RESEARCH PAPER

Effectiveness of Structured Lumbo-pelvic Exercises and Core Training on Pelvic floor function among women with Urinary Incontinence

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Abstract

Background: Urinary incontinence (UI), defined as the involuntary loss of urine, is a common and disturbing condition that affects millions of women globally. In addition to improving pelvic alignment and neuromuscular coordination, structured lumbo-pelvic exercises and focused core training may help regain functional strength in the pelvic area. Thus, this study is to determine the impact of a structured core training and lumbo-pelvic exercise program on pelvic floor function in women with urine incontinence.

Method: According to the inclusion and exclusion criteria, 56 subjects in all signed the information consent form and participated in the study. Participants were split into two groups at random. One group (Group A) followed a systematic lumbo-pelvic exercise program in addition to core training, while Group B followed a more traditional exercise program. After six weeks of the exercise regimen, a post-treatment evaluation was conducted, and the data was statistically analyzed.

Result: The results of study revealed that on comparing the mean values of group A and group B on the Analogue perinometer, Oxford grading scale, ICIQ group A showed 35.53, 4.82, 1.21 post test values and group B 17.17, 3.75 and 2.92. Which showed to be more significant in group A with a p value = 0.0001 as compared to group B.

Conclusion: For females with urine incontinence, a 6-week regimen of structured lumbo-pelvic and core strengthening exercises is useful in lowering the intensity of their symptoms.

Keywords: Urinary incontinence, women, core strengthening, Lumbo-pelvic muscles, bladder, menopause

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INTRODUCTION

Urinary incontinence (UI), Involuntary urine leakage is a common issue among women, particularly during and after menopause and as they age. In the india, over 60% of elder age women who live in the community have some form of urinary incontinence, and over 20% have moderate to severe urinary incontinence. According to estimates, the two most prevalent forms of urinary incontinence among people who have mixed urinary incontinence (MUI) and stress urinary incontinence (SUI).

Urinary incontinence is a severe debilitating condition affecting all women causing significant impact on the physical, psychological and socio-economical aspects of life. It is one of the most significant and prevalent condition.1 UI is highly prevalent among middle-aged and older women, according to numerous research. 2 The prevalence ranges from 8-45% in various studies across the world.3, 4

Involuntary urine loss, urinary incontinence is a common medical issue that affects people of all ages. UI is described as a "condition in which involuntary loss of urine is a social or hygienic problem and is objectively demonstrable" by the International Continence Society (ICS). Numerous anatomical, pathologic, physiological, and environmental causes can result in urinary incontinence. Types of urinary incontinence are defined according to their sign, symptom, and condition. There are various forms of urinary incontinence, with mixed urinary incontinence (MUI) being the most prevalent, desire urge urinary incontinence (UUI), and stress urinary incontinence (SUI) being the others. Approximately half of all urinary incontinence situations are of the most prevalent form, stress urinary incontinence, which is followed by MUI and UUI. Stress UI is caused by an increase in intra-abdominal pressure (IAP) without a bladder contraction and is brought on by physical exertion, such as heavy lifting, sports, and high-impact exercises. The symptoms of Urge UI include increased frequency (voiding eight or more times a day), nocturia (waking up from sleep to void), and urgency (strong desire to void for fear of leakage). Urge UI is defined as involuntary urine leakage that co-occurs with a strong urge to urinate. Mixed UI occurs by a combination of SUI and UUI and is commonly associated with long-term urine incontinence. Physical activity, overall mobility, and quality of life can all be significantly impacted by any kind of urinary incontinence. 5

The studied risk factors include menopause obesity, age, and parity, and the majority of risk factor research has been cross-sectional. For some women, the most significant risk factor for lifetime incontinence appears to be menopause. Decline in estrogen levels after menopause leads to atrophy of the urogenital tissues, weakening of the urethral and bladder support structures, and reduced urethral closure pressure. Women rarely experience urinary incontinence before becoming pregnant. 6

According to population-based studies, UI is more common in women and is thought to impact over 60% of adult women who live in communities, with 32% of all women reporting symptoms at least once a month. Due to social stigma and embarrassment, many occurrences remain unreported; consequently, even these numbers do not fully capture the

extent of the issue. Consequently, UI continues to have a major financial and health impact on the individual as well as a major economic impact on the health service. About 70 percent of the conservative management of SUI alone,
including as routine care like primary care appointments, , perineal rash, and urinary tract infections, as well as mental health problems like anxiety, fear, and depression. 7
Lumbar stabilization exercises are those that include strengthening the trunk to support the low back. These exercises reduce the risk of urine incontinence and strengthen the lumboplevic muscles. The core muscles dynamically stabilize the lumbar spine. The rectus abdominis, transversus abdominis, erector spinae, multifidus muscles, internal and external obliques, and pelvic floor muscles are some of these muscles. The transversus abdominis and other deep compartment muscles are essential for lumbar stabilization. The piriformis, gluteus medius, gluteus maximus, and deep core muscles work together to stabilize the pelvis. Tasks that test lumbo-pelvic stability have been shown to activate the pelvic floor muscles, supporting the pelvic floor muscles proposed function in controlling the pelvis and lumbar spine. The lumbar spine is stabilized by the combined action of the pelvic floor muscles and the lumbo-pelvic muscles. Postural alterations may contribute to incontinence; urine losses can be treated by correcting these changes with lumbo-pelvic stabilization exercises.8
Core training has emerged as a promising non-invasive intervention for managing UI by strengthening the muscles that support the bladder and pelvic organs. The core consists of the diaphragm, deep abdominal muscles, multifidus, and pelvic floor muscles, all of which contribute to intra-abdominal pressure regulation and urinary control.(9) Previous studies suggest that incorporating core stability exercises, including pelvic floor muscle training (PFMT), deep abdominal activation, and functional movement recommended, Research can help clarify the optimal frequency, duration, and technique for maximum benefit. So, conducting studies in this area can contribute valuable insights to clinical practice and improve the overall management of urinary incontinence. Focused studies on exercises for urinary incontinence can significantly enhance understanding, treatment, and prevention strategies, ultimately improving patient care and quality of life.
This study aims to bridge this gap by investigating the effectiveness of a structured lumbo-pelvic and core training program in enhancing pelvic floor function among women with urinary incontinence. The findings will provide valuable insights for clinicians, physiotherapists, and rehabilitation specialists in designing comprehensive, evidence-based treatment protocols for UI management.
Targeted structured lumbo-pelvic exercises including core stabilization exercises can enhance muscle strength, coordination, and endurance. This, in turn, helps improve intra-abdominal pressure regulation and reduces episodes of urinary leakage. Additionally, these exercises are non-invasive, cost-effective, and can be incorporated into rehabilitation programs to improve quality of life in individuals suffering from incontinence.
The purpose of the study was to find the effects of structured lumbo-pelvic and core muscle exercise on severity of urinary incontinence and quality of life in women. Through this study, we aim to gain further insights into the effectiveness and advantages of structured lumbo-pelvic exercises along with core training for treatment of urinary incontinence in women. The results of this study may influence clinical practices and future research in the treatment of urinary incontinence.

buying pads, diapers, laundering, and dry cleaning, is thought to be paid for out of pocket by women with UI. Long-term isolation or physical inactivity may be experienced by patients with UI, which may result in secondary health complications like pressure ulcers
patterns, can enhance continence mechanisms and reduce urinary leakage. Despite growing interest in conservative management approaches for UI, limited research has systematically evaluated the effects of core training as a targeted intervention. This study aims to assess the impact of core training on urinary incontinence by examining changes in muscle strength, urinary leakage episodes, and overall quality of life. The findings may contribute to the development of evidence-based rehabilitation protocols and support the integration of core training into clinical practice for UI management.(10)
Need for study:
Urinary incontinence (UI) is a prevalent and often underreported condition among menopausal women, significantly affecting their quality of life, psychological well-being, and social functioning. The lumbo-pelvic muscles play a critical role in maintaining continence, and dysfunction in these muscles is a primary contributor to UI. We need to initially activate the lumbo pelvic muscles before progressing toward strengthening exercises. The hormonal changes associated with menopause, particularly the decline in estrogen levels, contribute to the weakening of Lumbo-pelvic muscles, both of which increase the risk of urinary incontinence. Understanding effective interventions can improve strength of lumbo-pelvic muscle, decrease leakage severity of urine and improve quality of life.
Efficacy of exercises while structured lumbo-pelvic exercise program along with core stability are commonly

Materials and Method

Study Design:

This experimental comparative pre- post study was conducted at the outpatient Krishna hospital, karad city, Maharashtra. The study duration was about 8 months.

Participants:

The samples were recruited from the outpatient Krishna hospital, Krishna Vishwa Vidyapeeth deemed to be university, karad. Subjects were selected by a simple random sampling method, which enables an equal chance of selection for the subjects. The study conducted was between two groups (intervention and control group). Individuals were divided into two groups based on the criteria for inclusion and exclusion. Total 56 females suffering with urinary incontinence with fulfilling inclusion criteria, such as Women age 45 to 65 years, Women who are suffering from Urinary Incontinence, Subject willing to participate, Women who are experiencing >1 to 2 episodes of urinary leakage per day. The participants excluded were Women who have already attended a similar type of study, Previous incontinence surgery, History of genitourinary malignancy, Those with pelvic organ prolapse, Untreated urinary infection, Women

suffering from psychiatric disorders.

Outcome Measures:

Analouge Perinometer: perineometer is a device used to measure the strength of pelvic floor muscles. 11

Modified Oxford Grading scale: The Modified Oxford Grading Scale (MOS) is a 6-point scale (0-5) used to assess pelvic floor muscle strength during vaginal palpation, with 0 indicating no contraction and 5 representing strong

contraction. 12

The Questionnaire for female Urinary incontinence diagnosis (QUID): The Questionnaire for Urinary Incontinence Diagnosis (QUID), a 6-item urinary incontinence (UI) symptom questionnaire, was developed and validated to distinguish stress and urge UI. This study's objective was to evaluate QUID validity and responsiveness when used as a clinical trial outcome measure. 13

Intervention:

Participants in group A received Structured lumbo-pelvic exercise along with core training. The exercise program is mentioned in table no. 1,2,3,4,5. Group B received

Conventional exercise routine table no. 6. All the exercise were performed for 10 repetitions with a hold time of 10 seconds daily for 6 week.

Exercise protocol for group A – structured lumbo-pelvic exercise along with core training

Table no.1

Relaxation Technique	
Muscle Group	
Upper limb muscle groups:- Hands	Clench each fist separately (right and left), feel the tension in the fist and forearm respectively for 5 seconds. Release the fist, relax.
Arms	A) Feel the tension for five seconds by bending each arm (left and right) individually up at the elbow and tightening the biceps for 5 seconds then relax B) With the hands relaxed and the lower arms supported by the chair, straighten the right and left arms individually and tighten the triceps. Take 5 seconds to feel the stress, then relax
Shoulder Girdle:- Shoulder	Tense shoulder by tightening and shrinking shoulder (shrugs your shoulder up to your ears), feel the tension for 5 seconds, relax
Neck	A) Push the head back as far as it will go (against a chair), feel the tension for 5 seconds. Bring head to its position, relax. B) Lower your head and place your chin against your chest for 5 seconds. Relax and return the head to its natural position.
Pelvic Girdle:- Buttocks	Squeeze the muscles in your buttocks and feel them tighten for five seconds then Relax.
Spine and Postural muscles:- Back	For five seconds, feel your muscles contract as you arch your back away from the chair. Relax.
Abdomen & segmental relaxation of spine:- Abdomen	Contract abdominal muscles, hold for 5 seconds. then relax.
Lower limb muscle groups:- Thighs	Tighten thigh muscles. Feel the tension for 5 seconds. Relax.
Lower leg	Tighten the calf muscles by pulling toes towards you, feel the tensing for 5 seconds. Relax.
Feet	Curl toes towards the bottom of feet. Relax

Table No. 2

Basics of core training:		
WEEK 1 AND 2	EXERCISE	DESCRIPTION
	Diaphragmatic breathing	Lying down on your back. Put one hand on the abdomen and one on the chest. Slowly take a breath in and focus on trying to get your hand on stomach to rise while the hand on your chest remains still. As your breath in, the hand on your stomach should rise. The hand on your stomach should rise as you exhale.
	Transverse abdominis activation	With your feet flat on the floor and your knees bent, lie on your back. Contract the abdominal muscles by drawing the belly button up and in.
	Hook lying with abdominal drawing in maneuver and alternating arms	With your feet flat on the ground and your knees bent, lie on your back. Contract abdominal muscles with raise your arm.
	Bracing with heel slides	Lie on your back to perform drawing in maneuver of the abdomen and hold it with sliding of the heel per leg.
	Bracing with leg lift	Lie on your back to perform drawing in maneuver of the abdomen and hold it. With raising up the leg.
	Pelvic floor activation	Lie on your back with your legs wide apart. Closing your eyes and visualize that you need to resist the urge to urinate. The idea is your relaxed and breathing normally while you try and engage the pelvic floor muscles to squeeze and lift around vaginal opening.

Table No. 3

Mild to moderate Lumbo-pelvic exercise:		
WEEK 3 AND 4	EXERCISE	DESCRIPTION
	Bracing with bridging	In supine lying position to perform a drawing in maneuver of the abdomen and gently lift up the buttock.
	Bracing with bridging and leg lifts	In supine lying position to perform a drawing in maneuver of the abdomen and gently lift up the buttock and hold it with raising up the leg.
	Bracing with standing	Patients were given instructions to stand and do the drawing-in maneuver of the abdomen.

	Squeeze and hold	With your knees bent and your feet flat on the floor, lie on your back. Squeeze the pelvic floor muscles and hold for a slow count of five to start, working up to 10. Relax and rest for 10 seconds.
	Assisted Abdominal crunches	Lie on your back with your hands at your sides, palm facing down. Bend your knees and place your feet on the ground. Contract your abdominal muscles and lift your chest and shoulders. Slide your elbows under your shoulders, supporting your weight on your forearms. Slowly uncurl your abs and return to staring.
	Pelvic tilt exercise	Bend your knees and lie on your back on the floor. Tighten your abdominal muscles and slightly bend your pelvis to flatten your back against the floor.

Table No. 4

Lumbo-pelvic exercise framework with Abdominal in-drawing maneuver and pelvic floor function		
WEEK 5 AND 6	EXERCISE	DESCRIPTION
	Quadruped arm lift with abdominal drawing in maneuver	In prone kneeling position to perform abdominal drawing in maneuver of the abdomen. Flex one upper extremity.
	Quadruped Legs lift with abdominal drawing in maneuver	In prone kneeling position to conduct the drawing in maneuver of the abdomen, stretch one lower extremity and elevate it off exercise mat.
	Quadruped arm and leg lift with abdominal drawing in maneuver	In prone kneeling position to perform the drawing in maneuver of the abdomen, flex one upper extremity and extend contralateral lower extremity.
	Quick squeeze	With your feet flat on the floor and your knees bent, lie on your back. As quickly and strongly as you can, squeeze and raise the pelvic floor muscles.
	Cat/ Camel exercise	Gently look up with your head and let your chest sink towards the floor, then look down and arch your back like a cat. This exercise should be done very gently and pain free range of motion. Do not force the movements.

Table No. 5

Lumbo-Pelvic stability exercise:		
WEEK 5 AND 6	EXERCISE	DESCRIPTION

	Abdominal crunches	With your feet flat on the floor and your knees bent, lie on your back. Your head is supported by your hands. Squeeze your abdominal muscles, raise your shoulder, and hold the position for one to two seconds. Slowly return to staring position.
	Exercise ball marching	Sitting on an exercise ball, slowly lift one foot off the ground. Go back, then raise the other side. Try just moving your legs.
	Exercise ball- wall squats	Supporting your low back on an exercise ball on a wall is a good place to start. Make sure your feet are shoulder-width apart. After that, gradually bend your knees and bring your buttocks down to the floor.
	Bicycle crunches with theraband	Loop a resistance band around your feet. Lies on your back with your knees bend. Place your hand behind your head, separate knees slightly. Extend one leg and bring the opposite knees to your elbow.

Table No. 6: Exercise protocol for Group B

Conventional Exercise Routine for Urinary Incontinence	
Kegel Exercises (Pelvic Floor Muscle Training)	Identify the right muscles by stopping urination midstream. Once identified, contract the pelvic floor muscles. Hold for **5 seconds**, then relax.
Bridge Pose	Lie on your back with your feet hip-width apart and your knees bent. Arms by your side, palms down. Lift your hips toward the ceiling while squeezing your buttocks and pelvic muscles. Hold for **5 seconds**, then relax.
Squats	Stand with feet shoulder-width apart. Keep your back straight and chest up. Place your hips and bend your knees. Lower yourself as though you were seated in a chair. Once your thighs are parallel to the floor, stop. To stand up, push through your heels. Hold for a moment, then rise up again.
Leg Raises	Lying on your back on the floor with your legs extended straight up towards the ceiling, slowly lower your legs towards the floor.
Butterfly exercise	Sit on the floor with your back straight. Bend your knees and bring your feet together. Hold your feet with your hands. Pull your feet gently toward your body. Let your knees fall toward the floor. Gently your knees up and down like wings. Do it slowly for 30 seconds.
Adductor ball squeeze	Feet flat on the floor and your knees bent, lie on your back. Put a pillow or soft ball between your knees. Engage your core and keep your back flat on the floor. Squeeze the ball using your inner thighs. Hold the squeeze for 5–10 seconds. Relax slowly, then repeat.
Clamshell exercise	Lie on your side with knees bent, Rest your head on your lower arm, and place your top hand on your hip for support. Keep feet together and your core engaged. Lift your top knee as high as you can without moving your hips or separating your feet. Pause briefly at the top. Lower your knee slowly back to the starting position.

Results

Analogue Perinometer (score):

Table no. 7: Group A and Group B Pre and Post comparison for Analogue Perinometer

Variable	Group A		Group B		Mean Difference	P value
Analogue Perinometer	mean	SD	Mean	SD		
Pre test	13.78	2.6	16.71	4.72	2.92	0.058
Post test	35.53	3.82	17.17	3.71	-18.35	<0.001

Interpretation: This table indicate that no significant difference in pre test values between group A and group B ($p>0.058$) and statistically highly significant difference in post test values between group A and group B ($p<0.001$).

Modified oxford grading scale:

Table no. 8: Group A and Group B Pre and Post comparison for Modified oxford grading scale

Variable	Group A		Group B		Mean Difference	P value
Modified oxford grading scale	mean	SD	Mean	SD		
Pre test	1.96	0.79	2.21	0.68	0.25	0.212
Post test	4.82	0.39	3.75	0.88	-0.71	<0.0001

Interpretation: This table indicate that not significant difference in pre test values between group A and group B ($p=0.212$) and statistically extremely significant difference in post test values between group A and group B ($p<0.0001$).

The Questionnaire for female Urinary Incontinence Diagnosis (QUID) :

Table no. 9: Group A and Group B Pre and Post comparison for The Questionnaire for female Urinary Incontinence Diagnosis (QUID)

Variable	Group A		Group B		Mean Difference	P value
The Questionnaire for female Urinary Incontinence Diagnosis (QUID)	mean	SD	Mean	SD		
Pre test	5.10	0.83	5.42	0.69	0.32	0.121
Post test	1.21	0.78	2.92	1.12	1.71	<0.0001

Interpretation: This table indicate that not significant difference in pre test values between group A and group B ($p=0.121$) and statistically extremely significant difference in post test values between group A and group B ($p<0.0001$).

Table No.10: Comparison of post test mean scores of Modified Oxford Grading Scale between Group A and Group B

Outcome measure	Post Intervention Values		t value	P value
	Group A	Group B		
	Mean ± SD	Mean ± SD		

Analogue Perinometer	35.53±3.82	17.17±3.71	18.22	p<0.0001 (ES)
Modified Oxford Grading Scale	4.82±0.39	3.75±0.88	5.85	p<0.0001 (ES)
The Questionnaire for female Urinary Incontinence Diagnosis (QUID)	1.21±0.78	2.92±1.12	6.62	p<0.0001 (ES)

Interpretation: The above table shows post- test verses post-test values of Analogue Perinometer, Modified Oxford Grading Scale, Questionnaire for female Urinary Incontinence Diagnosis (QUID) between Group A and Group B for patients with urinary incontinence, for all of them it is extremely significant p<0.000.

DISCUSSION

One prominent worldwide public health issue is urinary incontinence. Most women at some point in their lives have debilitating urinary incontinence. In India, the prevalence of urine incontinence is especially alarming. Nearly 26.25 percent of Indian women experience urine incontinence. (14) Our research revealed that core training and structured lumbo-pelvic exercise were useful in reducing the severity of bladder incontinence. In present study it was found that although combined exercise program proved to be effective when pre post intervention.

Urinary incontinence constantly experienced a frequent urination, a sudden strong urge to urinate, leaking urine during activities, waking up multiple times at night to urinate. As a result is to increases urine leakage intensity in female with urinary incontinence. A simple random sample was used to divide the 56 participants into two groups: Group A and Group B. Group A comprised 28 individuals who followed a (interventional) received structural lumbo-pelvic exercise along with core training and group B (control) received home based exercise routine.

The age group of 50 to 70 years old was the largest for those with urine incontinence, indicating that the bladder is incontinent. The menopause transition, according to Hunskaar et al., is a sequence of phases varying in duration that span from pre-, early peri-, and late peri- to post menopause and are characterized by modifications in menstrual and hormonal patterns. The prevalence of incontinence is higher among women between the ages of 50 and 80, which corresponds with the menopausal transition, based on the findings of cross-sectional epidemiological studies. (15)

In a prior study, Vidya Seshan et al. provided more evidence that incontinence is either caused by or made worse by the review's findings, based on which the primary risk factors for UI include age, parity, BMI, menopause, hysterectomy, recurrent UTIs, the fetal weight, and co-occurring diseases such as diabetes and chronic lung disease. (16) Furthermore, in their research, Danforth et al. (2009) found a high correlation between UI and cigarette smoking, hysterectomy, parity, BMI, and type 2 diabetes mellitus.(17) Wu et al. (2011) also found that the risk factors for the type of UI were fetal weight, number of abortions, constipation, age, BMI, pelvic organ prolapse, dysmenorrhea, vaginitis and cervicitis, dystocia, and caesarean section.(18) Further analysis by Peyrat et al. (2002) revealed that hysterectomy, postpartum incontinence, vaginal delivery and pregnancy were all significant UI risk factors.(19)

In terms of Analogue Perinometer, Group A exhibits a significantly higher mean in (35.53 ± 3.82) compared to Group B (17.17 ± 3.71), with p value (p<0.001). This suggests that Group A intervention leads to a more favorable outcome as compared to Group B. In previous study of Greendale et al. Menopausal women often experience a decline in estrogen levels, It carries significant consequences for musculoskeletal health, including reductions in bone mineral density, muscle mass, and joint stability. These changes can contribute to lower back pain, pelvic instability, and reduced functional mobility. Lumbo-pelvic stability exercises target core muscles—primarily the transversus abdominis (TA), pelvic floor muscles, multifidus and gluteals—thereby enhancing spinal alignment, postural control, and load distribution across the lumbar-pelvic region. (20)

In terms of Modified oxford grading scale, Group A exhibits a significantly higher mean in (4.82± 0.39) compared to Group B (3.75 ± 0.88), with p value (p<0.001). This suggests that Group A intervention leads to a more favorable outcome as compared to Group B. Exercises for lumbo-pelvic stability perform effectively for this problem because they focus on the deep core muscles, such as the transversus abdominis, multifidus, and pelvic floor muscles, which are essential for lumbo-pelvic control and continence. (21)

In terms of The Questionnaire for female urinary incontinence, Group A exhibits mean value (1.21± 0.78) compared to Group B (2.92± 1.12), with p value (p<0.001). This suggests that Group A intervention leads to a more favorable outcome as compared to Group B. In study of de Souza et. Al. lumbo-pelvic exercises improve the coordinated activation of abdominal muscles along with pelvic floor muscle, enhance neuromuscular control, and reduce intra-abdominal pressure during activities like coughing or lifting. This is especially beneficial for **stress urinary incontinence (SUI)**, the most common type in menopausal women. (22)

This study revealed that the subjects in Interventional group (group A) experienced alterations with a notable difference in urine leakage. The study found that both groups' lumbo-pelvic muscle strength significantly improved. Along with alleviating the symptoms of urine leakage, Group A's treatment regimen resulted in a more notable improvement in core and lumbo-pelvic muscular strength. According to a prior study by Sameera M. et al., patients with urine incontinence can significantly increase their lumbo-pelvic muscular strength by using Pfilates exercises for six weeks.

Dynamic lumbar strengthening exercises increase muscle activity in the rectus abdominus and erecter spine muscles. (23)

Intervention group (Group A) were given Structured lumbo-pelvic exercise along with core training where special emphasize was given on lumbo-pelvic stability function to interpret the results of outcome measures the first test assessed was Analouge perinometer. The mean value before the intervention was 13.78 but after the intervention is 35.53. The difference between the pre-intervention and post-intervention mean values is extremely large. This indicates that the intervention had a significant impact with p value<0.001 on the measured parameter, resulting in a large improvement in the Analouge perinometer results. Second outcome measures assessed was Modified oxford grading scale. The mean value before the intervention was 1.96 but after the intervention is 4.82. The difference between the pre-intervention and post-intervention mean values is extremely large. This indicates that the intervention had a significant impact with p value<0.001 on the measured parameter, resulting in a large improvement in the Modified oxford grading scale results. Third outcome measure is Questionnaire for female urinary incontinence diagnosis (QUID). The mean value before the intervention was 5.10 but after the intervention is 1.21. This indicates that the intervention had a significant impact with p value<0.001 on the measured parameter, resulting in a large improvement in QUID.

In study of Gladwell et. Al showed Dynamic lumbar strengthening exercises can strengthen the spinal region with supporting lumbar structure. This exercises is one of spinal mobilization effective core stabilization training and endurance stabilizing musculature. The primary component of dynamic lumbar strengthening exercises is spinal muscular strength and movement. (24)

The present study demonstrated that, in patients with urinary incontinence, symptoms were reduced as the structured lumbo- pelvic exercise along with core muscle training strengthened the core muscles with pelvic floor muscles. The modified Oxford scale is an effective diagnostic tool despite its subjective nature; it is also inexpensive and very easy to use. The objective techniques including the Perinometer, the modified Oxford grading scale, and QUID were used in that investigation to evaluate the pelvic floor muscles' strength, which focused more on whether training for this muscle, affected muscle morphology. In a recent special communication, the American College of Sports Medicine discussed evidence-based progression models for resistance training in healthy people. (25)

Our purpose was to avoid the risk of interfering with increases in strength, to adjust the exercise schedules on a regular basis and to provide motivation to the patients. Since the International Consultation on Incontinence Committee recommends that women with stress incontinence undergo supervised pelvic floor muscle training for 8–12 weeks before reassessment, the patients' symptoms were evaluated in weeks 0 and 6. (26, 27)

The National Institute of Clinical Excellence's guideline for treating female incontinence recommends pelvic floor muscle exercise for at least three months. The guideline states that pelvic floor exercises were effective in treating over 50% of female patients' incontinence. (28)The present study's findings showed that a 6-week structured pelvic floor muscle exercise program and core training were successful in controlling female incontinence. It has improved the quality of life, reduced leakage of urine, and strengthened the lumbo-pelvic and pelvic floor muscles. (29)

The systematic training of lumbo-pelvic muscles and strengthening of the core were used in this study, which concentrated on improving muscle strength was successful in lowering the severity of incontinence and enhancing strength and quality of life, according to the main effects of the intervention results. It's also possible that the inclusion of an equal amount of fast and slow activities helped to improve the results. Before and during attempts when intra-abdominal pressure rises, the women's planned exercise routine helps them pre-contract their pelvic floor muscles. It is believed that this stops urine leakage by stabilizing the neck of the bladder under elevated abdominal pressure, such as coughing.

The long-term structural support of the pelvis is strengthened by exercises that improve the hypertrophy and stiffness of the connective tissues and pelvic floor muscle, as well as the elevation of the levator plate inside the pelvis. It has been proven that pelvic floor exercises reduce perineal descent with raised intra-abdominal pressure and encourage automatic motor unit activation. The main factors influencing the reduction of stress incontinence are the types of exercise, their frequency and intensity, the length of the training period with the training program. (30)

Conventional exercise routine group showed improvement in all measurement of outcomes whereas leakage of urine score did not show major reduction when compared to structured lumbo-pelvic exercise and core strengthening exercise program after 6 weeks of training. A study was conducted to combined efficacy structured lumbo-pelvic exercise and core strengthening exercise program on decreasing urinary incontinence symptoms. A treatment was effective in improve strength of pelvic floor and deceasing functional impairments. In our study from the methodological point of view, duration of the studied intervention 3 times per week for 6 week were applicable to produce benefits.

Finally, we compare both the groups, the result is combined effectiveness of structured lumbo-pelvic exercise and core exercise program is better for urinary incontinence.

Conclusion

Various conservative treatment methods in treating urinary incontinence but in this study concluded that combined pattern of structured lumbo-pelvic exercise regimen and core strengthening exercise protocol effective. It is proved from this study that structured lumbo-pelvic exercise and core strengthening exercises for period of 6 weeks is effective in reducing the symptom severity in females suffering from urinary incontinence. Thus alternate hypothesis that there is significant effect of structured lumbo-pelvic exercise and core strengthening exercises for urinary incontinence accepted.

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Conflict of Interest

Regarding the study's content, there are no conflicts of interest.

Ethical clearance

The Ethical clearance was taken from institutional ethics committee of KIMSDU.

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