

Effects of Kegel and General Fitness Exercises in Reducing the Severity of Urinary Incontinence- An Interventional Study

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ABSTRACT

Introduction: The involuntary flow of urine from the bladder is known as Urinary Incontinence (UI). Men and women of any age can experience incontinence, but it is more prevalent in older women. Several chronic illnesses and environmental variables increases incidence of UI in elderly adults. Most people in this modern era avoid seeking medical intervention early, due to financial worries as the current diagnostic and intervention methods are expensive.

Aim: To use low-cost urinary diaper method for assessing the severity of UI and to study the effect of Kegel and therapeutic exercises in reducing the severity of UI in elderly women.

Materials and Methods: This interventional study was conducted in an Inshape Physiotherapy Centre in Chennai, Tamil Nadu, India. The duration of the study was five months, from August 2021 to December 2021. A total of 36 women with UI aged 55-75 years were included. The severity of UI among the participants was assessed using one-hour Diaper Test (DPT), Hamilton Anxiety Rating Scale (HAM-A) and their level of fitness was evaluated using Senior Fitness Test (SFT). Kegel exercise, pelvic floor

exercises were implemented following American College of Sports Medicine (ACSM) standards. Statistical analysis was carried out using the Statistical Package for Social Sciences (SPSS) version 20.0, and data collected was subjected to descriptive statistics and paired t-test.

Results: The mean age of the study participants was 69.43±3.4 years. As a result of the intervention, 13 out of 36 participants, who initially had severe UI showed improvement (10 participants improved to moderate UI and three participants improved to mild UI). Out of seven participants, who initially had moderate UI, three participants improved to mild UI. Eight out of the 36 participants showed no UI after intervention, indicating complete recovery. There is an association between the Body Mass Index (BMI), HAM-A and UI, the intervention results in the changes of BMI, and HAM-A thus, reducing the severity of UI.

Conclusion: The present study showed that, cost-effective diagnostic and non invasive intervention methods reduced the severity of the UI. The study also recommends regular physical activities to reduce stress and anxiety levels, which in turn helps to improve UI.

Keywords: Abdominal weakness, Chronic illnesses, Fungal infections

INTRODUCTION

Nearly 8.1% of India's population is over the age of 65 years, (2.4%) of people live in rural areas, and nearly 3.8% have a low socio-economic status [1]. Chronic diseases like ischaemic heart diseases, hypertension, diabetes and urinary problems are more prevalent among aged people [2]. A person with UI is unable to control his/her urine during some strenuous activities or even while at rest [3,4]. The UI was declared a social disease by the World Health Organisation (WHO) since, it impacted 6.3% of the general population [5]. Core muscle weakness, depression and anxiety are the major predisposing factors for UI [6]. Sneezing, coughing, laughing or engaging in any other routine activity might cause urinary leakage, medically known as Stress Urinary Incontinence (SUI) [7]. Urinary leakage and high urgency are the hallmarks of Urge Urinary Incontinence (UUI) [8]. Mixed Urinary Incontinence (MUI) is characterised by urine leakage, stress incontinence, and urge incontinence. The available treatment methods for UI, such as pharmacologic and neuromodulator therapies, mechanical devices such as urethral plugs and anti-incontinence surgeries are quite expensive [9]. The one-hour urinary DPT measures the amount of urine leakage and classifies it into three categories: mild (1-10 g), moderate (11-50 g), and severe (>50 g) [10]. Women with UI are also suffering from some associated problems like skin irritation, dermatitis, rashes, sores and fungal infections due to the wetness of skin around the vulva, which significantly reduced

their quality of life [11]. Most of the Indian women suffer from the problems of UI silently, even with symptoms, in order to avoid the treatment expenses, hindrance in their family and society due to cultural barriers [12]. It has been observed that, ageing, weakness of the abdominal muscles, stress and anxiety are predisposing factors in the development and progression of UI [13]. Majority of the elderly women suffering from UI considered it as untreatable. They considered that, the problem is because of the process of ageing and are embarrassed to undergo treatment. There are only a limited number of studies, that have addressed the importance of exercise for patients who suffer from UI. Therefore, the present study was needed in order to explain how exercise can reduce the severity of UI symptoms.

Accordingly, in order to address this issue and fill the lacunae in the literature, the present study aimed to examine whether, general fitness, Kegel exercises, and breathing techniques could improve the health and reduce the severity of UI in older women. The objective of the present study was to evaluate the severity of UI using a cost-effective urinary diaper.

MATERIALS AND METHODS

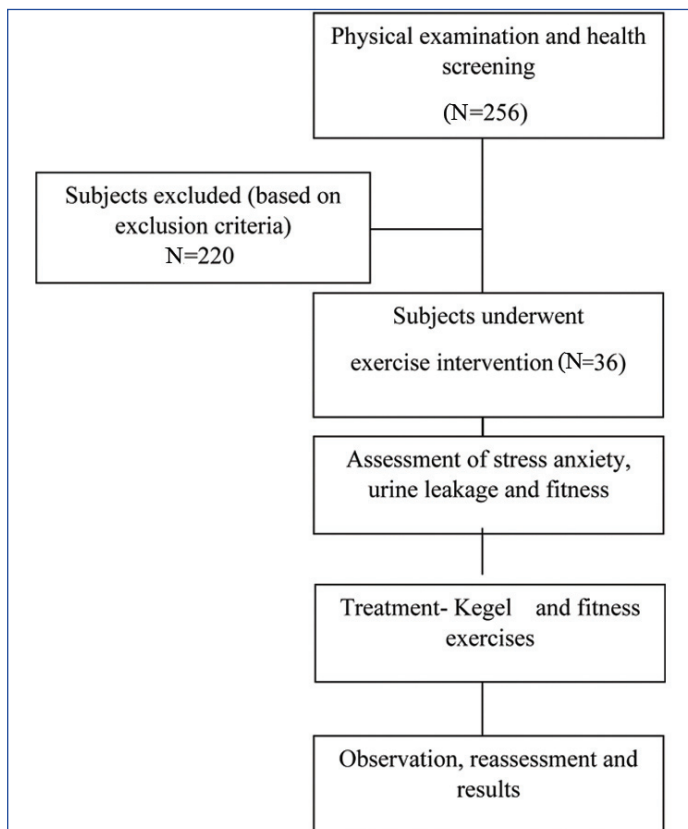
This interventional study was conducted in an Inshape Physiotherapy Centre in Chennai, Tamil Nadu, India. The duration of the study was five months, from August 2021 to December 2021. The study was approved by Institutional Ethical Committee (IEC)

(Ref: IEC NI/14/DEC/44/93) of Sri Ramachandra University, Chennai, Tamil Nadu, India.

Inclusion criteria: Participants with UI, who were willing to participate were included in the study.

Exclusion criteria: Participants with uncontrolled hypertension, cardiovascular diseases, respiratory, renal, hepatic, rheumatologic diseases, skin disorders, inflammatory conditions, ulcers, open wounds, recent fractures were excluded from the study.

Sample size calculation: A total of 36 women with UI aged between 55 and 75 years were included in the present interventional study. The sample size was calculated based on the prevalence, using simple Gaussian theory [14]. A total of 256 participants underwent physical examination and health screening among them 220 were excluded based on the exclusion criteria, leaving 36 participants for intervention as shown in [Table/Fig-1].



[Table/Fig-1]: Flowchart for inclusion of subjects.

Study Procedure

The height and weight of the study participants were measured using conventional height and weight measuring scale and a pulse oximeter was utilised to monitor their blood pressure and heart rate. Other materials used for the study were adult urinary diapers {Carrier-Induced Regeneration (CIR) premium adult diaper}, a digital laboratory scale (LAB220.1-Electronic LAB Extremely Precise Scale) for weighing urinary diapers, a measuring tape, a chair without an armrest, resistance bands, dumbbells and writing supplies.

Health evaluation and testing: Following the guidelines established by the American College of Sports Medicine (ACSM) [15], each participant underwent a health screening and physical assessment. Additionally, details on their dietary patterns, lifestyle selections, state of health, present and previous medical histories were obtained. A total of 36 participants were selected for the subjective assessment based on the health screening and physical examination results. The severity of the UI, fitness level and stress anxiety level were appropriately assessed using the one-hour DPT, SFT and the Hamilton Stress Anxiety (HSA) rating scale, respectively.

One-hour Diaper Pad Test (DPT) [16]: The preweighted adult urinary diaper was to be worn by the intervention participants before they covered it with their regular or comfortable clothing. The participants were given 500 mL of water to drink within 15 minutes and were made to sit or rest afterwards. Then, depending on their degree of exercise tolerance, the participants performed mild to moderate physical activities, such as walking for 20-30 minutes, sitting and standing up from a chair (10-15 counts), bending and picking up objects from the floor (5-10 counts) and coughing (10-15 counts). A pulse oximeter was used to monitor the heart rate continuously throughout the activity. Following the physical activity, the participants removed their urinary diapers and handed them over to the examiner. The diaper's weight with urine was then calculated using a digital scale, and the amount of urine leakage was documented and categorised according to severity of UI mild (1-10 g), moderate (11-50 g) and severe (>50 g) [17].

Hamilton Stress Anxiety Rating Scale (HAM-A) [18]: The HAM-A is a questionnaire administered to the participants after thoroughly explaining the scale's purpose and application. They were then instructed to note any reactions they had to the set of questions. Each of the 14 questions had a single response to be chosen by the participants. Their stress and anxiety levels were divided into three categories based on their score: severe, moderate and mild.

Senior Fitness Test (SFT) [19-21]: The level of participants' fitness was evaluated using SFT. It included a series of physical tests to evaluate the extent of physical impairment, functional limitations of joints and ability/inability to perform particular movements. The test was administered once the participants had been accustomed to the movements and the values were noted. The examiner had demonstrated and explained every movement to them in an appropriate stance and posture.

- Chair stand for 30-second: The strength of the lower extremities was assessed by sitting and standing up from an armless chair for 30 seconds. The number of movements that were carried out correctly was noted.
- Sit-and-reach: The flexibility of the lower extremity was measured by placing the middle finger on the great toe with the extended knee, while being seated on the floor. The distance between the great toe and the middle finger was noted (in cm).
- Arm curl: The upper body strength was measured by doing an arm curl with a dumbbell that weighed 2.0-2.5 kg. The number of repetitions that were done correctly was noted.
- 2-minute step test: To measure aerobic/cardiorespiratory endurance, hip and knee flexion at an angle of 90° was used and the number of accurately executed movements was noted.
- Back scratch test: In order to measure upper extremity flexibility, the subject stood with one hand over the shoulder and dragged it down to the middle of the back. The subject then attempted to touch or overlap the middle fingers of both hands by placing the other hand behind the back, palm facing out. It was measured how far apart the middle fingers were (in cm).

Intervention: The objective of the present study was to observe the effects of intervention to improve senior women's based on the urinary diaper test method. Based on the assessment guidelines provided by ACSM, the exercise intervention was prescribed and executed for three months. The intervention consisted of general fitness [22], Kegel exercises [23], and breathing techniques [24] as shown in [Table/Fig-2]. Throughout the activities, the heart rate was constantly monitored using pulse oximeter. The exercise intensity was raised based on the improvement in fitness level.

S. No.	Exercises as per ACSM guidelines	
1	Standard exercises	
a	Warm-up drills	Moving joints and stepping (10-12 minutes/session)
b	Flexibility training	Self-stretching of all the main muscles (10-12 minutes/session)
c	Cardiovascular conditioning	<ul style="list-style-type: none"> Low step kicks Walking Weekly Three-four days, 15-20 minutes/session, METs- 1.2 to 2.8
d	Back and core stability	Knee supported plank, pelvic bridging, (15-30 second, four-five days/week)
e	Strength training active exercises (using own body weight), resisted exercises (using low weight dumbbells and resistant tubes) for all the major muscles	Three-four sessions/week Three-four sets 8-10 reps/set Rest for one-three minutes in between sets. Tempo- 3:2:5
2	Kegel exercises	
a	Instructions given to participants: Breathe in deeply through your nose while relaxing your pelvic floor muscles. The patient should feel the abdomen rise. Exhale slowly and smoothly for three to six seconds, while gently contracting the pelvic floor muscles. Release the contraction as the patient inhales	12-15 times/session, 3-5 sessions/day

[Table/Fig-2]: List of the exercises based on the ACSM recommendations for seniors. METs: Metabolic equivalents; Reps: Repetitions

STATISTICAL ANALYSIS

The statistical analyses were carried out using SPSS version 20.0. Paired t-test was used to evaluate the effectiveness of exercise intervention. The Confidence Interval (CI) was 99% and p-value >0.05 was set as the threshold level for significant results.

RESULTS

The characteristics of the subjects were determined using descriptive statistics. The Mean±SD for age of the study participants was 69.43±3.4 years, for height was 162.21±3.7 cm, for weight 68.14±7.2 kg and for BMI is 24.81±2.12 kg/m². The participants were categorised into mild UI 44.44%, moderate UI 19.44% and severe UI 36.11%, based on the severity assessed using one-hour pad test, as shown in [Table/Fig-3].

Grades	Frequency (n)	Percentage (%)
Mild	16	44.44
Moderate	7	19.44
Severe	13	36.11
Total	36	100

[Table/Fig-3]: Frequency and percentage of Urinary Incontinence (UI) based on the severity.

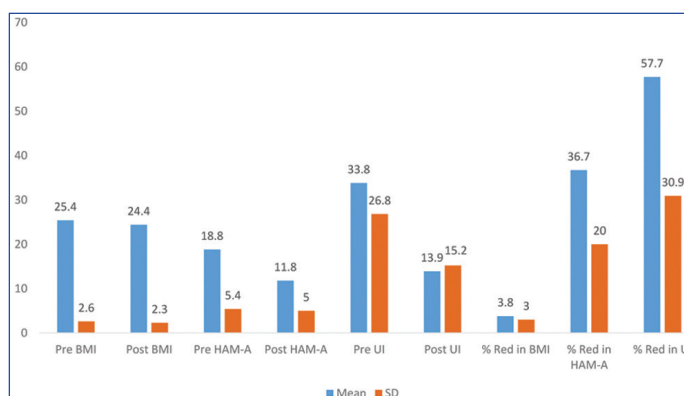
The mean value of preintervention of BMI was 25.41, and postintervention was 24.42 with a t-value of 9.901. Similarly, the pre and post mean value of HSA was 11.77, and 9.901 with a t-value of 7.15, respectively and the pre and post mean value of UI was 33.83 and 13.88 with a t-value of 6.84. BMI, HAM-A, and UI tests showed a statistically significant p<0.01, indicating the intervention's effectiveness as shown in [Table/Fig-4]. Paired t-test was used to observe the parameters; pre and postintervention values showed

S. No.	Parameters	(N=36)		t-value	p-value
		Mean±SD			
		Preintervention	Postintervention		
1	BMI	25.41±2.62	24.42±2.32	7.15	<0.001*
2	HAM-A	18.80±5.48	11.77±5.26	9.09	<0.001*
3	UI	33.83±27.15	13.88±15.43	6.84	<0.001*

[Table/Fig-4]: Comparison of the subjects' parameters. BMI: Body mass index; HAM-A: Hamilton anxiety scale; UI: Urinary incontinence; *: Statistically significant

that, the intervention given has provided positive changes in all the parameters with a statistical significance p<0.001.

As a result of intervention, out of the 36 participants, a total of 13 patients, who initially had severe UI showed, improvement (10 participants improved to moderate UI and three participants improved to mild UI). Three of seven participants, who initially had moderate UI improved to mild UI. Eight out of the 36 participants showed no UI after intervention, indicating complete recovery. There is an association between the BMI, HAM-A and UI, the intervention results in the changes of BMI and HAM-A thus, reducing the severity of UI [Table/Fig-4,5]. SFT was the major tool consisting of a series of physical test used to assess the participants' fitness level during the pre and postintervention period. The paired t-test was performed to find the improvement in SFT. The administered exercises to the elderly seniors significantly improved their fitness level in all the components, as shown in [Table/Fig-6].



[Table/Fig-5]: Shows the changes in BMI and HAM-A thus, reducing the severity of UI.

BMI: Body mass index; HAM-A: Hamilton anxiety rating scale; UI: Urinary incontinence; % Red: the percentage of reduction. Paired t-test with a statistical significance p<0.001. Changes were observed in BMI, HAM-A and UI in the pre and postintervention

S. No.	SFT	(N=36)			
		Mean±SD		t-value	p-value
		Preintervention	Postintervention		
1	Chair stand (reps)	11.31±2.68	15.81±2.18	11.16	<0.001*
2	Arm curl (reps)	13.53±3.72	17.56±4.81	10.31	<0.001*
3	2-minute step (step counts)	62.81±14.31	84.46±12.28	9.37	<0.001*
4	Chair sit and reach (cm)	0.12±1.69	3±2.1	11.28	<0.001*
5	Back scratch (cm)	0.12±1.81	1.92±2.13	10.76	<0.001*

[Table/Fig-6]: SFT comparison of the subjects' fitness before and after the intervention.

*statistically significant, SFT: Senior fitness test; Repetition count (reps), distance (cm), and time (sec). Paired t-test was performed to observe the fitness effects; pre and postintervention values show that, the intervention given has provided positive changes in all the parameters of SFT with a statistical significance p<0.001

DISCUSSION

The Kegel exercises and a set training schedule were beneficial in reducing UI in older seniors. Over a period of three months, the 36 participants exercised regularly; as a result, their fitness levels increased and their anxiety levels significantly dropped. A 3.5 METs or less (equivalent to three hours per week of brisk walking) of low-intensity physical activity are safe, effective and practical approaches to improving seniors' health [22]. The exercises were prescribed and carried out in the present study as per the recommendations made by the ACSM. The intensity of the exercises was restricted to 1.1-2.9 METs during the execution of SFT as shown in [Table/Fig-2]. SFT is a highly effective tool in assessing physical impairment, functional limitation and diminished capacity and it has been used to determine fitness level. The pelvic floor muscles, urethral sphincter and abdominal muscles all facilitate micturition as a part

of their functional anatomy. UI frequently affects obese people due to weakness of the pelvic floor muscles [25].

According to Bump RC et al., bariatric surgery resulted in a weight loss of 45 to 50 kg and a significant improvement in UI [26]. Compared to the Bump RC et al., study, the present study also found that, a moderate level of weight loss had a significant improvement in the UI. The present study differs from the Bump RC et al., study, where exercises were only given for three months, but positive changes in the UI were noted. Although, weight loss was not a focus of the current study, regular exercise did result in significant weight loss and changes in BMI, which may have contributed to the improvement in UI. As a result, regular exercise and maintaining a healthy weight may help older people with UI to avoid surgical interventions.

Mingin GC et al., investigated the effects of stress on mice and found that, it results in a functional disorder in the bladder which manifestes as an uncontrolled frequency of urination and a smaller bladder volume [27]. According to Crews DJ and Landers DM, regular aerobic and strength training promotes healthy sympathetic nervous system and Hypothalamic-Pituitary-Adrenal (HPA) activity, which lowers anxiety levels. An effective exercise programme was prescribed in the present study and safely carried out, based on the fitness level identified by SFT [28]. When combined with bladder training, Kegel exercises have been shown to reduce UI episodes in older people, according to research by Sumedi et al., [29]. When compared the present study with Sumedi et al., their study had implemented the general fitness and controlled breathing exercises to improve the overall health and reduce the stress and anxiety levels and the results revealed that Kegels exercises, general fitness exercises and breathing exercises had reduced the severity of the UI. Vijayakumar K et al., had reported that Kegel exercise, controlled breathing exercises and fitness exercises had reduced the severity of UI among the elderly males [30]. The Kegel exercises targeted at controlling UI, fitness drills targeted at increasing flexibility, muscle power and cardiorespiratory endurance, and appropriate breathing techniques have all been used in the present study to lower stress and anxiety. A non invasive, cost-effective urinary diaper was used in a one-hour pad test to assess the severity of urine leakage among elderly women. Compared to the one-hour and 24-hour test methods, the one-hour test method was much more manageable for elderly people and could lessen infection, when worn for a short time.

Limitation(s)

Urinary continence is also prevalent among young obese women with weakness of the pelvic floor muscles. But the present study focused only on the elderly women with UI is the limitation of the present study.

CONCLUSION(S)

The present study revealed about the advantages of Kegel exercises and fitness workouts among elderly seniors with UI in accordance with the recommendations of ACSM. To lessen the severity of the UI, focused exercises and affordable urinary diapers were prescribed. A thorough and well-planned training programme, which includes warm-up exercises, flexibility stretches, cardiovascular endurance exercises, exercises for the core muscles and strength training based on assessment results was designed and implemented to increase the health-related fitness components. In addition to maintaining a healthy body, exercise also lowers stress and anxiety levels. According to the study, consistent physical activity is the greatest treatment for senior persons' health-related and psychological issues.

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