICINE AND RESEARCH INSTITUTE, BHUBANESWAR, ODISHA

CDSCO Reg. No.: ECR/1981/Inst/OD/24

Prof. (Dr.) E. Venkata Rao
Chairperson

Mr. Chinmaya Kumar Patra
Member Secretary

Ref. No. ABSMARI/IEC/2025/168

Date: 09/05/2025

**APPROVAL LETTER**
**APPENDIX- VIII**

To,

**SHABNOOR KHANAM**
ABSMARI
273, PAHAL, BHUBANEWAR-752101

**MEMBERS**

**Dr. Smaraki Mohanty**
Clinician

**Dr. Satyajit Mohanty**
Scientific Member

**Mr. Shib Shankar Mohanty**
Legal Expert

**Ms. Annie Hans**
Social Scientist

**Ms. Subhashree Samal**
Lay Person

**Mr. Deepak Ku. Pradhan**
Scientific Member

**IEC-SECRETARIAT**

**Mr. Gouranga Ku. Padhy**
**Mr. Susant Ku. Raychudamani**

**Protocol Title: Effect of core stability exercises versus Isometric exercises on Pain and Quality of Life in Women with Dysmenorrhoea: Experimental Study**

**Protocol ID.:** ABS-IEC-2025-PHY-070

**Subject:** Approval for the conduct of the above referenced study

Dear Mr./Ms./Dr **Shabnoor Khanam**
With reference to your Submission letter dated 06/01/2025 the ABSMARI IEC has reviewed and discussed your application for conduct of the study on dated 25/04/2025.

The following documents were reviewed and discussed

| S.N. | Documents | Document (Version/Date) |
|---|---|---|
| 1 | IEC Application Form | 25/04/2025 |
| 2 | Informed Consent Form | 25/04/2025 |
| 3 | Undertaking form PI | 25/04/2025 |
| 4 | CRF | 25/04/2025 |
| 5 | COI from the Investigators | 25/04/2025 |

The following members were present at meeting held on 25-04-2025

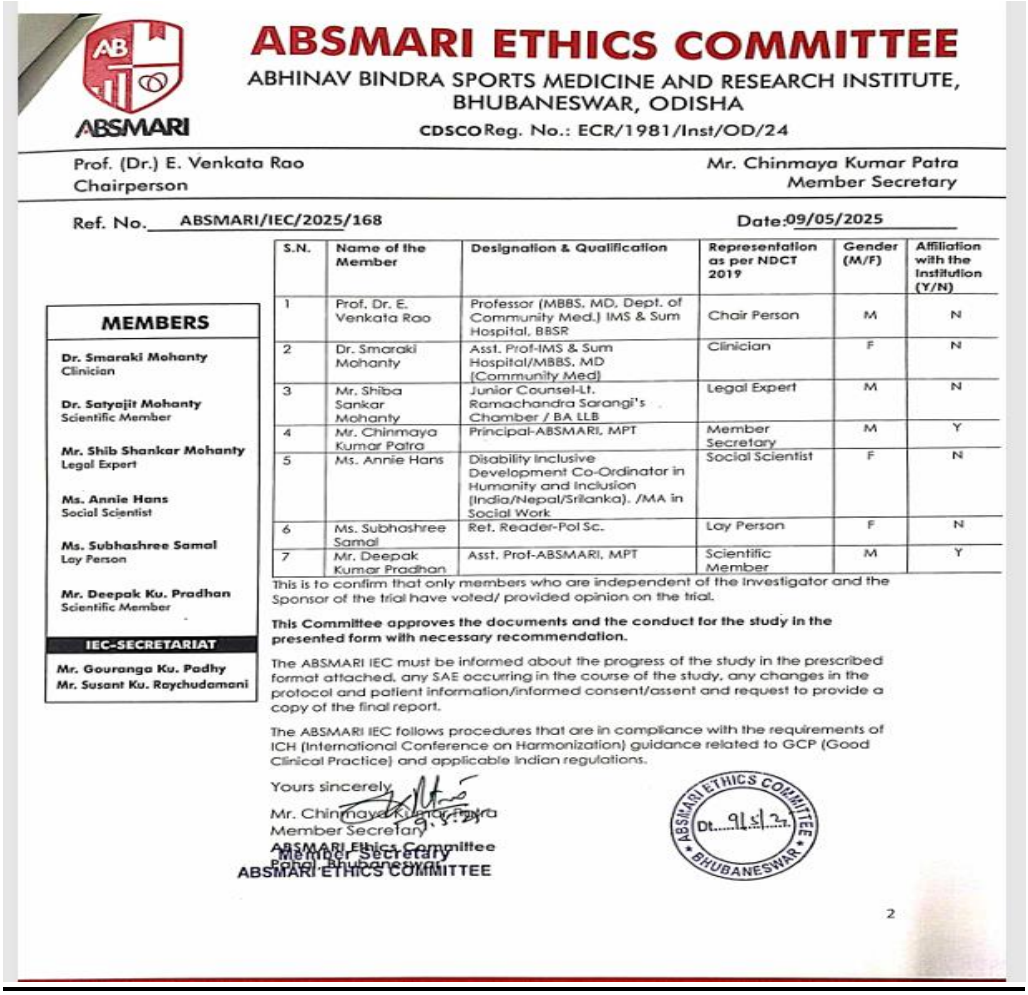
ABSMARI ETHICS COMMITTEE Dt. 9/5/25 BHUBANESWAR

1

Utkal Signature, Plot No.-273, Ground Floor, Pahal, Bhubaneswar-752101 +91-63707-03654 iec@absmari.com

**ANNEXURE:4**

**ICE INSTITUTIONAL ETHICAL COMMITTEE**



# ABSMARI ETHICS COMMITTEE

ABHINAV BINDRA SPORTS MEDICINE AND RESEARCH INSTITUTE,
BHUBANESWAR, ODISHA

CDSCO Reg. No.: ECR/1981/Inst/OD/24

Prof. (Dr.) E. Venkata Rao
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Mr. Chinmaya Kumar Patra
Member Secretary

Ref. No. ABSMARI/IEC/2025/168

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**Ms. Annie Hans**
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**Ms. Subhashree Samal**
Lay Person

**Mr. Deepak Ku. Pradhan**
Scientific Member

**IEC-SECRETARIAT**

**Mr. Gouranga Ku. Padhy**
**Mr. Susant Ku. Raychudamani**

| S.N. | Name of the Member | Designation & Qualification | Representation as per NDCT 2019 | Gender (M/F) | Affiliation with the Institution (Y/N) |
|---|---|---|---|---|---|
| 1 | Prof. Dr. E. Venkata Rao | Professor (MBBS, MD, Dept. of Community Med.) IMS & Sum Hospital, BBSR | Chair Person | M | N |
| 2 | Dr. Smaraki Mohanty | Asst. Prof-IMS & Sum Hospital/MBBS, MD (Community Med) | Clinician | F | N |
| 3 | Mr. Shiba Sankar Mohanty | Junior Counsel-Lt. Ramachandra Sarangi's Chamber / BA LLB | Legal Expert | M | N |
| 4 | Mr. Chinmaya Kumar Patra | Principal-ABSMARI, MPT | Member Secretary | M | Y |
| 5 | Ms. Annie Hans | Disability Inclusive Development Co-Ordinator in Humanity and Inclusion (India/Nepal/Srilanka). /MA in Social Work | Social Scientist | F | N |
| 6 | Ms. Subhashree Samal | Ret. Reader-Pol Sc. | Lay Person | F | N |
| 7 | Mr. Deepak Kumar Pradhan | Asst. Prof-ABSMARI, MPT | Scientific Member | M | Y |

This is to confirm that only members who are independent of the Investigator and the Sponsor of the trial have voted/ provided opinion on the trial.

**This Committee approves the documents and the conduct for the study in the presented form with necessary recommendation.**

The ABSMARI IEC must be informed about the progress of the study in the prescribed format attached, any SAE occurring in the course of the study, any changes in the protocol and patient information/informed consent/assent and request to provide a copy of the final report.

The ABSMARI IEC follows procedures that are in compliance with the requirements of ICH (International Conference on Harmonization) guidance related to GCP (Good Clinical Practice) and applicable Indian regulations.

Yours sincerely,

Mr. Chinmaya Kumar Patra
Member Secretary

ABSMARI Ethics Committee
Member Secretary
ABSMARI ETHICS COMMITTEE

ABSMARI ETHICS COMMITTEE
Dt. 9/5/25
BHUBANESWAR

2

## ANNEXURE:5

## MASTERCHART

| SR NO. | NAME | AGE | PRE DATA (NPRS) | PRE DATA (SF-12 PCS SCORE) | PRE DATA (SF-12 MCS SCORE) | POST DATA (NPRS) | POST DATA (SF-12 PCS SCORE) | POST DATA (SF-12 MCS SCORE) |
|---|---|---|---|---|---|---|---|---|
| 1 | S1 | 26 | 7 | 41.2 | 36.9 | 4 | 52.7 | 49.6 |
| 2 | S2 | 24 | 6 | 54.1 | 41.8 | 4 | 55.03 | 42.3 |
| 3 | S3 | 26 | 8 | 54.2 | 41.2 | 6 | 56.9 | 43.1 |
| 4 | S4 | 25 | 8 | 42.1 | 49.8 | 5 | 48.1 | 51.2 |
| 5 | S5 | 24 | 7 | 53.5 | 40.7 | 5 | 55.3 | 44.8 |
| 6 | S6 | 22 | 6 | 56.8 | 44.8 | 3 | 59 | 46.4 |
| 7 | S7 | 19 | 8 | 46 | 48.2 | 6 | 54.5 | 58.6 |
| 8 | S8 | 25 | 5 | 55.6 | 44.2 | 3 | 55.9 | 44.1 |
| 9 | S9 | 20 | 8 | 47.6 | 39.8 | 6 | 50.8 | 42.6 |
| 10 | S10 | 26 | 6 | 47.1 | 44.5 | 4 | 53.2 | 47.9 |
| 11 | S11 | 19 | 9 | 41.7 | 42 | 7 | 54.2 | 46.4 |
| 12 | S12 | 20 | 9 | 52.4 | 41.2 | 5 | 56.3 | 43.9 |
| 13 | S13 | 19 | 7 | 51.4 | 44.9 | 4 | 56.4 | 48.2 |
| 14 | S14 | 19 | 6 | 48.6 | 38.2 | 3 | 54.6 | 52.1 |
| 15 | S15 | 19 | 8 | 50.1 | 47.2 | 5 | 51.5 | 46.9 |
| 16 | S16 | 19 | 6 | 46.2 | 39.9 | 4 | 51.2 | 46.9 |

| A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|
| SR NO. | NAME | AGE | PRE DATA (NPRS) | PRE DATA (SF-12 PCS SCORE) | PRE DATA (SF-12 MCS SCORE) | POST DATA (NPRS) | POST DATA (SF-12 PCS SCORE) | POST DATA (SF-12 MCS SCORE) |
| 17 | S17 | 21 | 5 | 58.1 | 52.1 | 4 | 58.6 | 54.2 |
| 18 | S18 | 21 | 6 | 53.6 | 40 | 5 | 54.2 | 42.3 |
| 19 | S19 | 20 | 5 | 47.2 | 44.8 | 2 | 52.1 | 49.2 |
| 20 | S20 | 20 | 7 | 48.3 | 43 | 5 | 51.3 | 50.8 |
| 21 | S21 | 26 | 7 | 48.3 | 39.2 | 6 | 50.1 | 42,6 |
| 22 | S22 | 18 | 9 | 55.1 | 43.1 | 7 | 56.4 | 45.9 |
| 23 | S23 | 19 | 8 | 38.2 | 40.8 | 7 | 41.2 | 41.9 |
| 24 | S24 | 25 | 7 | 37.6 | 35.7 | 6 | 40.1 | 39 |
| 25 | S25 | 21 | 9 | 38.9 | 48.6 | 7 | 40.2 | 50 |
| 26 | S26 | 23 | 7 | 43.7 | 44.8 | 5 | 44.9 | 47.3 |
| 27 | S27 | 25 | 8 | 62.1 | 60.4 | 7 | 63.4 | 61.3 |
| 28 | S28 | 21 | 6 | 56.2 | 45.3 | 5 | 56.4 | 45.9 |
| 29 | S29 | 24 | 5 | 56.8 | 42.4 | 4 | 57.2 | 42.8 |
| 30 | S30 | 22 | 5 | 56 | 44.7 | 3 | 58.5 | 50.2 |
| 31 | S31 | 22 | 4 | 51.2 | 48.6 | 3 | 52.1 | 49.8 |
| 32 | S32 | 25 | 8 | 35.8 | 37.9 | 6 | 40.6 | 41.6 |

## ANNEXURE:6

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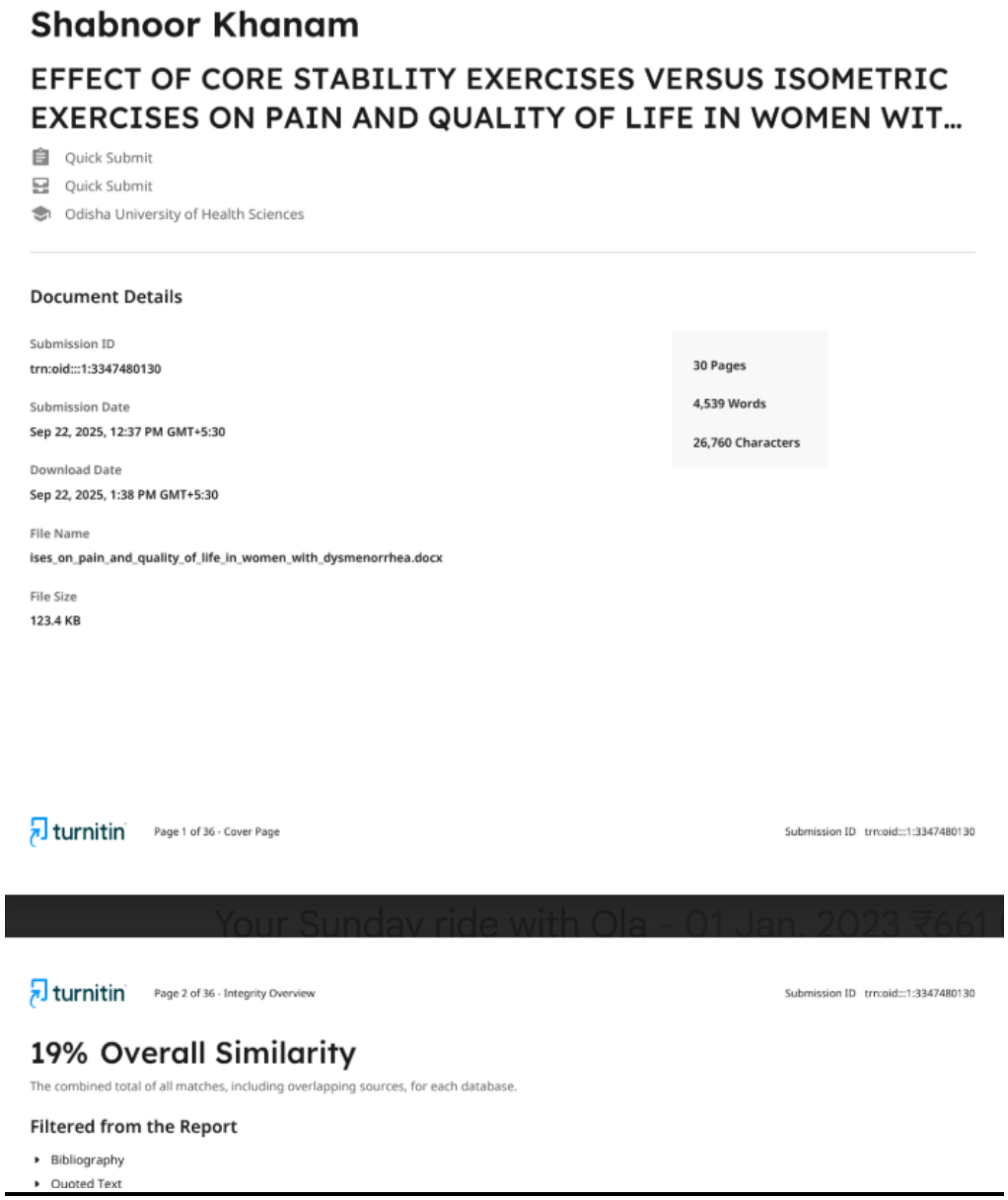

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**ANNEXURE:7**

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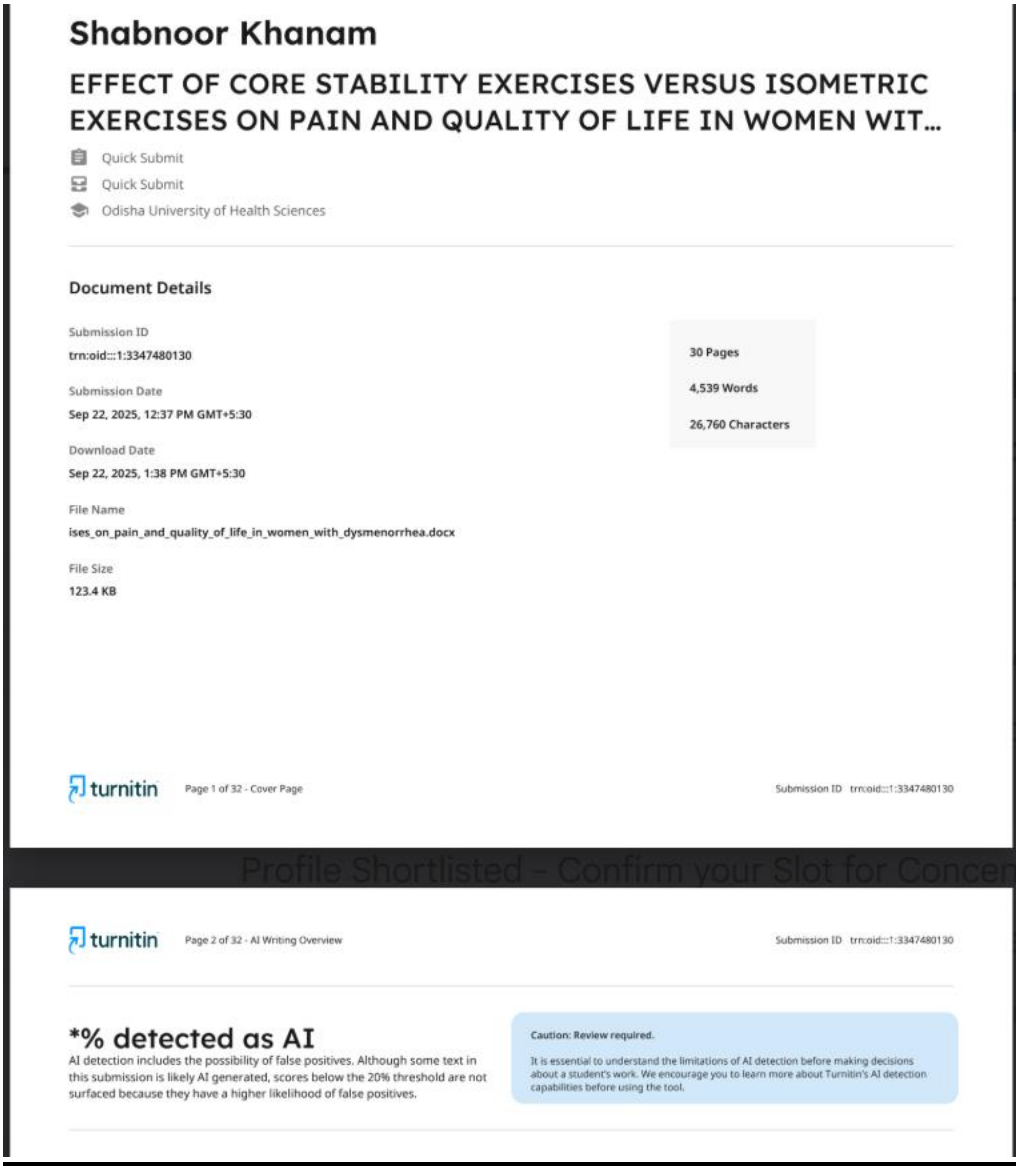

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