



Original Research Article

## Correlation of Digital Examination Vs Perineometry in Measuring the Pelvic Floor Muscles Strength of Young Continent Females

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### ABSTRACT

**Introduction:** Pelvic floor muscles in women play an important role in supporting the pelvic viscera, controlling voiding and defecation and helping in normal delivery. The pelvic floor muscles (PFM) may be exposed to alterations during different phases of a woman's life, such as pregnancy, the postpartum period, and physiological aging (menopause). Apart from incontinence, weak perineal muscles can give rise to many other pathologies including prolapse of pelvic organs. The evaluation of the PFM is important to provide prophylaxis and improve treatment of PFM dysfunctions. International Studies have supported the use of digital evaluation and pressure perineometry as simple, well-tolerated and minimally invasive methods that identify whether there is correct muscular recruitment and predicts PFM dysfunction. There is little literature available on PFM strength of females in Indian set up. This study is a genuine try to correlate digital evaluation with perineometry in measuring PFM strength in healthy young females. **Objectives:** The primary objective of the study is to correlate the per vaginal manual muscle testing (PVMMT) measured by digital examination to vaginal squeeze pressure (VSP) measured by perineometer in young continent females. The secondary objective is to see the difference in pelvic floor muscles strength between parous and nuliparous groups. **Methodology:** The females reporting to gynec OPD of V.S. General Hospital for routine checkup or for infertility were recruited. The inclusion criteria were: age range 20-40years, females without any pathology. Exclusion criteria: pregnant females, females with incontinence or other pathologies. Their pelvic floor muscles were assessed using PVMMT by digital examination and VSP by perineometer (PFX09122). The scores of PVMMT and perineometer were correlated. The difference of pelvic floor muscles strength in parous and nuliparous females was noted. **Results:** There was statistically significant strong positive correlation between PVMMT and VSP. The spearman's correlation coefficient  $r = 0.887$  and  $p < 0.0001$ . Mann whitney u test was applied to see the difference in pelvic floor muscles strength of parous and nuliparous females.  $u = 58.00$ ,  $p = 0.0367$  for VSP and  $u = 50.50$  and  $p = 0.0144$  for PVMMT. This shows that there is a significant difference in pelvic floor muscle strength of parous and nuliparous females. **Conclusion:** The PVMMT and VSP are positively correlated with each other. This adds to the reliability of PVMMT in Indian set up. The parous

women had less pelvic floor muscles strength than the nuliparous. This further supports that pregnancy affects the pelvic floor muscle strength.

**Key words:** Digital examination, Perineometer, Pelvic floor muscles.

## INTRODUCTION

Pelvic floor muscles in women play an important role in supporting the pelvic viscera, controlling voiding and defecation and helping in normal delivery. They are highly ignored muscles of human body that many females do not know how to contract them voluntarily though they are under voluntary control.

The pelvic floor muscles (PFM) may be exposed to alterations during different phases of a woman's life, such as pregnancy, the postpartum period, and physiological aging (menopause). These factors can impair the integrity of the PFM and lead to urinary incontinence (UI).<sup>[1]</sup> The prevalence of UIs ranges from 23% to 67% during gestation and 6% to 29% after delivery.<sup>[2,3]</sup> Apart from incontinence, weak perineal muscles can give rise to so many other pathologies including prolapse of pelvic organs. The evaluation of the PFM is important to provide prophylaxis and improve treatment of PFM dysfunctions.<sup>[4]</sup>

Several methods are available for PFM assessment. The non invasive methods like per vaginal manual muscle testing (PVMMT) by digital examination, perineometry and trans vaginal ultrasonography are easy and safe methods. Lenox Hoyte et al have found out that 2-dimensional magnetic resonance images and 3-dimensional models differ among asymptomatic subjects when compared with those having genuine stress incontinence and prolapse.<sup>[5]</sup> Trans perineal ultra sonography is helpful in determining the direction of perineal muscle activity. It can guide the therapist to instruct the patient to go for proper contractions of PFM. But it is expensive and not available easily at the

examination site. So perineometer and digital examination provides the easy and cost effective assessment tool for PFM.

Studies have supported the use of PVMMT and pressure perineometry as a simple, well-tolerated and minimally invasive method that identifies whether there is correct muscular recruitment and predicts PFM dysfunction.<sup>[6,7]</sup>

Evaluation with a perineometer is a reliable method to objectively assess the strength of the PFM.<sup>[8]</sup> Frawley et al<sup>[9]</sup> have found that both although manometry (perineometry) and digital muscle testing were reliable tools for measuring the maximum voluntary contraction in lying and upright positions, manometry exhibited a greater reliability.

There is little literature available on PFM strength of females in Indian set up. This study is a genuine try to see the PFM strength of young healthy females in Indian culture. The primary aim of the study is to correlate the digital examination score with perineometry score. The secondary aim is to compare the PFM strength in parous and nuliparous continent females.

The hypothesis for primary aim would be that there is a significant correlation between perineometer score and manual muscle testing and for the secondary aim is that there is statistically significant difference in PFM strength of parous and nulliparous continent females.

By proving the primary hypothesis it will be easier for the researchers to go for only manual muscle testing through digital examination in measuring strength of PFM when perineometer is not available. This may add to the reliability of manual muscle

testing in measuring perineal muscle strength.

Materials used in this study were gloves, pressure perineometer (PFX09122- pelvic floor exerciser with vaginal sensor by Laborie, Canada), condoms, plinth.

## **MATERIALS AND METHODS**

This study is a cross sectional correlation study. The women coming to gynec OPD of V.S. General Hospital for routine check-up and infertility issues were screened for not having any type of incontinence and for not having any other pathology. The routine checkup includes females without any evident pathology but having complaints regarding menstrual cycle irregularities or dysmenorrhoea. They were explained regarding the study and their informed consents were taken for per vaginal examination and also for perineometer. The inclusion criteria were age between 20-40 years and women not having any type of incontinence. Women with other pathologies like prolapsed pelvic organ, inflammatory diseases were excluded. Women who were pregnant were also excluded. The females who have signed the consent forms were asked regarding any allergy to condoms and then taken on the examination table. The gynaecologist first performed per vaginal examination to rule out other pathologies. Then she performed pelvic floor manual muscle testing by inserting a gloved index finger and asking the subject to hold it so that she can feel pressure on her finger to grade muscle power. The PFM power was graded by using Oxford method which is validated by Laylock and Jerwood. [10]

After this the pressure perineometer (PFX09122- with vaginal sensor by Laborie, Canada) was inserted with condom on its probe. For each female separate condom was used which was discarded after single use. The female was asked to relax the

muscles for easy insertion of the probe. The resting pressure was turned to zero by moving the knob. Then the female was asked to contract the muscles as if she is stopping the mid stream urine. Three trials of maximal contractions were taken, out of which the maximum reading was noted as maximal vaginal squeeze pressure. The perineometer used has 0 to 12 arbitrary scale. 0 is the lowest and 12 is the highest score.



Figure 1: Perineometer.

Total 32 females were recruited according the inclusion criteria. Out of them 3 were excluded as they had age > 40 years to avoid age related factors affecting pelvic floor muscles strength. [11] The females after signing the consent forms were made to lie in dorsal position (position used for per vaginal examination). Manual muscle testing and peineometry were performed and the readings were noted by a single examiner.

## **RESULTS**

For statistical analysis, Graph Pad Prism 5.03 version was used. The data was analysed using non-parametric tests. For correlation, Spearman's test was applied whereas to see the difference of PFM strength in parous vs nulliparous, Mann

whitney test was applied. The medians of PVMMT and VSP were also found out. Correlation analyses were done for: 1. PVMMT vs vaginal squeeze pressure, 2. Age vs PVMMT, 3. Age vs vaginal squeeze pressure, 4. No. of deliveries vs PVMMT and 5. No. of deliveries vs vaginal squeeze pressure.

Table 1: Demographic data and values of the parameters.

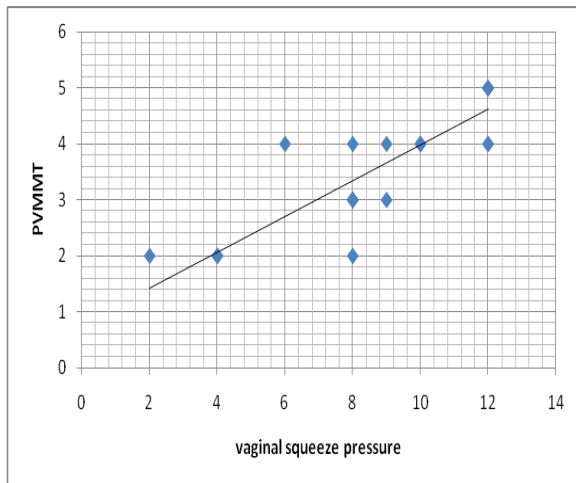
Total no. of subjects	29
Age range	19 to 39 years
Mean $\pm$ SD of age (years)	29.48 $\pm$ 5.03
PVMMT median	4
VSP median	9
Total no. of nuliparous women	14
Total no. of parous women	15
Range of no. of deliveries	0-5
Median of VSP in parous women	8
Median of VSP in nuliparous women	11
Median of PVMMT in parous	3
Median of PVMMT in nuliparous	4

Table 2: Correlation co efficient values with their significance level

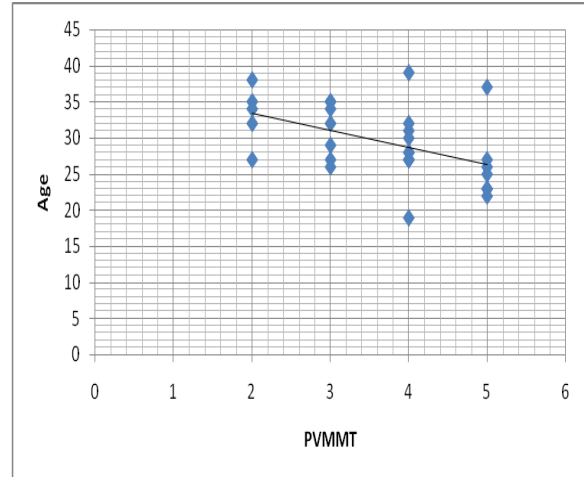
	PVMMT vs VSP	Age Vs PVMMT	Age vs VSP	No. of deliveries vs. PVMMT	No. of deliveries Vs VSP
r value	0.887	-0.527	-0.347	-0.591	-0.545
p value	<0.0001	0.003	0.06	0.0007	0.002

Table 3: Statistical values of u and p for difference in PFM strength in parous and nuliparous women using Mann whitney test.

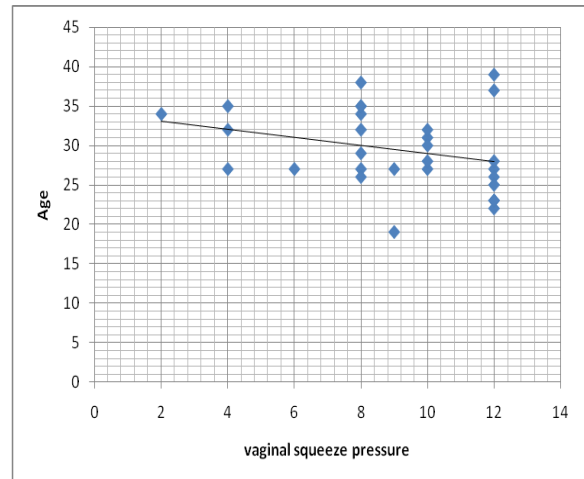
	u value	P value	Level of significance
Vaginal squeeze pressure	58.00	0.0367	Yes
PVMMT	50.50	0.0144	Yes



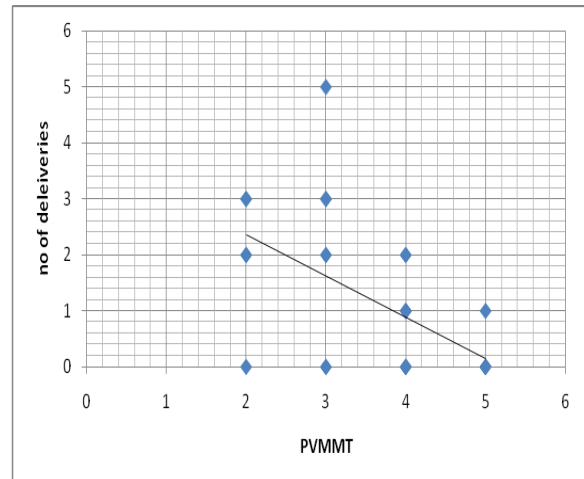
Graph 1: Positive correlation between PVMMT and vaginal squeeze pressure.



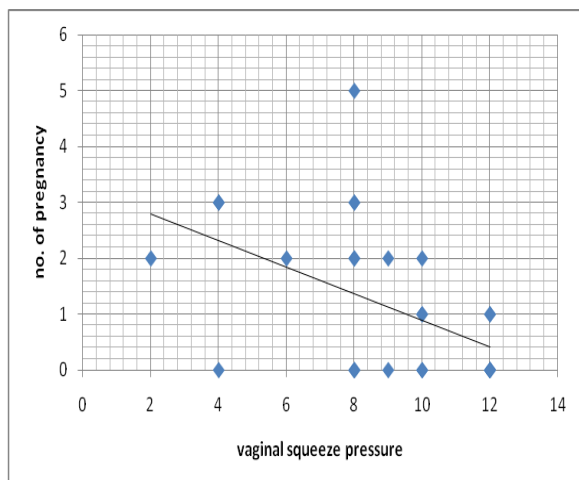
Graph 2: Negative correlation between age and PVMMT.



Graph 3: Negative correlation of age vs vaginal squeeze pressure.



Graph 4: Negative correlation between no. of deliveries and PVMMT.



Graph 5: Negative correlation of no. of deliveries vs vaginal squeeze pressure.

## DISCUSSION

This study was done to assess the PFM of young healthy females. Two methods used here were: Per Vaginal Manual Muscle Testing (PVMMT) by digital examination and Vaginal Squeeze Pressure (VSP) by perineometer. Both of them are simple, easy and non-invasive methods. Both of them are highly reliable and valid and used frequently in developed countries. In India, still the use of perineometer and PVMMT is limited due to lack of awareness and difficulty in easy availability of perineometer. VSP measurement by perineometer is costlier method than PVMMT. PVMMT is very simple and bedside clinical examination which can be performed at any time if a clinician is trained properly.

The standardisation committee of the International Continence Society has commented that there are no published data which is directly comparing the various methods of measuring pelvic floor contraction strength. [12] The strong positive correlation shown in this study ( $r = 0.887$  and  $p < 0.0001$ ) between perineometric reading of VSP and PVMMT will further support the use of PVMMT in measuring PFM strength in our cultural set up.

Isherwood and Rane [13] have found out good agreement between digital assessment of pelvic floor contraction strength and vaginal perineometry. In their study they have discussed about lack of validated method for assessing pelvic floor muscles. They have used a large sample size of 263 females. The good agreement shown in their study added validity of digital manual muscle testing in measuring pelvic floor muscle strength. This comparative study has shows that digital evaluation of pelvic floor strength compares favourably with perineometric results. Therefore clinicians can utilise this method of assessment in their everyday practice and reinforce the importance of carrying out regular pelvic floor exercises and to assess the results of this practice at a later date without the expense of purchasing specialized equipment.

The present study has shown negative correlation between the Age of females and strength of PFM. This has shown that increase in the age can decrease the strength of PFM. Gin and soo- Cheen [11] have concluded in their review article on ‘Functional and Structural Changes of the Pelvic Floor in Ageing Women’ that the ageing process play a negative role on structure and function of PFM in aged women. Ageing may add to deterioration of pre existing pelvic floor dysfunction. This study also shows that as the age increases the strength decreases. But the negative correlation is stronger between manual muscle testing and age rather between perineometry and age. Brink et al have shown that test-retest and inter-observer scores for digital assessment of pelvic floor contraction strength are reliable in women. [14] This supports our findings.

There were 14 nuliparous women and 15 parous women in this study. Out of them 11 were multipara and 4 were primipara. Thus, there were almost equal

no. of nuliparous and parous females. Results have shown negative correlation between no. of deliveries and PFM strength. As the no. of deliveries increase, the pelvic floor strength decrease. Roger and Goldberg have shown that twenty percent of primiparous women had a visible defect in the levator ani muscle, with the majority of defects seen in the pubovisceral (“Kegel”) portion of the levator ani. [15] Peschers et al. [16] evaluated levator ani function before and after childbirth, and found that muscle strength was significantly reduced three- to eight days postpartum following vaginal birth, but not after caesarean, and returned to normal values within two months for most women. Allen and Hosker [17] also demonstrated a persistent reduction in muscle contraction strength. Using MRI to compare levator ani anatomy in nulliparous women against those after their first vaginal birth, DeLancey et al [18] found no levator ani defects in the nuliparous. Thus all these studies support our finding that increase in the number of deliveries will increase the weakness of PFM. Literature also supports that the chances of pelvic floor weakness are more in vaginal deliveries than in caesarean. Pelvic nerve and muscle functions are generally protected by caesarean delivery with the timing of intervention largely determining the degree of protection. [19] Stress urinary incontinence is less common after caesarean delivery compared with vaginal birth, although it is not fully eliminated. [20,21] Here, the type of delivery is not correlated with pelvic floor muscle weakness, which can be a suggestion for future study.

Apart from correlation, we have tried to see the statistical difference of pelvic floor strength between the two groups: parous and nuliparous. There was a statistically significant difference between the two groups while measuring PVMMT and VSP. The strength measured by VSP

and PVMMT were better in nuliparous than in parous.

## CONCLUSION

Perineometer and digital assessment of pelvic floor muscles both can be used to assess the pelvic floor muscles. There is strong positive correlation between perineometric reading and digital assessment scores which adds to the reliability of digital evaluation(PVMMT) of pelvic floor muscles. Thus the unnecessary expense of costly instruments like perineometer can be avoided. PVMMT should be offered to all females visiting gynec OPD to screen them for early perineal muscle weakness and to pass on the benefits of pelvic floor muscle exercise at an early stage to prevent complications of perineal floor muscle weakness including stress urinary incontinence.

The age and no. of deliveries were negatively correlated with the strength of pelvic floor muscles. The nuliparous women have shown better pelvic floor muscles strength than parous women.

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