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Effect of Pelvic Floor Exercises on Urinary Incontinence Related to Menstrual Cycle and Quality of Life

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ABSTRACT

Background-Urinary continence is the ability of the urinary bladder to hold the urine. In situations where this ability is lost, there can be a reflexive or involuntary loss of urine, which is termed as urinary incontinence. Incontinence is a social and hygienic problem and is demonstrable objectively. Though it is not a threat to life, it could possibly affect the person's quality of life, and may restrict social activity.
Method- 30 nulliparous females having symptoms of urinary incontinence were screened using Questionnaire for Urinary Incontinence Diagnosis and Kings Health Questionnaire. Consent was obtained from them. They were given pelvic floor exercises 3 times a week for one month period. Second screening was done after completion of one month.
Conclusion – Pelvic floor exercises have a significant effect in reducing the severity of urinary incontinence related to menstrual cycle in nulliparous females of 18-25 years. They are more effective on stress urinary incontinence component than urge. Pelvic floor exercises have also been effective in improving the quality of life of the females of 18-25 years of age.

Key words - Urinary incontinence, menstrual cycle, pelvic floor exercises, nulliparous, quality of life, type of incontinence

INTRODUCTION

Urinary continence is the ability of the urinary bladder to hold the urine. [1] In situations where this ability is lost, there can be a reflexive or involuntary loss of urine, which is termed as urinary incontinence. Incontinence is a social and hygienic problem and is demonstrable objectively. [2-7] Though it is not a threat to life, it could possibly affect the person's quality of life, and may restrict social activity. [8-15] The affected individual suffers silently and does not take any rehabilitation for their problem. [8] As compared to men, more women are affected with incontinence and tend not to bring their suffering to any ones notice. [8,16,17] Types of urinary incontinence are- [18]

Stress urinary incontinence-

It is the involuntary loss of urine which occurs due to sneezing, coughing, giggling or any other exertion. This particular incontinence occurs when there is a sudden increase in the intra-abdominal pressure and the pelvic floor muscles are unable to counteract the pressure effectively. Hence it results in trickling of urine from the bladder.

Urge urinary incontinence-

It is the involuntary loss of urine which occurs due to or is followed by urgency and exertion. Even if the bladder is incompletely filled, the affected individual

can have loss of urine volume if an urge to void is felt.

Mixed urinary incontinence-

It is the involuntary loss of urine associated with urgency along with exertion, coughing, sneezing or any other form of effort.

The rhythmic and cyclic event that takes place from the onset of puberty, during the reproductive period in a woman's life till the menopause, is termed as the menstrual cycle. A normal cycle is of 28 days. [19, 20, 21] Menstrual cycle is a series of events which takes place in a female under the influence of hormones. Many changes in mood, behavior, muscular strength, endurance, emotions are noticed in this period. [19- 22] Similarly a change in the tone of pelvic floor muscles is also noted during the menstrual cycle. Research shows that PFM performance is altered by hormonal fluctuations during menstruation. [23-25] Few studies have contradictory findings, in which the hormonal fluctuations occurring during the menstrual cycle do not affect the skeletal muscle strength, fatigability and its contractile properties. [26, 27]

Urinary incontinence is thought to have an association with hormone fluctuations. Estrogen and progesterone receptors are found in abundance in the female lower urinary tract. [3, 5, 23, 28] The squamous epithelium of proximal and distal urethra, vagina, trigone of the bladder, pubococcygeus and pelvic floor muscles except levator ani has estrogen receptors. Along with estrogen receptors, androgen and progesterone receptors are also present in the lower urinary tract. The progesterone receptors are present in the bladder, trigone and vagina. Androgen receptors are present in the bladder and urethra. Thus, the action of these respective muscles varies according to the hormonal fluctuations occurring during the menstrual cycle. [3, 4, 5, 23, 28] This alteration in muscular function can be a cause of urinary incontinence that is experienced by approximately 10-16% females. [2-16]

To hold the urine in the bladder the urethral pressure must remain higher than the intravesical pressure always. Estrogens help in increasing the sensory threshold of the bladder by increasing the urethral resistance or by increasing the α-adrenoreceptor sensitivity in the urethral smooth muscles. Intermediate and superficial cells in vagina, bladder and urethra increase in postmenopausal women under the action of exogenous estrogen. Estrogen and progesterone levels vary throughout the menstrual cycle. Raised progesterone levels in the luteal phase of the menstrual cycle causes detrusor overactivity. Estrogen has a direct effect on the detrusor function through modified muscarinic receptors. Estradiol increases the sensory threshold of the bladder in some women by reducing the spontaneous rhythmic detrusor muscle contractions. [3-5, 19-21, 23, 28]

Dr. Arnold Kegel, described a pelvic floor exercise, more commonly called a Kegel exercise, which consists of repeatedly contracting and relaxing the muscles that form part of the pelvic floor. Kegel's exercises are considered a very important component of rehabilitation of urinary incontinence. [29] Studies also show that pelvic floor muscles' training significantly improves the quality of life women, which in turn improves their physical, mental and social functioning. [10, 12, 13, 30]

Literature demonstrates that PFMT, when performed regularly, can improve pelvic floor muscle function. Due to this factor, it is believed that the improved functionality can be directly associated with a decrease in the number of urinary leakage events, and consequently improve QOL for these women. [10, 13, 16, 17, 29-34]

During menstruation, as a result of stress and hormonal fluctuations there is dribbling of urine due to reflex contraction of the urethral striated sphincter and periurethral striated musculature. Thus, with reference to the literature cited above through this study, there is a need to find out whether the PFM exercises improve the

severity urinary incontinence during menstrual cycle in nulliparous women and also the effect of PFM exercises on the quality of lives of the women.

MATERIALS AND METHODOLOGY

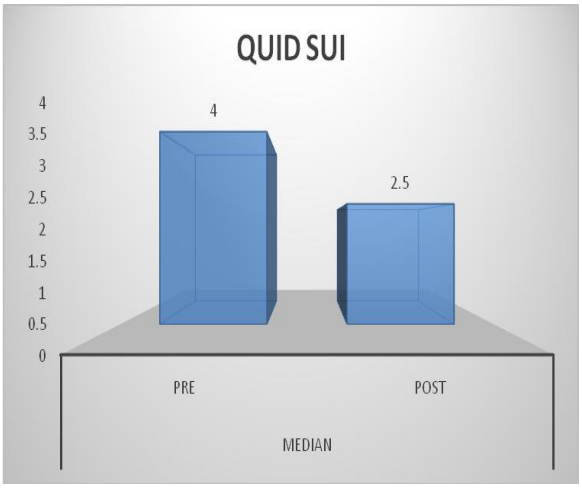
Study Design: intervention based experimental study, Study Setting: Community, colleges, Duration of Study: 12 months. Sampling method: Purposive; Inclusion Criteria- Nulliparous females, Age- 18-25 years, having a regular menstrual cycle, Able to read and write in English. Exclusion Criteria- Known case of incontinence other than during the menstrual cycle, polycystic ovarian syndrome or disease, Endometriosis, Ovarian and uterine cysts, Fibroids, Urinary tract infection, Women who are not willing to participate.

METHODOLOGY

Ethics committee approval was taken before commencing the study. After obtaining an approval a consent form was taken from the committee which was given in various colleges and permission was obtained to carry out the study. Information about the study was given to the subjects. An informed consent was obtained from the subjects. The ones fulfilling the inclusion criteria were selected for the study. 30 subjects were screened using Questionnaire for Urinary Incontinence Diagnosis (QUID; reliability 0.64-0.87) and King's Health Questionnaire (KHQ). 26 subjects fulfilling the criteria were included in the study. Pelvic floor exercises in sitting position were done 3-4 times per week for 4 weeks. A month later QUID and KHQ was collected from all the subjects participating in the study along with the consent form.

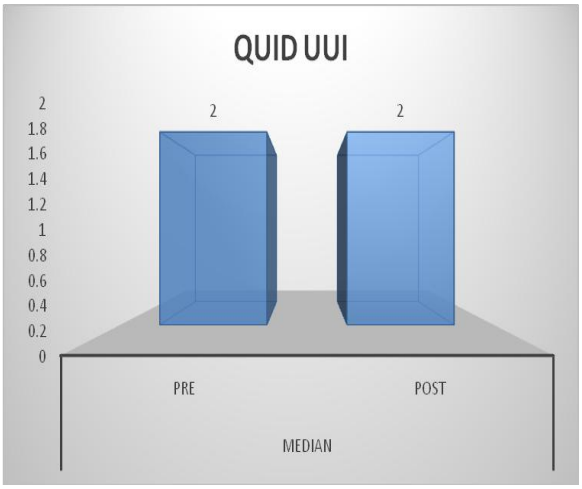
RESULTS

26 nulliparous females suffering from urinary incontinence related to menstrual cycle participated in the study. The results of which were analysed (using SPSS 17.0)



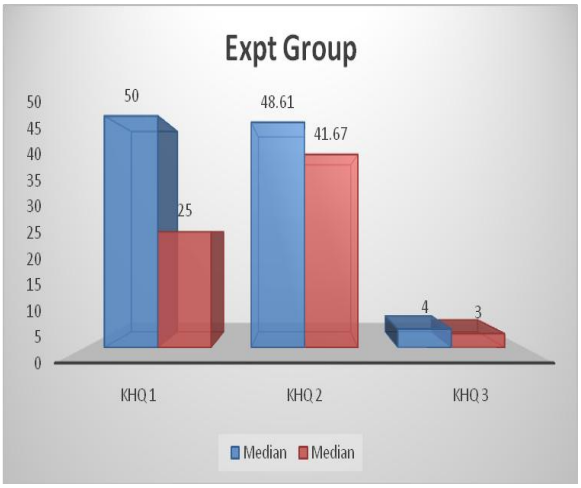
Graph 1- QUID SUI

INFERENCE- The above graph shows pre and post scores of QUID SUI. Since observations were on ordinal scale, we used Wilcoxon Signed Rank Test to test the efficacy. From above graph we can observe that P-Value is less than 0.05. Hence we conclude that effect observed is significant.



Graph 2- QUID UUI

INFERENCE- The above graph shows pre and post scores of QUID UUI. The observations were on ordinal scale, we used Wilcoxon Signed Rank Test to test the efficacy. From above graph we can observe that P-Value is greater than 0.05. Hence we conclude that effect observed is not significant.



Graph 3-

INFERENCE- The above graph shows pre and post test values of KHQ1 KHQ2 and KHQ3. Since observations were on ordinal scale, we used Wilcoxon Signed Rank Test to test the efficacy. From above table we can observe that P-Value is less than 0.05 for KHQ1. Hence we conclude that effect observed is significant for KHQ1. For other variables KHQ2 and KHQ3 it is not significant.

DISCUSSION

Urinary incontinence, an umbrella term, is the inability or reduced ability of the bladder to store urine in it, which includes dribbling of urine from the bladder due to any stressor [1]. Incontinence is a major health issue, which is not discussed openly. The female population is found to be affected more in comparison to the male population due to the anatomical differences in the pelvic organs. [19-21] The urethral outlet in women is 4 cm in length, which causes urine to dribble out easily from the bladder under minor stresses as well. [19-21] A major component of pelvic floor rehabilitation is pelvic floor exercises, also known as Kegel's exercises. [2, 6, 10, 16, 17, 29, 32-34]

In our study, two outcome measures were used; the Questionnaire for Urinary Incontinence Diagnosis (QUID) and the King's Health Questionnaire (KHQ), both targeting different aspects of urinary incontinence. The QUID has two sub-components: the Stress Urinary Incontinence and the Urge Urinary Incontinence, which can be identified based on the scores of different questions used in the QUID. The KHQ is divided in three components. [35-37] Of the two components of QUID, a significant improvement was seen in the stress urinary incontinence component. The biological rationale is three-fold. Firstly, an intentional, effective PFM contraction (lifting the PFM in a cranial and forward direction) prior to and during effort or exertion clamps the urethra and increases the urethral pressure, preventing urine leakage. [38] This is demonstrated on ultrasonography and MRI studies. [39, 40] Miller named this counter-balancing PFM contraction prior to a cough the 'knack' and assessed its effectiveness in an RCT [41]; they demonstrated that a voluntary PFM contraction before or during coughing can reduce leakage after only one week of training. Other published research, employing the term 'PFM functional training', recommends pre-contracting the PFM not only during a cough but for any daily task that results in increased intra-abdominal pressure. [42] Timing of PFM contraction is an important factor for maintenance of urinary incontinence, as is suggested by literature research. [16, 33]

Secondly, the bladder neck receives support from a strong, toned PFM (resistant to stretching), thereby limiting its downward movement during effort and exertion, preventing urine leakage. [38, 43] Bø has suggested that intensive strength training may build up the structural support of the pelvis by permanently elevating the levator plate to a higher position inside the pelvis and by enhancing the hypertrophy and stiffness of its connective tissues. [16, 33]

Thirdly, PFM may be activated with a transversus abdominus (TrA) muscle contraction; this has implications for coordination of muscle activity in and around the pelvis/abdomen during daily activities. An increasing body of evidence suggests that the active contraction of the TrA muscle is associated with co-activation of the PFM. This has been demonstrated by

US, EMG and MRI studies. Maximum PFM contraction produced a mean rise of 9 mmHg in the intra-abdominal pressure, whereas the rise in intra abdominal pressure during coughing is 46mm Hg and during forced expiration is 36 mmHG. A PFM contraction is accompanied by a transverses abdominis contraction. This TrA contraction can help in reducing the intra-abdominal pressure by providing a bracing effect to the abdominal contents. Due to this, the pressure exerted by the abdominal contents on the pelvic floor reduces. This can help by reducing stress urinary incontinence. [2, 16, 44]

The UUI component did not show any significant results. Urge urinary incontinence occurs as a result of sudden increase in intra-abdominal pressure or detrusor muscle overactivity. Pelvic floor muscles' contraction helps in narrowing the urethral opening. Though the pelvic floor muscles have an inhibitory effect on the detrusor, it requires a co-contraction of the pelvic floor muscles with the detrusor contraction for the PFM to inhibit the detrusor. This was not performed in the present study. This could be a reason for the urge component of the QUID to not show a significant change pre and post treatment. [33]

The KHQ's first component shows a significant improvement in the quality of life of the candidates. Fatima Fani Fitz et al in her study[11] had used KHQ to observe the effect of pelvic floor exercises on the quality of life on the affected population. A significant change in all the components of the KHQ scale after treatment was observed. In the present study the Part 2 and Part 3 of the scale did not show a significant improvement. The PFM has more proportion of slow twitch fibres as compared to fast twitch fibres. The duration required to improve the functioning of the slow twitch fibres could be more. In the present study the intervention was given for 1 month, whereas an intervention period of at least 3 months is required for the impact of the exercises to be significant. These could possible explain why the present study did not show any changes in the KHQ. [11]

In the present study the subjects were given treatment with Kegel's exercise for a month. After a month, the data was analysed and an improvement was found in the stress urinary incontinence component and the quality of life also improved. This is in accordance to the study conducted by Neela Soni et al, in which they screened women of 20-65 years of age having stress urinary incontinence. They treated them with pelvic floor exercises for a month and the data was collected again after one month's time. In their study, a significant improvement was found in the perineometry power as compared to the pretreatment scores. [34]

Maria Thereza Micussi et al [24] in her study found that maximum thickness of pelvic floor muscle was found in the luteal phase as compared to all the other phases of the menstrual cycle. This states that just before the beginning of the menstrual cycle the estrogen and progesterone levels reduce. The dropped levels are also found in the pelvic floor muscles due to the cyclic changes. Thus the muscles are unable to effectively contract to maintain continence. One of the probable reasons for incontinence in this period could, hence, be the hormonal action. Other probable reason could be the varying thickness of the pelvic floor muscles across all the phases of menstrual cycle. Andrew Hextall suggests that the pelvic floor muscles' thickness reduces towards menstruation, which can, hence, lead to an ineffective muscular contraction. Hormonal activity can have an effect on the contractility of the muscle, which can be another reason for the incontinence noted in the menstrual phase. [23] Sarwar et al in their study had assumed that estrogen levels increase during ovulatory period and hence the muscle strength increases. [25] To explain why strength did not increase during the luteal phase they suggested that progesterone might inhibit the proposed strength-enhancing effect of oestrogen. In contrast to

the above studies, X. A. K. Janse de Jonge, et al in their study found no significant effect of hormone fluctuations on the muscle function.[26] A unique finding of this study was that oestrogen levels were found to have a significant effect on musculo-tendinous systems (MTS) throughout the menstrual cycle. Specifically, MTS decreased significantly at the time of ovulation in contrast to the menstrual and follicular phases. A stiffer musculotendinous system is assumed to be advantageous over a less stiff or more compliant system. Increased muscle stiffness, and, therefore, enhanced joint stiffness, is believed to augment functional joint stability through an elevated potential to resist sudden joint displacement more effectively. However, Eiling's study too found that the muscle's force of contraction was not affected by fluctuating hormone levels. [45]

To achieve effective function, patients should ensure that their pelvic muscles have strength (maximal force production), endurance and coordination, the speed of contraction and metabolic efficiency of the muscle fibre influences muscular performance. In the context of PFM training, there is no real differentiation between specific protocols for improving strength or endurance. The principle of specificity requires that the muscle must be trained with physical activity that replicates as closely as possible the functional movement required, (e.g., for a marathon athlete specificity requires running), at close to the maximal force or tension generated and progressive resistance weight training. For the pelvic floor, the Kegel exercise meets the specificity requirement and is the only exercise considered to improve PFM fibre function. [46]

CONCLUSION

Kegel exercises have a significant effect in reducing the severity of urinary incontinence related to menstrual cycle in nulliparous females of 18-25 years. They are more effective on stress urinary incontinence component than urge. Kegel exercises have also been effective in improving the quality of life of the females of 18-25 years of age.

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