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Original Article

Physiotherapy Section

Effect of Pelvic Floor and Abdominal Muscle Exercise on Women with Stress Urinary Incontinence: A Quasi-experimental Study

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ABSTRACT

Introduction: International continence society and the international urogynaecology association defined the Urinary Incontinence (UI) as "the complaint of any involuntary urine loss". Pelvic Floor Muscles (PFM) weakness leads to Stress Urinary Incontinence (SUI). There exists an association between physical exertions along with urinary loss in UI. For decreasing urine leak episodes in women, PFM exercises are recommended. The PFM serves as the inner unit and the transverse abdominal muscle, multifidus along with diaphragm act as core muscles. Therefore, for treating SUI, abdominal muscle strengthening might be efficient.

Aim: To analyse the effect of combined PFM exercises and abdominal muscle exercises on SUI symptoms.

Materials and Methods: A quasi-experimental study was executed with 15 subjects in the Experimental Group (EG) and 11 subjects in the Control Group (CG) via purposive sampling technique at Outpatient Department (OPD), Sri Ramachandra Hospital, Chennai, Tamil Nadu, India. The study was conducted from December 2018 to April 2019. The EG was treated with abdominal muscle exercises along with Pelvic Floor Exercises (PFE) for eight weeks while the CG was treated with PFE. Via phone calls, the training follow-up was conducted. PFM strength and the Questionnaire for Urinary Incontinence Diagnosis (QUID) were the outcome measures. The between group perineometer scores analysed with paired t-test. For examining the pre and post-test score of PFM strength scores the independent t-test was employed. For analysing the QUID score Wilcoxon signed-rank test, Mann-Whitney U test was applied.

Results: The mean of PFM strength (mmHg) for the interventional group was 5.4 while in the CG the mean was 1.64 as exhibited by the within group analysis (p=0.001). An enhancement in every component of QUID in the interventional group was shown in the post-test QUID score between groups which depicted a statistically significant difference in all the components (cough p=0.001, bending p=0.002, walk p=0.001).

Conclusion: Abdominals and PFM exercise lessens the SUI symptoms even though PF exercise is the regular treatment aimed at SUI. Better improvement in SUI symptoms and PFM strength is possible by the abdominal exercises along with eight week PF exercise program.

Keywords: Abdominal exercises, Biofeed back training, Core strengthening, Kegel exercise, Pelvic floor strength

INTRODUCTION

International continence society and the international urogynaecology association defined the UI as "the complaint of any involuntary urine loss". PFM weakness leads to SUI. The complaints of any involuntary leakage of urine during physical exertion or an effort are called SUI. It happens when the urethral closure pressure is exceeded by bladder pressure, producing transient sphincter opening along with urine loss. Physical activities namely lifting weights, walking, coughing, sneezing, or any other activity that causes a sudden rise in intra-abdominal pressure results SUI. SUI is caused if intraurethral pressure is exceeded by intra-abdominal pressure in the non existence of the detrusor muscle's contraction [1].

The prevalence of SUI differs between 12.8-40.8% worldwide in an Australian review [2]. Approximately 20-40% is the occurrence of SUI reported in India and the prevalence increases as the age advances [3]. Three fourth of women complaint SUI symptoms as bothersome and one fourth as moderate to severe in intensity. Only 60% of women with SUI report their problem and seek treatment [4]. The most UI cases had shown the PFM weakness. Age, hormone therapy, hysterectomy, multiparity, increased body mass index, smoking and diabetes, several risk factors are detected for SUI [5].

Frustration and disappointment about life, perineal soreness and sleep disturbances are the associated issues produced by SUI that interferes with social activities. When compared to the woman who had experienced Lower Segment Caesarean Section (LSCS) and women who had vaginal deliveries were considerably affected by incontinence [6]. One of the subjective measurement tool for SUI is the QUID. QUID is the six item UI questionnaire which distinguishes SUI from urge pattern. QUID is a valid and reliable questionnaire with good psychometric properties [7].

The abdominal cavity's base is formed by the PFM. Thus, for assisting the pressure rise and maintaining continence, PFM should contract throughout tasks that elevate intra-abdominal pressure. For instance, during coughing, pubococcygeus activity is more and puborectalis activity is augmented while lifting. For decreasing urine loss episodes in women, PFM exercise is stated as 50-69% efficient [8]. The first line of treatment meant for women with SUI is the PFM exercises which strengthen weak perineal and PFM. However, their success extremely relies on the patient's motivation level along with compliance with these exercises [9]. A valid strength training device that estimates the PFM's accurate strength is called perineometer. It could well be utilised as an assistive device for enhancing PFM strength [10].

The PFM serves as the inner unit and the transverse abdominal muscle, multifidus along with diaphragm act as core muscles. Instead of focusing PFM alone, contracting core muscles can increase the pelvic floor strength. An effective mechanism for core strength might be offered by the abdominal muscles contraction along with the PFM's contraction. The usage of abdominal muscle training is to restore the PFM which might be helpful in treating SUI [11]. Intravaginal pressure is augmented by deep abdominal muscle contraction as found by Madill SJ and McLean L [12].

SUI has been managed with PFM exercises in preceding studies. When analogised to the PFM exercises, PFM together with abdominal muscle strengthening exercises will be a better substitute as stated by few literatures [11,12]. There prevails a deficit of information on PFM exercise and abdominal muscle exercise although the PFM's effect on SUI is established. Thus, this study aimed to analyse the effect of combined PFM exercises and abdominal muscle exercises on SUI symptoms.

MATERIALS AND METHODS

A quasi-experimental study was conducted in which the subjects with SUI were recruited from the Urology and the Gynaecology OPD, Sri Ramachandra Hospital, Chennai, Tamil Nadu, India. The study was conducted from December 2018 to April 2019. A written informed consent was obtained and Institutional Ethical Committee (IEC) approval was obtained (CSP/18/SEP/73/265). The participants underwent the procedures but did not give consent to include the images in the article, hence was not published.

Sample size calculation: With the two different mean, power-80%, CI-95%, sample size was computed as 40 [13].

Inclusion criteria: Females of age 30-60 years with the complaint of stress incontinence with a score equal to or over 3 on the QUID were included in the study.

Exclusion criteria: Uterine prolapse, vaginal or abdominal hysterectomy, severe urinary tract infection or vaginal infection and patients who do not understand the commands were excluded.

Patients who fulfilled the inclusion criteria were assigned in interventional (n=15) and CG (n=11), via purposive sampling.

Study Procedure

A baseline assessment was executed which comprised mode of delivery, demographic data, obstetric history, QUID score and pelvic floor strength. The EG had participated in eight weeks exercise program. The PF exercises and abdominal exercises were the key exercises for EG. (PF exercise, pelvic bridging, alternative straight leg raising, tummy tucking, tummy tucking and pelvic bridging, pelvic floor exercise along with tummy tucking and pelvic bridging (10 repetitions each, 3-5 days/week and PF exercises 10-20 repetitions-5 sets/daily). CG received only PF exercises-10-20 repetitions/daily-5 sets. The exercise information sheet was received by both the groups and also the follow-up was assured with an exercise follow-up diary and via phone calls. Both the groups were assessed for pelvic floor strength and incontinence score using QUID after the intervention [7]. QUID questionnaire was used for stress and urge urinary incontinence. The responses of first three questions summed up for SUI. Rest questions (4-6) summed up for Urge Urinary Incontinence (UUI). This study was on SUI. So, the scores of first three questions were taken.

STATISTICAL ANALYSIS

Statistical Package for the Social Sciences (SPSS) software version 20.0 was used for statistical analysis. Shapirowilk test was performed to test normality of data. For baseline characteristics of participants, descriptive statistics were computed. The between group perineometer scores were analysed with paired t-test. For examining the pre and post-test score of PFM strength scores the independent t-test was employed. For analysing the QUID score, Wilcoxon signed-rank test and Mann-Whitney U test was applied.

RESULTS

Baseline characteristics of the study population showed that most of the women in study population were multiparous and mode of delivery was Spontaneous Vaginal Delivery (SVD) or Assisted Vaginal Delivery (AVD) [Table/Fig-1].

Variable	Experimental (EG), n (15)	Control (CG), n (11)
Age (year) (Mean±SD)	47.20±10.79	47.73±11.98
Body mass index (kg/m^2) (Mean±SD)	24.95±4.39	28.26±5.4
Parity, n (%)		
Nulliparous	0	1 (9.1%)
Primiparous	1 (6.7%)	1 (9.1%)
Multiparous	14 (93.3%)	9 (81.8%)
Mode of delivery, n (%)		
SVD/AVD	14 (93.3%)	10 (90.9%)
LSCS	1 (6.7%)	1 (9.1%)
Post menopause status	6 (40%)	4 (36.7%)

[Table/Fig-1]: Baseline characteristics of participants.
SVD: Spontaneous vaginal delivery; AVD: Assisted vaginal delivery; LSCS: Lower segment caesarean section

Analysis of PFM strength using perineometer within experimental and control group revealed that the post-test mean (SD) score of experimental group was 5.40±3.91 whereas in control group 1.64±2.20 which had shown statistically significant difference within both the groups [Table/Fig-2].

Group (n)	Perineometer scores (mmHg)		t-value	p-value
	Pretest (mean±SD)	Post-test (mean±SD)		
EG (15)	2.00±3.95	5.40±3.91	9.06	0.001*
CG (11)	0.82±1.78	1.64±2.20	4.5	0.001*

[Table/Fig-2]: Perineometer scores within experimental and control group.
*Significant at p<0.05, paired 't' test

Analysis of QUID score for SUI within experimental and control group revealed that there was an improvement in cough/sneeze (p-value=0.001), bend down (p-value=0.002), walk/exercise (p-value=0.001) components of QUID in experimental group with a significant difference within the group [Table/Fig-3]. The between group analysis had shown clinical improvement in mean of PFM strength in both the groups followed by eight week training but it was not significant [Table/Fig-4].

Group	QUID	Mean rank	Z-value	p-value
EG (15)	Cough/Sneeze	7.50	3.407	0.001**
	Bend down	7.50	3.155	0.002**
	Walk/Exercise	7.50	3.185	0.001**
CG (11)	Cough/Sneeze	4.00	2.646	0.008
	Bend down	2.50	1.890	0.059
	Walk/Exercise	2.50	1.890	0.059

[Table/Fig-3]: QUID scores within experimental and control group.
**Significant at p<0.05, Wilcoxon signed rank test

Variable	Group (n)	Mean±SD	p-value
Perineometer (pre) (mmHg)	EG (15)	2.0±3.95	0.129
	CG (11)	0.82±1.78	
Perineometer (post) (mmHg)	EG (15)	5.4±3.91	0.135
	CG (11)	1.64±2.20	

[Table/Fig-4]: Pre/post-test score of perineometer between experimental and control group.
Significant at p <0.05; Independent 't' test

The post-test QUID score between groups had shown improvement in all the components of QUID in EG which showed statistical significant difference [Table/Fig-5].

DISCUSSION

This study was conducted with 15 participants in experimental and 11 in control group. Followed by eight weeks training, the

QUID	Group	Mean rank	Z-value	p-value
Cough/Sneeze-pre	EG	11.10	2.055	0.61
	CG	16.77		
Bend down-pre	EG	11.67	1.521	0.64
	CG	16.00		
Walk/Exs-pre	EG	11.80	1.413	0.198
	CG	15.82		
Cough/Sneeze-post	EG	8.72	3.725	0.001**
	CG	19.82		
Bend down-post	EG	8.90	3.659	0.001**
	CG	19.77		
Walk/Exercise-post	EG	9.60	3.136	0.002**
	CG	18.82		

[Table/Fig-5]: Pre/post test QUID scores between experimental and control group. **Significant at p<0.05, Mann-Whitney U Test

within group results revealed that both the group had shown improvement in PFM strength (p=0.001). The within group analysis of QUID components (cough p=0.001, bending p=0.002, walk p=0.001) had shown that combination of pelvic floor and abdominal muscle exercise improved the PFM strength than pelvic floor exercises alone.

The PFM strength was enhanced by the combined PF and abdominal muscle exercises than PF exercises as illustrated by the between group post test analysis of QUID components (cough p=0.001, bending p=0.001, walk p=0.002). In the present study, the biofeedback based PFM training at first visit benefitted both groups in improving PFM strength. The Frequency, Intensity, Type and Time of exercises (FITT) principle on exercises recommendation on PF exercises is the commonly neglected part in pelvic floor rehabilitation. This study focused pelvic floor exercises with education with FITT principle for both the groups and the experimental group were trained along with abdominals strengthening. During exercise, there is an improved oxygen supply, Adenosine Triphosphate (ATP) production, removal of metabolic waste and formation of extensive capillaries network around the muscle fibres. The muscle's ability was increased by all these changes for sustaining the contraction for larger periods and augmenting the contraction of core muscles during various postures effectively [14]. Abdominal activity along with PFM contractions were combination responses to one another [15]. The urethral closure pressure had risen with PFM contraction along with isometric abdominal muscle holds [16]. There was an enhancement in PFM strength in the groups after 'eight' weeks of PF and combined (PF and abdominals) exercise as shown by present study results.

Jahromi MK et al., proposed the PFM exercise's effect on UI. Incontinence score was enhanced by the PF intervention which had exhibited a significant difference between the 'two' groups (p=0.001) as established in the self-esteem of elderly females with SUI. For enhancing their Quality of Life (QoL) along with self-esteem, PFM exercises were an empowering method in incontinent women. [17].

Park SH and Kang CB studied the "Effect of kegel exercises on the female SUI management" which denoted that the UI symptoms of female SUI were considerably decreased by Kegel exercises [18]. In the present study, the perineometer grades were enhanced in EG who were on abdominal and PF exercises when contrasted to the CG who were trained with PF exercises.

Like the existing study, Ptak M et al., discovered that the QoL of women with SUI was enhanced by the combined training of the PFM and the synergistic muscles [6]. Superior results noted in women who practiced PFM and also the synergistic muscle exercises. There was a significant difference in the post QUID scores (cough p=0.001, bending p=0.001, walk p=0.002) in the experimental group contrasted to CG. In line to this study, the '12' week abdominal muscle strength training program as SUI treatment was better than PF strength training [19].

Limitation(s)

Smaller sample size. Confounding variables such as menopausal status to be analysed with larger sample size.

CONCLUSION(S)

Abdominals and PFM exercise lessens the SUI symptoms in QUID scores even though PF exercise is the regular treatment aimed at SUI. Better improvement in SUI symptoms and PFM strength is possible by the abdominal exercises along with PF exercise program.

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