Research article

Pelvic floor muscle strength in women with diabetes

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ABSTRACT

Introduction and Aim: Diabetes mellitus (DM) is a global health problem with increasing prevalence linked to the alterations in the lifestyle, growing obesity rates and ageing. Women with insulin resistance (IR)/high insulin levels have worse electromyographic activity in the PFMs than women without IR/high insulin levels which prove the effect of IR/high insulin levels on PFMs. This study aimed at assessing and strengthening the pelvic floor muscles in women with diabetes and urinary incontinence.

Materials and Methods: The subjects were diabetic women of age group 45-55 with urinary incontinence assigned to one of two groups namely the group A (experimental group) and the group B (control group) which consisted of 30 patients each. The strength of the pelvic floor muscle was measured by vaginal examination prior and after the treatment and a Kegels Perineometer was inserted to measure the Strength of contraction (MOS), Length of hold (s), Repetitions (n) and Fast contractions (n) for both the groups. Experimental group was advised to do pelvic floor strengthening exercises in various positions with differing durations and increasing repetitions while control group received the regular physiotherapy care.

Results: The results revealed that there was significant increase in the pelvic floor strengths in both the groups but while comparing the post test results of both the groups there was a significant higher strength of contraction, length of hold, repetitions and fast contractions scores in experimental group.

Conclusion: It is evident from the study that performing the pelvic floor strengthening exercises in various positions as in the experimental group exhibited more improved post test results which proved to show reduced symptoms of urinary incontinence and improved quality of life than that of the subjects in the control group.

Keywords: Diabetes mellitus; pelvic floor muscle; pelvic muscle strength; urinary incontinence; insulin.

INTRODUCTION

Diabetes mellitus (DM) according to WHO is a chronic metabolic disease characterized by the elevation in the blood glucose levels may lead to complications. It is a global health problem with increasing prevalence linked to the alterations in the lifestyle, growing obesity rates and ageing. The pelvic floor consists of muscles, ligaments, and fascia that act as a sling to bear the bladder, reproductive organs and rectum. The pelvic floor muscles (PFMs) that are present superficially are the bulbospongiosus, ischiocavernosus and superficial and deep transverse perineal muscles. The muscles that line the inner walls of the pelvis forming the deep pelvic floor muscles are the levator ani and coccygeus. The levator ani comprises of three muscles namely the puborectalis, pubococcygeus and iliococcygeus (1). Women with insulin resistance (IR)/high insulin levels have worse electromyographic activity in the PFMs than women without IR/high insulin levels which prove the effect of IR/high insulin levels on PFMs (2).

Pelvic floor muscles (PFM) weakness is one of the leading problems faced by older adults that may further worsen into pelvic floor dysfunction (PFD) which establishes association with lower urinary tract symptoms (LUTS) like incontinence (urinary and anal), pelvic organ prolapses, chronic pelvic pain, defecatory dysfunction and sexual dysfunction. The factors that affect the strength of the PFM are increasing age, obesity, hormonal status, menopause, mode of delivery, parity, weakness of the peripheral and core muscles, chronic obstructive diseases, and pelvic surgery (3-5). The effects of PFM weakness add hygiene issues, embarrassment, disturbances in sleep, depression, and drastic negative effect on the quality of life (4).

The most reliable and standard technique to evaluate the endurance of PFM is perineometer (6-10). Kegels exercises as described by American Gynecologist Arnold Kegel in 1948 is the most popularly used non-invasive conservative treatment method to reinforce the PFMs which is cost effective and can be performed by the patient anywhere any time after being taught and trained. There prevails a negligence in addressing the pelvic floor muscle in diabetic women unless it is worsened which directs researchers to the need for further studies to correlate the relationship between pelvic floor strength and DM and to frame the various treatment options to prevent further worsening which

is addressed in the purpose in regard to the study which was to assess and increase the strength of the PFMs on women with DM according to their differing PFMs strength (11-13).

MATERIALS AND METHODS

The subjects were diabetic women of age group 45-55 with urinary incontinence being referred for physiotherapy by the Gynecologists and Urologists who were in turn randomly allotted to one of two groups namely the experimental group (Group A) and the control group (Group B) which consisted of 30 patients each i.e., n=60. The initial study process consists of explaining the study process and obtaining the consent of the participants followed by which history taking, biochemical analysis including hormonal dosage and physical examination was done. The medical history taking mainly consists of details on menarche, categorization of the menstrual cycle (regular / irregular) followed by the obstetric history, personal history and family history on diabetes, obesity, cardiovascular disease, and dyslipidemia. The height, weight, waist and hip circumference was scaled to evaluate the BMI and waist-hip ratio (7). The WHO guidelines for BMI are as follows, Underweight (BMI<18.5kgs/m), Normal weight (18.5-24.9kgs/m), Overweight (25-29.9kgs/m) and Obese (30kgs/m) (8). Physical examination was done as part of the gynecological assessment to judge pelvic floor muscle strength, perineal tears and local inflammation. The strength of the pelvic floor muscle was measured by vaginal examination using the Modified Oxford Scale prior and after the treatment.

The physiotherapist performed the vaginal examination by following proper hand washing procedures and used latex free gloves which were well lubricated using a lubricating gel. The patient was positioned in crooked lying position on the plinth which was covered with a single use paper towel followed by which the examiner inserts the Kegel's perineometer roughly 4 cm into the vagina and the patient was instructed to contract the pelvic floor muscle as hard as possible and the maximal voluntary contraction (MVC) with very less use of the abdominal muscles was ensured by having the left hand of the physiotherapist over the patient's abdomen. Hence using this method, the strength of contraction (MOS), length of hold (s), repetitions (n) and fast contractions (n) was scored for both the groups. (9) The treatment exercise regime for pelvic floor strengthening consists of instructing the patient to do repetitive contraction or squeezing of the pelvic floor muscles inward and upwards in various positions (Table 1) for group A which is progressed with the increasing weeks of treatment in which the number of contractions and repetitions were increased (Table 1) while group B received the regular physiotherapy care.

Statistical analysis

The collected data were tabulated and analyzed using descriptive & inferential statistics. A paired t-test was used to analyze significant changes between pre-test and post-test measurements. An unpaired t-test was used to analyze significant changes between post-test measurements of both groups. P-value < 0.001 is considered as statistically significant.

Table 1: The treatment exercise regime given for group A (experimental group)

Sl No	POSITIONS	DURATION	REPETITONS
1.	LYING Supine Lying Crook Lying Prone Lying	1-4 weeks	Contractions: 8-12, 3 times per day
2.	Prone Kneeling Sitting Abducted	5-8 weeks	Contractions: 20, 4 times per day
3.	Standing, Squatting	8-12 weeks	Contractions: 200 per day

Table 2: Comparing the pre and post-test values of group A for strength of contractions, length of hold, repetitions, and fast contractions for PFM

Parameters	Pre/Post tests	Mean ± SEM*	t value	p value
Strength of contractions (MOS)	Pre-test	2.50± 0.088	-10.256	<0.001
	Post test	3.40± 0.092		
Length of hold (s)	Pre-test	4.40± 0.126	-17.954	
	Post test	6.67± 0.187		
Repetitions(n)	Pre-test	4.07± 0.119	-24.002	
	Post test	6.97± 0.190		
Fast contractions(n)	Pre-test	7.33± 0.252	-17.574	
	Post test	11.77± 0.365		

Table 3: Comparing the pre and post-test values of group B for strength of contractions, length of hold, repetitions and fast contractions for PFM

Parameters	Pre/Post tests	Mean ±SEM*	t value	p value
Strength of contractions (MOS)	Pre-test	2.47± 0.074	-10.770	<0.001
	Post test	3.27± 0.082		
Length of hold (s)	Pre-test	4.43± 0.179	-14.297	
	Post test	5.57± 0.184		
Repetitions(n)	Pre-test	4.20± 0.089	-11.547	
	Post test	5.23± 0.192		
Fast contractions(n)	Pre-test	6.67± 0.214	-9.032	
	Post test	8.60± 0.293		

*SEM = Standard Error of the Mean

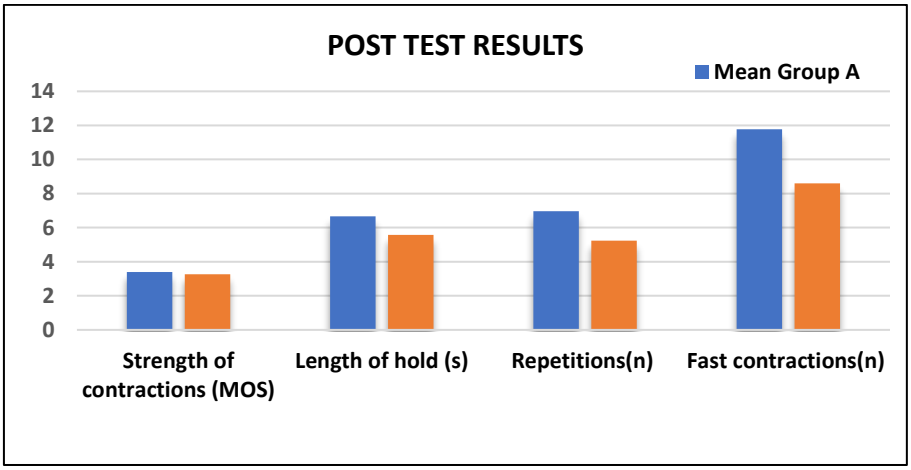

Fig. 1: The comparison of the post test results between group A and group B

RESULTS

The comparison of the post pelvic floor muscle function assessments of both the groups revealed that the subjects had considerable increase in the strength of contraction (MOS), length of hold (s), repetitions (n) and fast contractions (n) in both groups. The post-test SD of Strength of contraction (MOS), length of hold (s), repetitions (n) and fast contractions (n) in experimental group showed significant (p value < 0.001) increase than the pretest SD showing the increase of the pelvic floor muscle strength after the treatment period.

The post test SD of the pelvic floor muscle strength determining components - strength of contraction (MOS), length of hold (s), repetitions (n) and fast contractions (n) in group B (Table 3) showed significant (p value<0.001) increase than the pre-test values indicating the increase of the pelvic floor muscle strength after the treatment period.

On comparing the significance in the differences between the post-test test values of both group A and group B it was evident that there was a significant (p <0.001) increase in the post-test values of group A (Fig.1), where the subjects performed the pelvic floor muscle strengthening exercise at various positions with differing duration and increasing repetitions.

DISCUSSION

A study by Danforth *et al.*, aimed at improving the understanding of the etiological relationship between urinary incontinence (UI) and type 2 diabetes in women aged between 37-79 concluded that women with type 2 diabetes exhibited an elevation in the odds of UI compared with those women without type 2 diabetes hence suggesting that type 2 diabetes may impact the risk of urge urinary incontinence (14-17). This study shows improvement in the strength of the pelvic floor muscle after the treatment similar to the results got from the case study conducted by Sujitha *et al.*, on a 52 year's old female with a history of stress urinary incontinence which concluded stating that after 12 weeks of strengthening the pelvic floor muscles in various positions through exercise there was an increase in the pelvic floor muscles strength which in turn decreased the urine leakage (18-20).

With the improving technological developments to assist in healthcare there are multiple options among online paid and free mHealth Apps available to provide PFMT programs for women having urinary incontinence (UI) but most of them were found not

linked to either credible sources or scientific evidence hence future app developments should have their focus on enhancing the overall quality of the apps and should consider including evidence based content with features that increases the adherence to the treatment as suggested by Ho *et al*., in their study (21).

CONCLUSION

It is clear from this study results that performing pelvic floor strengthening exercises reduced the symptoms of urinary incontinence in the test and control groups by improving the strength of contraction (MOS), length of hold (s), repetitions (n) and fast contractions (n) scores. It is also noted that performing the pelvic floor strengthening exercises in various positions as in the experimental group exhibited more improved post test results which proved to show reduced symptoms of urinary incontinence and improved quality of life than that of the subjects in the control group who performed exercises in a fixed sitting and standing positions.

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CONFLICT OF INTEREST

None

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