



COMPARATIVE EFFECTS OF TRADITIONAL AND INTEGRATED PELVIC FLOOR EXERCISE IN TREATING WOMEN WITH PELVIC FLOOR DYSFUNCTION- A SINGLE BLINDED QUASI EXPERIMENTAL STUDY.

G.DEEPTHI¹, S.PRATHAP², HEPZIBAH KIRUBAIMANI³, LAVANYA PRATHAP⁴ AND P.SANKARAKUMARAN⁵

¹Lecturer, Department of Urology & Obstetrics Physiotherapy, Saveetha college of physiotherapy, Saveetha university, Chennai

²Assistant professor, College of allied health sciences, Gulf medical university, Ajman, UAE.

³Professor, Department of Obstetrics & Gynaecology, Saveetha medical college & Hospital, Chennai.

⁴Adjunct Assistant Professor, Department of bio medical sciences, Gulf medical university, Ajman, UAE.

⁵Lecturer, School of Physiotherapy, AIMST University, Malaysia.

ABSTRACT

The objective of this study is to compare the effect of traditional and integrated pelvic floor exercise regimes for treating pelvic floor dysfunction in women. Using convenient sampling method, based on inclusion and exclusion criteria 30 subjects were selected for the study and they were allocated into two groups. The researcher was blinded for subject allocation and outcome measure. The symptoms, quality of life and pelvic floor muscle strength was assessed using PFD-Q and pelvexiser. The pelvic floor exercise with different regimes had been taught for both the groups respectively. Every 30 days the patient was asked to come for treatment progression based on muscle power evaluation the treatment protocol was changed. After the period of 90 days the post-test values was measured using PFD-Q and pelvexiser. The collected data were tabulated and analyzed using descriptive and inferential statistics. This study showed statistically significant improvement in the quality of life and reduction in the pelvic floor dysfunction symptoms ($P < 0.001$) and improvement in pelvic floor muscle strength ($P < 0.001$) in group-B treated with integrated pelvic floor exercise compared to group-A treated with traditional pelvic floor exercise. From this study it is concluded that the integrated pelvic floor exercises helps in strengthening the pelvic floor and reduce the symptoms. This can be incorporated in clinical practice for better results.

KEY WORDS: Pelvic floor dysfunction, PFD-Q, kegel's exercise, integrated pelvic floor exercise, Pelvexiser.



G.DEEPTHI

Lecturer, Department of Urology & Obstetrics Physiotherapy,
Saveetha college of physiotherapy, Saveetha university, Chennai.

Received on: 21-02-2017

Revised and Accepted on : 25-04-2017

DOI: <http://dx.doi.org/10.22376/ijpbs.2017.8.2.p.432-440>

INTRODUCTION

Pelvic floor is composed of muscle fibers of levatorani (pubococcygeus, Puborectalis and iliococcygeus) and the coccyges which is attached to the minor pelvis and associated connective tissue which span the area underneath the pelvis. The pelvic muscle function is to support pelvic organs, assist in urinary and fecal continence, aid in sexual performance (orgasm), stabilize connecting joints, act as a venous and lymphatic pump for the pelvis^{1,2}. The weakness of the pelvic floor muscle lead to genital prolapse, decreased ability to support pregnant uterus, urinary incontinence, faecal incontinence and sexual dysfunction.³ Female pelvis has a wider diameter and more circular shape than that of male which predisposes to subsequent pelvic floor weakness^{4,5}. The predisposing factors for pelvic floor weakness includes age, increased number of parity, childbirth, obesity, diabetes, connective tissue disorder, neurological disease, in some genetic predisposition, other causes includes menopause, chronic cough, constipation, lifting heavy weights. Female pelvic floor dysfunction is a term applied to a wide variety of clinical conditions, including urinary incontinence, anal incontinence, pelvic organ prolapse, sensory and emptying abnormalities of the lower urinary tract, defecatory dysfunction, sexual dysfunction, and several chronic pain syndromes⁶, only the first three is encountered more. The prevalence of incontinence was 18.6%⁷. Pelvic floor dysfunction occurs commonly in pregnancy and following childbirth, with increasing parity urinary incontinence particularly stress incontinence was more common. The most common type of urinary incontinence is stress incontinence (SUI) defined as the involuntary leakage of urine on effort of exertion or on coughing or sneezing⁸. SUI is an important barrier to regular physical and fitness activities in women.⁵⁻⁷ Anal incontinence, or the leakage of gas, liquid, or solid stool, is common in women. Pelvic floor muscles are the small group of muscles which supports the pelvic organs (bladder, uterus, and rectum) and also helps in maintaining the bladder and bowel control. The pelvic floor dysfunction occurs when these muscles goes for the weakness/injuries followed by pregnancy, vaginal delivery, obesity, chronic cough and constipation. Utero vaginal prolapse is the condition of the uterus collapsing, falling down or downward displacement of the uterus with relation to the vagina. Uterine prolapsed happens in women who have had one or more vaginal births. chronic constipation and pushing associated with it can worsen uterine prolapse.^{9,10} Strengthening the pelvic floor muscle gives beneficial effects to overcome these symptoms. Kegel was the first to report training of pelvic floor muscle to be effective in management of urinary incontinence in women. Berek et al 1996 suggested that pelvic muscle training could be performed as kegel's exercise with or without aid instruments like vaginal cones^{11, 12}. The objective of the study is to evaluate the effect of traditional kegel's exercise and integrated kegel's exercise individually and to compare the effect of traditional and integrated pelvic floor exercise in improving pelvic floor muscle strength in women with pelvic floor dysfunction.

MATERIALS AND METHODS

This study was conducted between November 2014 to July 2015 after getting scientific review board and institutional Human Ethical Clearance number 019/03/2015/IEC/SU. The subjects those who were willing to participate in the study were explained briefly about the study by giving information sheet and informed consent were taken. This single blinded quasi experimental study was conducted at Physiotherapy outpatient department, Department of Urology and Obstetrics Physiotherapy, Saveetha Medical College and Hospital, Chennai. Using convenient sampling method, Thirty married females between 18 to 60yrs, those who are Positive for cough stress test, Pelvic floor muscle power >2 in modified oxford grading were included for the study. Those who are neurological (spinal cord injury) or psychiatric cases, any previous surgeries for incontinence or prolapse, pregnant women, vaginal or rectal pain, allergic to plastic/rubber, any active vaginal infection, intrauterine devices, third degree pelvic organ prolapsed, active menstrual cycle were excluded from the study. The subjects were allocated into two groups based on their entry into the research, all odd numbers were put into one group and even numbers into another group by co-investigator. The pre test and post test evaluation was done by using pelvic floor dysfunction questionnaire (PFD-Q) which assess the symptoms of pelvic floor dysfunction and quality of life. Pelvexiser was used to measure the pelvic floor muscle strength by co investigator. For Group A traditional pelvic floor exercise and for Group B integrated pelvic floor exercises was given for 90 days. The pelvic floor muscle power was checked for every 30 days using pelvexiser for exercise progression. The post test values with PFD-Q and pelvexiser was done after 90 days. The Patient was provided with self evaluation form which consists of clear explanation on treatment protocol and instruction of number of sets to be performed. The patients were in contact through telephone.

Treatment protocols

Group A (Traditional pelvic floor exercises)

Kegel's exercises¹³ was performed in sitting on a hard chair leaning forward to support forearm on knees, with thighs & feet apart. In this position the perineum was against the chair seat so that the patient had some perineal sensory stimulus feedback. In this position the patient was asked to squeeze the muscles around the anus and vagina, lifting up as if to prevent the body from breaking wind and urinating and hold as per researcher instructions.

Group B (Integrated pelvic floor exercises)

Co contraction of pelvic floor with activation of Transverse abdominis, Rectus abdominis, Gluteus maximus¹⁴ was done by performing following exercises. In unsupported sitting¹⁵, with neutral spine, contracting the pelvic floor as we do kegel's exercise was followed by tummy tuck in while expiration¹⁶. In unsupported sitting with neutral spine, contract the gluteal muscle isometrically along with kegel's exercise¹⁷. In Supine lying bend the knees and place the soles of the feet flat on the ground with hip and knee flexed 30 and 90

degree, contract the pelvic floor, take deep breath in and slowly expire, tuck in the abdomen, gaze towards the ceiling and raise the head and shoulder of the couch and hold¹⁸ In supine lying take a deep breath in and out, lift unilateral lower limb to 10 degree without flexing the knee, dorsiflex the foot , contract the pelvic floor and hold¹⁹.All the above mentioned exercises were followed by fast contractions of the pelvic floor alone. These protocols were followed along with postural correction exercises²⁰ for lumbo pelvic area such as exercise for loss of lumbar lordosis , thoracic kyphosis , anterior pelvic tilts corrections. if needed. For incontinence patients the following incontinence triggering activities was practiced Duration, sub maximal contraction, maintenance, Pre contraction before activities like getting up & coughing, timed voiding. Other than this the maximal sustained contraction during sexual intercourse, Defecation techniques was also taught. Repetitions- Hold time, Rest time, Frequency and repetition to be performed was prescribed by the researcher based on the individuals muscle strength.

Pelvic floor dysfunction questionnaire: (PFD-Q) (Appendix –A)

PFD-Q assess the severity of the Pelvic floor dysfunction and the quality of life, it consists of 20 questions. These questions were adopted from various studies based on the requirement of the current study which has been validated from experts in the same field.^[21,22]The translation of the questions to the patients was done by the investigator /trained translator.

Pelvexiser

The subjects were asked to lie down comfortably in the crook lying position with legs apart. The deflated sensor (up to the neck) covered with the male condom was inserted into the vagina using a lubricant (Metrogyl as suggested by microbiologist).Increase the pressure in the sensor by using manual pump to 100 mm/hg. The patient was asked to contract the pelvic floor muscle and the reading shown in the biofeedback display was noted.



Figure 1
Pelvexiser

RESULTS

The results of the study were analyzed after ninety days of the treatment in the terms of Quality of Life using PFD-Q questionnaire and muscle strength using pelvexiser. The collected data were tabulated and analyzed using SPSS for windows, version 16.0. The comparison was made between the groups using independent t test and within the groups using paired t test. The pretest mean value of pelvic floor dysfunction Questionnaire for Group-A & Group-B is 13.40 & 14.07 and the post test value is 13.14 & 5.07. This shows

improvement in the quality of life and reduction in the pelvic floor dysfunction symptoms in Group B. The pre test mean value of pelvexiser for Group -A and Group-B is 12.53 & 12.13 and the post test mean value is 13.16 & 17.60. This shows that there is improvement in pelvic floor muscle strength in Group B. This study shows that there is statistically significant improvement in pelvic floor muscle strength (p<0.001) and reduction in pelvic floor dysfunction symptoms (p<0.001) for Group B treated with integrated pelvic floor exercise.

Table 1
Comparison of Pre test & Post test values of PFD-Q for Group A & Group B

PFD-Q	Mean	Standard deviation	t value	p value	
Group - A	Pre test	13.40	3.94	2.1768	<0.005
	Post test	13.14	3.89		
Group – B	Pre test	14.07	4.20	13.7477	<0.001
	Post test	5.07	2.52		

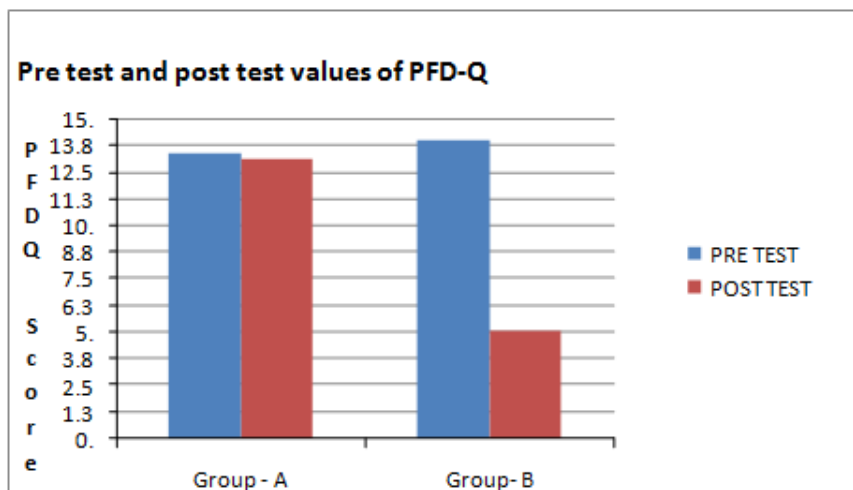


Figure 2
Comparison of Pre test & Post test values of PFD-Q for Group A & Group B

Table 2
Comparison of Post Test Values of PFD-Q between Group A & Group B

PFD-Q	MEAN	SD	t VALUE	P VALUE
Group- A	13.14	3.89	6.7451	P<0.001
Group- B	5.07	2.52		

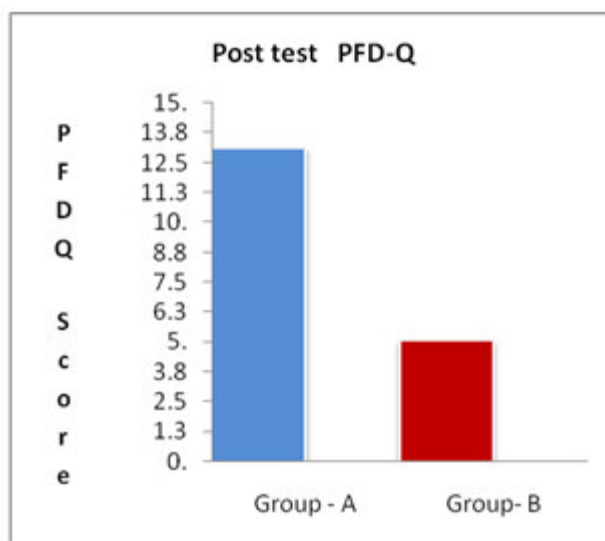


Figure 3
Comparison of Post test values of PFD-Q for Group A & Group B

Table 3
Comparison of Pre test & Post test values of Pelvexiser for Group A & Group B

Pelvexiser	Mean	Standard deviation	t value	p value
Group - A	Pre test	12.53	4.53	<0.005
	Post test	13.16		
Group - B	Pre test	12.13	21.37	<0.001
	Post test	17.60		

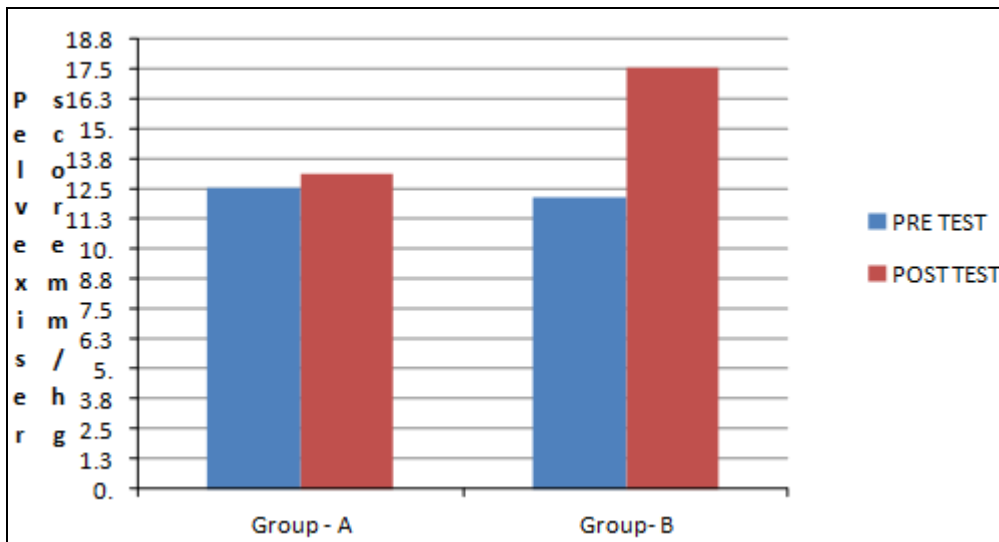


Figure 4
Comparison of Pre test & Post test values of Pelvexiser for Group A & Group B

Table 4
Comparison of Post Test Values of Pelvexiser between Group A & Group B

Pelvexiser	MEAN	SD	t VALUE	P VALUE
Group- A	13.02	3.98	2.6591	P<0.005
Group- B	17.60	4.15		

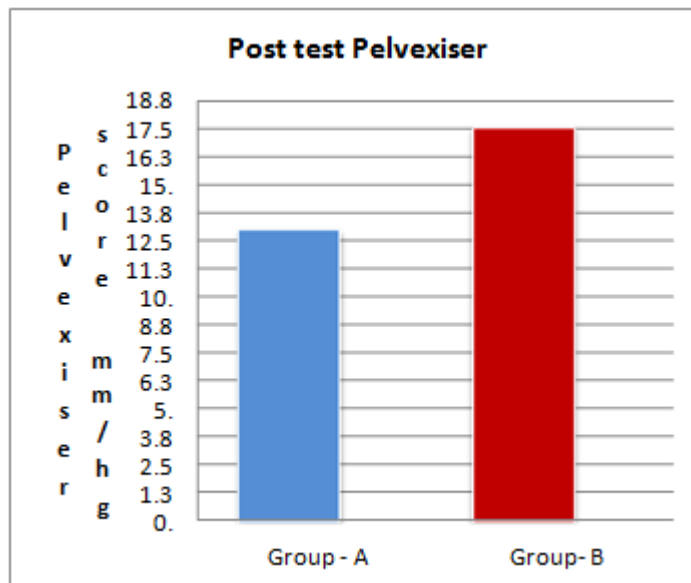


Figure 5
Comparison of Post test values of Pelvexiser for Group A & Group B

APPENDIX-A

PELVIC FLOOR DYSFUNCTION QUESTIONNAIRE (PFD-Q)

General data base:
 Name:
 Age:
 Occupation:

KINDLY TICK THE APPROPRIATE COLOUMN WHICH SUITS YOU.

1.None 2.Mild 3.moderate 4.Severe

1. Do you have to hurry to empty your bladder?

1	2	3	4
---	---	---	---

2. Have you ever been unable to postpone your urination?

1	2	3	4
---	---	---	---

3. Do you unintentionally lose your urine during coughing/sneezing?

1	2	3	4
---	---	---	---

4. Are there times when you don't make to it the bathroom and leak urine ?

1	2	3	4
---	---	---	---

5. Are you unable to stop your stream while urinating ?

1	2	3	4
---	---	---	---

6. Does your problem affect your physical activity ?

1	2	3	4
---	---	---	---

7. Do you feel that you have not completely emptied your bladder after urinating?

1	2	3	4
---	---	---	---

8. Do you dribble urine after urinating?

1	2	3	4
---	---	---	---

9. Have you ever noticed pressure / heaviness in the lower pelvic region?

1	2	3	4
---	---	---	---

10. Have you ever noticed a bulge coming from the vagina while straining?

1	2	3	4
---	---	---	---

11. Have you ever noticed something coming out from anus during /after defecation?

1	2	3	4
---	---	---	---

12. Do you get constipation often?

1	2	3	4
---	---	---	---

13. Are you ever incontinent of stool?

1	2	3	4
---	---	---	---

14. Have you ever been unable to control passing gas?

1	2	3	4
---	---	---	---

15. Have you ever used a special positions or maneuver such as giving manual pressure over perineum / vagina /rectum to complete the bowel movements?

1	2	3	4
---	---	---	---

16. Does the fear of leaking urine/stool /bulging in the vagina cause you to avoid/restrict your sexual activity?

1	2	3	4
---	---	---	---

17. Have you ever passed gas through vagina during the sexual intercourse?

1	2	3	4
---	---	---	---

18. Does your problem affect your sleep?

1	2	3	4
---	---	---	---

19. Does your problem make you feel depressed?

1	2	3	4
---	---	---	---

20. Does your problem affect your job or your normal daily activities?

1	2	3	4
---	---	---	---

DISCUSSION

Pelvic floor dysfunction is common health issues worldwide for women of all age groups and have a great impact on quality of life. It presents with wide spectrum of symptoms due to weak pelvic floor muscles leads to genital prolapse, urinary incontinence, fecal incontinence, sexual dysfunction⁶. It is not majorly addressed due to lack of awareness and hesitation due to cultural background in India. The major predisposing causes for pelvic floor weakness includes age, obesity, diabetes, connective tissue disorder, neurological disease in some women genetic predisposition²⁶⁻³⁵. Other cause includes menopause, chronic cough, constipation, lifting heavy weights, posture adapted by Indian women³⁶. John K. Nguyen²⁰ in the study stated that there exist an association between lumbar lordosis and pelvic floor weakness resulting in pelvic floor weakness resulting in pelvic floor dysfunction symptoms. It has been proposed that the forward lumbar curve of human spine and orientation of the pelvis helps in supporting the abdominal viscera and deflect or absorbs a fraction of downward intra abdominal forces before they reach the pelvic floor. Theoretically these changes may results in higher proportion of downward intra abdominal forces exerted on the pelvic floor which also predisposes women to pelvic floor muscle weakness. MRI-based investigations of Soljanik et al³⁷. Demonstrated synchronous movement of the fossa ischioanalis, levatorani, and gluteus maximus. Co activation of the pelvic floor and surrounding muscles can be associated with body and lumbopelvic posture. Based on the above evidences we have included postural evaluation and postural correction exercises of lumbo sacral spine in our study. DiNubile³⁸ in his study suggested that strengthening the pelvic floor muscle for more than twelve weeks improves muscle strength. But unfortunately few exceptional cases exist where symptoms doesn't get cured in spite of strengthening pelvic floor muscle due to faulty anatomical posture caused due to core muscle weakness. Mohseni-Bandpei et al.⁴⁰ reported that the pelvic floor muscle training should be combined with trunk stabilization exercises. Pelvic floor muscles (PFM) are active during voluntary activation of abdominal muscles, gluteal muscles and even during voluntary shoulder flexion or extension. PFM synergies are an important mechanism to promote continence by resisting increased intra-abdominal pressure generated by functional tasks like coughing and sneezing¹⁴. Skulpan Asavasopon et al¹⁴ done a study to find out the effect of accessory muscle activation on pelvic floor muscle and he concluded that during repeated activation of the pelvic floor muscle, gluteus maximus remained inactive. However, when the participant repeatedly activated the gluteus maximus, pelvic floor muscle gets activated in a synchronous fashion. This study concluded that the pelvic floor muscle was activated during voluntary activation of the pelvic floor muscle and voluntary activation of the gluteus maximus muscle. The study done by Halim jung et al showed that when participants were instructed to perform the abdominal drawing-in maneuver and maximal contraction of the pelvic floor muscle, the lower bladder

was elevated due to the contraction of the pelvic floor muscle. The pelvic floor muscle is relaxed and falls during inspiration and contracts and elevates during expiration in association with breathing⁴¹. This method of tummy tuck in during inspiration was incorporated in our study to enhance the co activation of transverse abdominis and pelvic floor muscle. In this present study we have compared traditional pelvic floor exercise to Group A and integrated pelvic floor exercise to Group B. As the participants were benefited there was no withdrawal of participants from the study. Both the treatment were effective but the participants in Group B stated the reduction of symptoms earlier (14.07- 5.07) and statistically significant improvement was see when compared to Group A (13.40-13.14) There was significant improvement in the muscle power also seen in Group B (12.13-17.60) compared to Group A (12.53-13.16).. So the participants were able to sustain the contraction for a longer period of time when compared to the initial state. The outcome measure was done with PFD-Q and pelvexiser which has both validity and reliability. Future study can be done with larger sample size with detailed postural assessment and incorporate the integrated pelvic floor exercise in women with various age group also.

CONCLUSION

Pelvic floor exercise is considered as a first line conservative management for treating pelvic floor dysfunction which commonly occurs in women during and after pregnancy and also in postpartum women. It is cost effective and does not need any resources except the physical therapist guidance and everyone can afford and have enhanced quality of life. Studies have proved that minimum of three to six months of pelvic floor training is needed in treating pelvic floor dysfunction. Isolation and recruitment of the pelvic floor muscle fibers adequately is mandatory. Since the pelvic floor muscles are small and it could not take up much of workload at a time as it gets fatigue easily. The co contraction of pelvic floor muscles with other muscles indirectly activates the pelvic floor muscle and enhances its fiber recruitments throughout the contraction without fatigue. The integrated pelvic floor muscle is more beneficial in post menopausal women as they have collagenolysis and need more training compared to reproductive age women. This study concludes that both the pelvic floor exercises are more beneficial and no adverse effects were noted and there is a significant improvement in the post test values of both the groups but there is a statistical significant improvement in the post test value of Group B treated with integrated pelvic floor exercise when compared to Group A treated with traditional pelvic floor exercise. This study provides significant evidence that integrated pelvic floor exercise improves the quality of life, reduces the symptoms of pelvic floor dysfunction and improves the pelvic floor muscle strength in pelvic floor dysfunction patients.

CONFLICT OF INTEREST

Conflict of interest declared none.

REFERENCES

1. Soames RW. Skeletal system. In: Williams PL, Bannister LH, Berry MM, Collins P, Dyson M, Dussek JE, editors. Gray's anatomy: the anatomical basis of medicine and surgery. 38th ed. New York: Churchill Livingstone; 1995. pp. 425-736
2. Daftry, Shrish, Chakravarthi, Sudip. Anatomy of pelvic floor. In: Arthur T. Evans, Emily DeFranco, editors. Holland and Brews Manual of Obstetrics. 3rd ed. New York: Elsevier; 2011. p1-16.
3. Salmons S. Muscle. In: Williams PL, Bannister LH, Berry MM. editors. Gray's Anatomy. 38th ed. New York: Churchill Livingstone; 1995. pp. 737-900.
4. Lawson JO. Pelvic anatomy I: pelvic floor muscles. Annals of the Royal College of surgeons of England. 1974; 54: 244-252.
5. T.V Chitra, Panicker seetha .Child birth, Pregnancy and pelvic floor dysfunction. The Journal of Obstetrics and Gynecology of India .2011 August .61(6):635-637.
6. Salmons S. Reproductive system. In: Williams PL, Bannister LH, Berry MM. editors. Gray's Anatomy. 38th edition. New York: Churchill Livingstone; 1995. pp. 737-900.
7. Richard C. Bump, Peggy A. Norton Epidemiology and natural history of pelvic floor dysfunction. 1998 December: 25(4):723-746.
8. B.D. Chaurasia. Lower limb. In: P S Mittal, Mridula Chandrupatla editors. Text book of Human Anatomy. 5th ed. India: CBS Publishers; 2012. 370-424
9. Abrams P, Cardozo L, Fall M, Griffiths D, Rosier P, Ulmsten U, van Kerrebroeck P, Victor A, Wein A. The standardization of terminology of lower urinary tract function. Report from the standardization subcommittee of the international continence society. American Journal of Obstetrics and Gynecology. 2002 July; 187(1):116-26.
10. Gormley EA, Lightner DJ, Faraday M, Vasavada SP. Diagnosis and treatment of over reactive (non- neurogenic) Bladder in adults. AUA/SUFU Guideline amendment. Journal of Urology. 2015 May; 193(5):1572-80
11. Rochester et al. Epidemiology, pathophysiology and classification of fecal incontinence. American Journal of Gastroenterology. 2015 January; 110(1):127-36
12. Delancy JO, Hur WW. Size of the urogenital hiatus in the levator ani muscles in the normal women and women with pelvic organ prolapsed. Obstetrics and Gynecology 1988 March; 91(3):364-368.
13. Kegel AH. Stress incontinence and genital relaxation. Ciba Clinical Symposia. 1952 March: 4(2)35-51.
14. Skulpan Asavasopon, Manku Rana, Daniel J. Kirages, Moheb S. Yani, Beth E. Fisher, Darryl H. Hwang, Everett B. Lohman, Lee S. Berk, Jason J. Kutch. Cortical Activation Associated with Muscle Synergies of the Human Male Pelvic Floor. Journal of Neuroscience. 2014 October: 34(41): 13811-13818.
15. Sapsford RR, Hodges PW. Contraction of the pelvic floor muscles during abdominal maneuvers. Archives of Physical Medicine and Rehabilitation. 2001 August; 82 (8):1081-1088.
16. Halim Jung, Sangwoo Jung, Sunghee Joo, Changho Song, Comparison of changes in the mobility of the pelvic floor muscle on during the abdominal drawing-in maneuver, maximal expiration, and pelvic floor muscle maximal contraction. Journal of Physical Therapy Science. 2016 February: 28(2): 467-472.
17. Floyd WF, Walls EW. Electromyography of the sphincter ani externus in man. The Journal of Physiology. 1953 December: 122(3):599-609.
18. A. C. Capson, J. Nashed, and L. Mclean. The role of lumbopelvic posture in pelvic floor muscle activation in continent women. Journal of Electromyography and Kinesiology. 2011 February: 21(1):166-177
19. R. R. Sapsford, C. A. Richardson, and W. R. Stanton. Sitting posture affects pelvic floor muscle activity in parous women- an observational study. Australian Journal of Physiotherapy. 2006 February: 52(3):219-222.
20. John k. Nguyen, Lawrence r. Lind, Jennifer y. Choe, Francis mckindsey, robert sinow, Narender n. Bhatia. Lumbosacral spine and pelvic inlet changes associated with pelvic organ prolapsed. Obstetrics & Gynecology: 2000 February: 95(3): 332-336.
21. Shumaker SA, Wyman JF, Uebersax JS, McClish D, Fantl JA. Health-related quality of life measures for women with urinary incontinence. The Incontinence Impact Questionnaire and the Urogenital Distress Inventory. Continence Program in Women (CPW) Research Group. Quality of Life Research. 1994 October: 3 (5):291-306.
22. Baessler K, O'Neill SM, Maher CF, Battistutta D. A validated self-administered female pelvic floor questionnaire. International journal of Urogynecology. 2010 February: 21 (2):163-72.
23. TK Sundari Ravindran, Savitri R, Bhavani. A. Women's experiences of uterovaginal prolapse .A qualitative study from Tamil nadu, India. In: Marge Berer and TK Sundari Ravindran editors. Safe Motherhood initiatives. Oxford, England, Blackwell Science. 1999. P.166-72.
24. Victoria L. Handa. Female sexual function and pelvic floor disorder. Obstetrics and Gynecology. 2008 May: 111(5):1045-1052.
25. Swift SE, Woodman P, O'Boyle A, Kahn M, Valley M, Bland D. Pelvic organ support study (POSST): the distribution, clinical definition and epidemiology of pelvic organ support defects. American Journal of Obstetrics and Gynecology. 2005 March: 192: 795-806.
26. Chandra Singh. Prevalence and risk factors for female sexual dysfunction in women attending a medical clinic in south India. Journal of postgraduate medicine: 2009 June. 55(2):113-20.

27. Nygaard I, Barber J, Burgio KL. Prevalence of symptomatic pelvic floor disorders in US women. *The Journal of American Medical Association*. 2008 September; 300:1311-1316.
28. Progetto, Menopausa Italia study group. Risk factors for genital prolapse in non hysterectomised women around menopause results from a large cross sectional study in menopausal clinics in Italy. *European Journal of Obstetrics and Gynecology*. 2000 December; 93(2):135-140.
29. Mac Lennan AH, Taylor AW, Wilson DH, Wilson D. The prevalence of pelvic floor disorders and their relationship to gender, age, parity and mode of delivery. *Brazilian Journal of Obstetrics and Gynaecology*. 2000 December; 107:1460-1470
30. Handa VL, Blomquist JL, Knoepp LR, Hoskey KA, MC Dermott KC, Munoz A. Pelvic floor disorders 5-10 years after vaginal or caesarean childbirth. *Obstetrics & Gynecology*. 2012 October; 24(5): 349–354.
31. Usual FE, Wingren G, Kjolhede P. Factors associated with pelvic floor dysfunction with emphasis on urinary and fecal incontinence and genital prolapse : An epidemiological study. *Acta Obstetrica et Gynecologica Scandinavica*. 2004 April; 83:383-389.
32. Clinica Suzanne Phelan, Francine Grodstein, Jeanette S. Brown. Research in Diabetes and Urinary Incontinence: What We Know and Need to Know. *Journal of Urology*. 2009 December; 182(6 Suppl): S14–S17.
33. Chen B, Yeh J. Alterations in connective tissue metabolism in stress incontinence and prolapsed. *Journal of Urology*. 2011 November; 186 (5):1768-1772.
34. Busacchi P, Perri T, Paradise R. Abnormalities of somatic peptide containing nerves supplying the pelvic floor of women with genitor urinary prolapsed and stress urinary incontinence. *Urology*. 2004 March; 63(3):591-595.
35. Burakgazi AZ, Alsowaity B, Burakgazi ZA, Unal D, Kelly JJ. Bladder dysfunction in peripheral neuropathies. *Muscle and nerve*. 2012 January; 45 (1):2-8.
36. L.C.M. Berghmans, C.M.A. Frederiks, R.A. de Bie, E.H.J. Weil, L.W.H. Smeets, E.S.C. van Waalwijk van Doorn, and R.A. Janknegt. Strength training. Efficacy of Biofeedback, When Included With Pelvic Floor Muscle Exercise Treatment for Genuine Stress Incontinence. *Neurourology and Urodynamics*. 1995 October; 15:37-52.
37. A. C. Capson, J. Nashed, L. Mclean. The role of lumbopelvic posture in pelvic floor muscle activation in continent women. *Journal of Electromyography and Kinesiology*. 2011 September; 21 (1): 166–177.
38. Soljanik, U. Janssen, F. May. Functional interactions between the fossa ischioanalis, levator ani and gluteus maximus muscles of the female pelvic floor: a prospective study in nulliparous women. *Archives of Gynecology and Obstetrics*. 2012 October; 286(4):931-938.
39. R. R. Sapsford, C. A. Richardson, and W. R. Stanton. "Sitting posture affects pelvic floor muscle activity in parous women: an observational study. *Australian Journal of Physiotherapy*. 2006 December; 52(3) 219-222.
40. Mohseni-Bandpei MA, Rahmani N, Behtash H, et al. The effect of pelvic floor muscle exercise on women with chronic non-specific low back pain. *Journal of Body work and Movement Therapies*, 2011 January; 15: 75–81.
41. Halim Jung, Sangwoo Jung, Sunghee Joo, Changho Song, Comparison of changes in the mobility of the pelvic floor muscle on during the abdominal drawing-in maneuver, maximal expiration, and pelvic floor muscle maximal contraction. *Journal of Physical Therapy Science*. 2016 February; 28(2): 467–472.

Reviewers of this article

Mr. Pradeep Balakrishnan, MPT

Program coordinator, Master of physiotherapy, Musculoskeletal, KPJ Healthcare University College, Kota Seriemas, Negerisembilan, Malaysia



Mr. Anubrata Paul M.Sc. Biotech (Research)

Department of Biotechnology, Natural Products Research Laboratory, Centre for Drug Design Discovery & Development (C-4D), SRM University, Delhi-NCR, Sonapat.



Prof. Dr. K. Suriaprabha

Asst. Editor, International Journal of Pharma and Bio sciences.



Prof. P. Muthuprasanna

Managing Editor, International Journal of Pharma and Bio sciences.

We sincerely thank the above reviewers for peer reviewing the manuscript