
**“ASSESSMENT OF PELVIC FLOOR
MUSCLE STRENGTH IN WOMEN AND
ITS ASSOCIATED FACTORS – A CROSS
SECTIONAL STUDY IN A TERTIARY
CARE CENTRE”**

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LIST OF ABBREVIATIONS USED

GLOSSARY	ABBREVIATIONS
PFMS	Pelvic Floor Muscle Strength
PFMC	Pelvic Floor Muscle Contraction
MOS	Modified Oxford Scale
MOG	Modified Oxford Grading
sEMG	Surface Electromyography
QOL	Quality Of Life
HRQOL	Health Related Quality Of Life
UI	Urinary Incontinence
SUI	Stress Urinary Incontinence
UUI	Urge Urinary Incontinence
MUI	Mixed Urinary Incontinence
KHQ	King's Health Questionnaire
LUTS	Lower Urinary Tract Symptoms
RE	Role Emotions
RP	Role Physical
SL	Social Limitations

PR	Personal Relationships
E	Emotions
S/E	Sleep/ Energy
SS	Severity Of Symptoms
ICI	International Consultation On Incontinence
ICIQ-UI SF	International Consultation On Urinary Incontinence Short Form
ASIS	Anterior superior Iliac Spine
PERFECTOR	Power Endurance Repetition Fast Elevation Co-contraction Timing Relax
PFDs	Pelvic Floor Disorders
PFDI	Pelvic Floor Distress Inventory
ES	Electrical Stimulation
TVES	Transvaginal Electrical Stimulation
MVC	Maximum Voluntary Contraction
BMI	Body Mass Index
USG	Ultrasonography
MRI	Magnetic Resonance Imaging

ABSTRACT

TITLE: ASSESSMENT OF PELVIC FLOOR MUSCLE STRENGTH IN WOMEN AND ITS ASSOCIATED FACTORS- A CROSS SECTIONAL STUDY IN A TERTIARY CARE CENTRE

Introduction & Background: Pelvic floor muscles (PFM) support pelvic organs and are influenced by factors such as age, childbirth, and menopause. Weakening of these muscles can lead to urinary incontinence and reduced quality of life. This study aimed to evaluate pelvic floor muscle strength (PFMS) and its associated factors using simple clinical tools.

Methodology: A cross-sectional study was conducted on 150 women aged above 18 years, categorized into nulliparous, perimenopausal, and postmenopausal groups. PFMS was assessed using the Modified Oxford Scale and vaginal manometry with a perineometer. Quality of life (QOL) was measured using the King's Health Questionnaire. Data were analyzed using SPSS, and $p \leq 0.05$ was considered significant.

Results: PFMS showed a significant decline with increasing age, higher BMI, greater parity, and vaginal deliveries ($p < 0.001$). Nulliparous women had the strongest PFMS. Women who practiced postnatal exercises had significantly better PFMS. Though QOL was poorer in postmenopausal women, the difference was not statistically significant.

Conclusion: Pelvic floor muscle strength progressively weakens with age and reproductive factors, especially post-menopause. Early intervention through pelvic

floor exercises and lifestyle changes is essential to preserve PFMS and improve quality of life.

Keywords: Pelvic floor muscle strength, perineometer, Modified Oxford Scale, urinary incontinence, postmenopausal women, postnatal exercises

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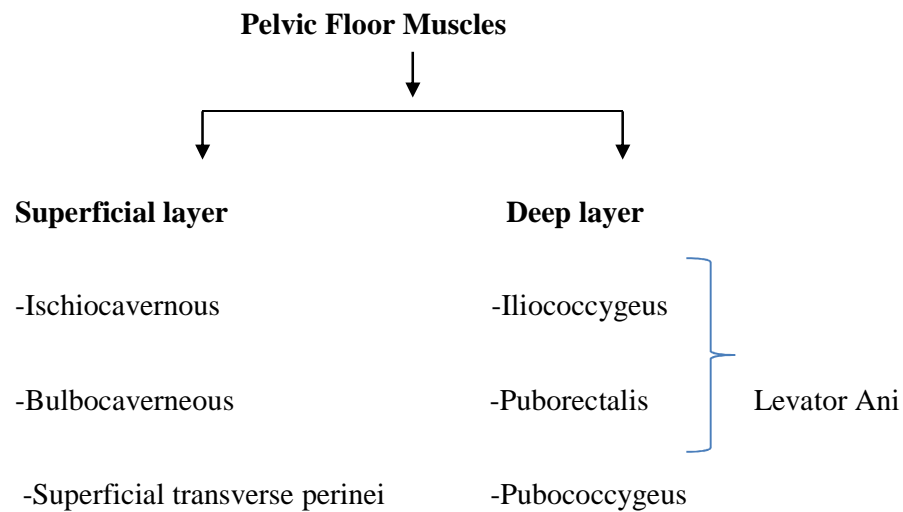
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INTRODUCTION

Pelvic floor means compound structures covering muscles layer along with bone pelvic outlet over pelvic floor, supporting pelvic organs and maintaining their function when contracted.



Functions of Pelvic Floor Muscles-

- **Organ support-** to uterus, bladder, rectum abdominal organs against gravity moreover any additional downward pressure
- **Stability-** PFM(Pelvic floor muscle) stabilizes pelvis and lower back
- **Sphincteric function-** PFMs regulate both urethral openings and rectum, hence providing urinary and fecal continence.
- **Sexual function**
- **Circulatory function-** PFMs pump blood back up towards heart.

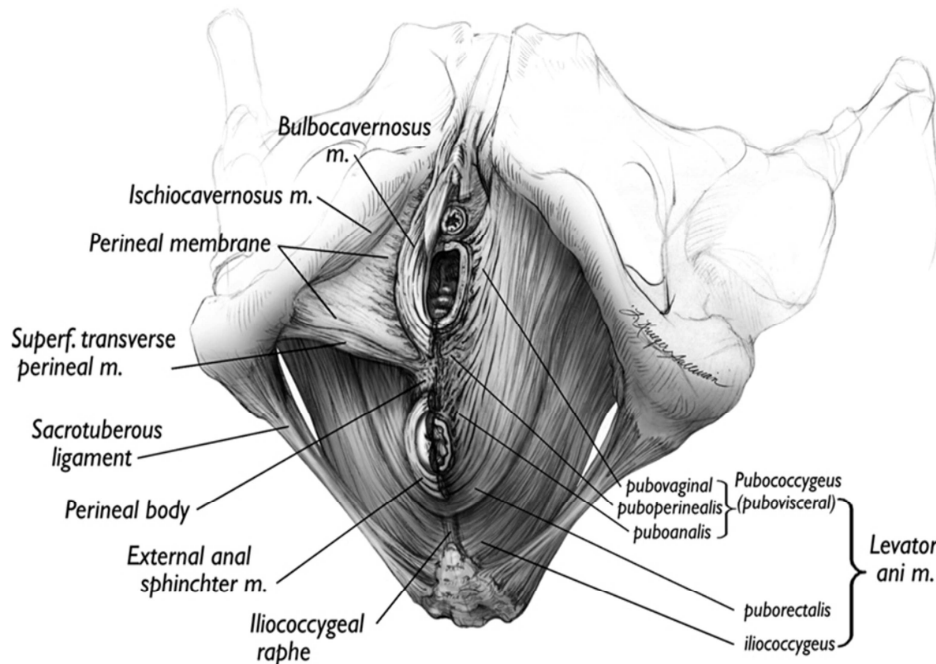


Figure 1: Pelvic floor from the inferior perspective. On the left, the superficial perineal muscles and membrane have been removed to reveal (LA) muscles' attachments to the anus, perineal body, distal vagina, and perineal membrane. Observe that LA does not directly join the urethra. (Courtesy with permission from Lianne Kruger Sullivan of Dallas, Texas.)

Pregnancy, vaginal delivery and menopause pose significant stress to PFMs leading to changes in the urinary and genital tract. Progesterone and relaxin which increases during pregnancy cause reduction in the tone of pelvic floor organs further leading to SUI (Stress urinary incontinence) ¹. These in turn affect the sexual, physical and professional activities of these women ². Estrogen has the opposite action to that of progesterone and relaxin. It increases pelvic floor strength and urethral vascularization by increasing the number and sensitivity of alpha-adrenergic receptors and decline in estrogen in menopausal state causes weakness in pelvic floor strength.³

Various methodologies used in PFM strength examination are pressure manometry, manual digital palpation, USG along with MRI. Among these manual digital palpation as well as vaginal manometry using perineometer have been simple, minimally invasive and well-received approaches.⁴

MANUAL DIGITAL PALPATION

Manual digital palpation assessment is done using Modified Oxford scale

Grading of Modified Oxford Scale

- 0 – No discernible PFM contraction
- 1 – Very weak PFM contraction
- 2 – Weak PFM contraction
- 3 – Moderate PFM contraction
- 4 – Good PFM contraction
- 5 - Strong PFM contraction

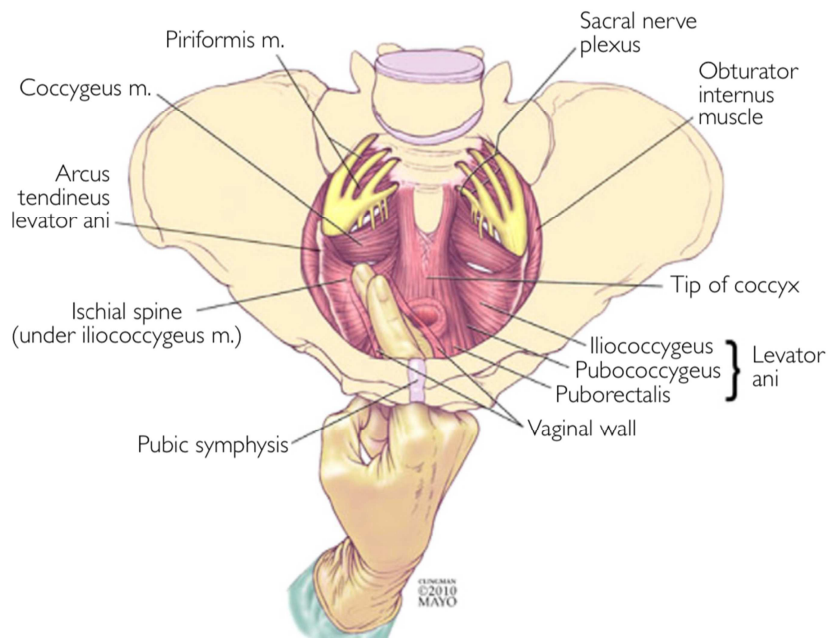


Figure 2: Deep PFMs’ manual digital palpation, Image courtesy Mayo Clinic

To measure contraction and relaxation as well as pain, the PFMs are manually digitally palpated. The transverse perineal muscles, bulbospongiosus, ischiocavernosus, and perineal muscles are all included in urogenital triangle's external palpitation. In women with dyspareunia, it is particularly crucial to assess urogenital triangle tenderness as well as muscular tension. The LA, which is made up of the puborectalis, pubococcygeus, along with iliococcygeus, is palpated when deep muscles are manually digitally palpated. Vaginal and rectal digital palpation⁹⁵ is used to evaluate for tone, tenderness, contraction, along with relaxation. Modified Oxford scale can be used to subjectively classify pelvic floor contraction strength once female has been asked to squeeze around palpating finger. Following an attempt at voluntary contraction, relaxation is measured.^{94,96} In addition to evaluating anal sphincter, rectal evaluation has been necessary to examine LA muscles, coccygeus, sacrococcygeal ligaments, as well as attachments to coccyx along with sacrum.⁹³



Figure 3. Pelvexiser Perineometer

PERINEOMETER

- Additional pelvic floor assessment is done by vaginal manometry using Perineometer. In this study, Pelvexiser perineometer is used for vaginal manometry.

A perineometer is a medical device designed to measure the strength and PFM endurance. It has been widely utilized in gynaecology, urology, as well as physiotherapy for assessing and monitoring circumstances like pelvic organ prolapse, urinary incontinence, along with postpartum muscle recovery. The device functions by detecting pressure changes within anal or vaginal canal when pelvic muscles contract. Perineometers play a vital role in pelvic floor rehabilitation by providing biofeedback, enabling patients to track their progress and improve muscle control. They are often used in conjunction with Kegel exercises and other pelvic floor therapy programs. Typically, the device consists of a vaginal or rectal sensor connected to a pressure gauge that records muscle strength during pelvic muscle contractions.⁵

PERINEOMETER TYPES -

- Air-filled perineometers use an inflatable probe connected to a pressure gauge to measure muscle contraction pressure.
- Fluid-filled or hydraulic perineometers employ a liquid-filled probe for stable readings.
- Electronic perineometers incorporate sensors and digital technology, often with options for data tracking and biofeedback training.
- Manometric perineometers work using mechanical manometers and display analogue readings.

- Electromyographic (EMG) perineometers, however, measure PFMs' electrical activity instead of pressure, primarily used for biofeedback therapy.⁵

PERINEOMETER MECHANISM

The mechanism of a perineometer involves a probe inserted into the vaginal or rectal canal. When the PFMs contract, they exert pressure on the probe, which is then transmitted to a measuring unit such as a gauge, electronic sensor, or computer. The readings are displayed in pressure units or as EMG signals, with some devices providing real-time biofeedback for guiding muscle training. These readings offer valuable insights into the strength of muscle contractions, endurance, and relaxation ability.⁵

Perineometers have numerous clinical applications. They assist in diagnosing pelvic floor dysfunction by evaluating muscle weakness or hypertonicity in conditions like pelvic organ prolapse. They are instrumental in treating urinary and faecal incontinence by guiding PFM training. Postpartum rehabilitation benefits greatly from perineometers, as they help strengthen weakened muscles after childbirth. Additionally, they aid in managing sexual dysfunction by improving muscle tone and addressing conditions like vaginismus or erectile dysfunction. In cases of pelvic pain disorders, perineometers assess muscle overactivity, while biofeedback therapy provides visual or auditory cues to enhance muscle training. They are also used for pre- as well as post-surgical evaluation of pelvic floor function.⁵

A manometric perineometer is a simple and cost-effective pressure-based device used to assess PFMS. This consists balloon-like probe filled with air or liquid, which is put into rectal/vaginal canal. When patient contracts their PFMs, pressure is transmitted to mechanical gauge, which displays the reading. Higher pressure values indicate

stronger muscles, while lower values suggest weakness. This device is advantageous for its simplicity, objective measurements, and suitability for initial assessments, though it lacks real-time biofeedback and electrical activity measurements.⁵

Clinical protocols for specific conditions often involve the use of a perineometer. For urinary incontinence, objective has been to fortify PFMs for improving bladder control. Baseline pressure is measured, and individuals undergo PFM training with fast as well as slow contractions, progressively increasing intensity over weeks. Progress is reassessed every four weeks, and additional therapies like electrical stimulation may be considered if improvement is not observed after three months. In postpartum rehabilitation, the device is used six weeks after delivery to measure baseline strength. Early-stage exercises focus on gentle contractions and relaxation, gradually transitioning to strength and endurance training over six months. Biofeedback and resistance training may be introduced for advanced progress monitoring, with long-term maintenance exercises to preserve muscle tone. Through these mechanisms and protocols, perineometers serve as invaluable tools in clinical and personal health management.⁵

Numerous questionnaires have been created and put into use during last 10years to evaluate symptoms in women with UI. Perfect questionnaire should lessen invasive as well as costly extra testing needs by aiding in the differentiation of urine incontinence types (Urgency, SUI, along with MUI). Perfect questionnaire must: 1. evaluate "Health Related Quality of Life (HRQOL)⁶ⁿ"; 2. be able to distinguish between urine incontinence causes; 3. have reliability, sufficient accuracy, as well as infallibility; 4. Have large sensitivity to detect urinary incontinence. HRQOL-based questionnaires provide comprehensive evaluation of how UI affects patients' mental health, physical activity, as well as social functioning. They have been important components of UI

patients' postoperative evaluation. These surveys could be condition-specific/general⁶. When it comes to evaluating treatment effects and changes that are clinically important, latter have better sensitivity than generic questionnaires. Amount of points obtained on questionnaire should accurately reflect severity of patient's symptoms, clinician must be certain.

Theoretical along with practical survey features which look at patients' subjective feelings have been called psychometry. Research of questionnaire validity, reliability, normalization, as well as criterion establishment for test parameters and objectivity, form psychometric approach foundation to questionnaire design⁷. KHQ(King's Health Questionnaire) had been completed by those who reported having UI symptoms (KHQ). This survey gauges how LUTS (lower urinary tract symptoms) affect individuals' life quality. There are 21 questions in KHQ questionnaire. Items are separated into 2 sections: incontinence influence along with general health. RP (Role Physical), RE (Role Emotional), SL (Social Limitations), E (Emotions), PR (Personal Relationships), S/E (Sleep/Energy), SS (Severity of Symptoms) are 7 subdomains that are addressed. Higher score on questionnaire indicates individuals' lower QoL⁸.

Need for this study arises from the fact that incidence of female PFM weakness ranges from 12% to 60%.⁴ Despite being a common issue, many women do not openly discuss their pelvic floor problems, resulting in delayed detection and treatment, which subsequently affects their physical, sexual, and professional well-being. PFMS could be impacted by various factors, including parity, age, mode of delivery, prolonged labor, and menopausal status. While some studies have explored age influence on PFMS, limited research has been conducted that aims to establish standardized reference values and examine differences in pelvic floor strength among

women. Therefore, this study intends to provide further insight into these variations, contributing valuable knowledge in this field.

PFMS standardization can be used as reference for PFMS moreover aid in forecasting sexual, fecal, as well as urine dysfunction in women.

AIMS AND OBJECTIVES

- To evaluate the pelvic floor muscle strength in a woman using vaginal digital palpation and Perineometer and its associated factors.
- To assess the Quality of life affecting a woman with pelvic floor muscle weakness.

REVIEW OF LITERATURE

PELVIC ANATOMY

All of the pelvic components are eventually anchored to rigid base provided by pelvic bones. When standing, forces are distributed to transfer forces to bones more adapted to prolonged, daily life's cumulative stress moreover to reduce pressure on musculature as well as pelvic viscera. Pubic rami have been orientated in nearly vertical plane when body is erect. These skeletal supports transfer bony support to femurs in a manner akin to bridge or archway. Pubic rami are almost horizontal where midline articulation has been there. Bony articulation provides inferior support for large weight portion of viscera in pelvis as well as abdomen. Sacrum, pubic rami, coccyx, ischium, as well as ilium are bones that make up pelvis. 5sacral vertebrae that make up sacrum have been fused together. Both laterally as well as anterior are nerve foramina locations. Sacrum's centre is covered by a dense neurovascular bed. Posterior boundary of pelvic outflow is inferiorly connected coccyx. Pelvic surgeon considers number of landmarks to be significant. Located laterally as well as anteriorly on superior ileum, ASIS(anterior superior iliac spine) is clearly recognized. Ischium as well as ilium have been fused together. Lateral margins of pelvic outflow are formed by medial ilium surface. Ischial spine has been protrusion which medially divides superior larger sciatic notch from inferior lesser sciatic notch. Broader sacrospinous ligament base originates from coccygeal segments as well as lower sacral side, whereas triangle ligament's apex has been laterally linked to ischial spine. Larger sciatic notch is changed into greater sciatic foramen by this ligament. Piriformis muscle, as well as every artery, nerve that exits pelvis for rear as well as gluteal area of thigh, pass through this foramen. Lower sciatic notch has also been transformed into lower sciatic foramen by sacrospinous ligament and dorsal

sacrospinous ligament. Internal pudendal vessels, pudendal nerve, along with tendon & nerve of internal obturator muscle all pass via this foramen. Various supporting structures join to ischial spine, which is easily palpable via rectal, or retropubic method. In variety of reconstructive procedures for pelvic organ prolapse, ischial spine serves as a marker and a fixed point for describing relative positions of other anatomical features. Located anteriorly, inferior as well as superior pubic rami articulate at pubic symphysis in midline. Iliopectineal line, also called Cooper's ligament, is ridge that runs along medial, superior surface of superior pubic rami. Pubic symphysis as well as ASIS are in same vertical plane when standing. As a result, pressure from pelvic along with intraabdominal contents has been directed toward pelvic bones rather than PFMs, endopelvic fascia attachments. Plane about 2-3cm inferior to ischial spine contains pubic symphysis posterior aspect. Hence, in standing posture, a line drawn between 2 constructions would be nearly horizontal.¹¹⁻¹⁷

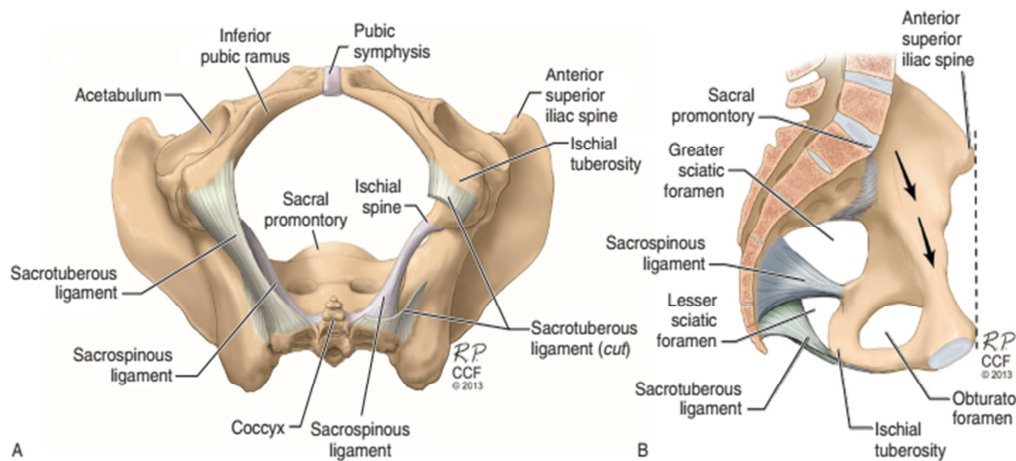


Figure 4: A, Pelvic bones and ligaments. Ligaments' connections to bony structures as well as pelvic outlets have been displayed in lithotomy image. B, Pelvic bones and ligaments. Nearly vertical weight distribution (arrows) toward pubic symphysis has been illustrated in sagittal view. Pubic symphysis has roughly been where ischial spine is located. Vertical axis of a standing lady is shown by dashed line.

PELVIC FLOOR AND SIDEWALLS

Pelvic sidewalls have been composed of piriformis as well as obturator internus. Fibrous membrane covering obturator foramen has been called obturator membrane. On intrapelvic(superior) obturator membrane side is obturator internus muscle. Inferior border of Superior pubic ramus as well as pelvic obturator membrane surface are obturator internus origins. For laterally rotating thigh, its tendon inserts onto greater femur trochanter after passing via minor sciatic foramen. Obturator nerve, running from L5 to S2, innervates obturator internus. Obturator canal is where obturator vessels as well as nerves go to reach the adductor compartment of the leg, passing through lateral as well as anterior obturator membrane borders. Lateral as well as Dorsal to coccygeus, piriformis has been component of pelvic sidewall. It extends from anterolateral sacrum, inserts onto greater trochanter, moreover passes via greater sciatic foramen. The lumbosacral plexus, especially large neurovascular plexus, lies on piriformis top. The arcus tendineus LA, the fascial covering of the obturator internus muscle, thickens linearly. From ischial spine to the posterior surface of the ipsilateral superior pubic ramus, this thicker fascia creates a distinct line. This musculofascial attachment has been where LA muscles begin.

LA muscles along with coccygeus muscles make up pelvic diaphragm. This has been connected to arcus tendineus LA via lateral pelvic walls moreover has been stretched hammock-like among coccyx behind as well as pubis front. 3LA muscle parts identified by Terminologia Anatomica are pubococcygeus, puborectalis, as well as iliococcygeus. For creating anorectal angle and support fecal continence, more medial puborectalis emerges from posterior inferior pubic rami as well as travels posteriorly, encircling rectum, vagina, as well as perineal body in sling. Though it inserts in midline onto anococcygeal raphe as well as anterolateral margins of the coccyx,

pubococcygeus shares similar origin. Pubococcygeous muscle fibers further split into perineal body (puboperineal), anal sphincter muscle (puboanalis), as well as vaginal muscularis (pubovaginalis). Although Terminologia Anatomica does not formally recognize term, it is commonly used to refer to the pubococcygeus because of its substantial attachments to the walls of the pelvic viscera. From the pubis to the ischial spine, the iliococcygeus travels via the arcus tendineus LA before inserting in midline onto anococcygeal raphe as well as coccyx.

Posterior portion of pelvic floor has been made up of coccygeus, which contributes to support even though it is not a member of the LA. It starts on sacrospinous ligament and ischial spine. It covers sacrospinous ligament moreover inserts on coccyx as well as lateral lower sacrum. As we age, muscle becomes fibrous as well as thin. Due to their similar insertion as well as origin, the coccygeus and sacrospinous ligament frequently merge together, making it challenging to tell them apart. The levator hiatus is the area between the LA musculature that vagina, urethra, and rectum travel through. The levator plate is formed by the fusion of the LA where they meet in the midline. The foundation of pelvic stability is the levator plate. Particularly in older people and those with pelvic organ prolapse, LA may be extremely thin and attenuated. Human pelvis as well as vertebral column experienced a number of evolutionary alterations as a result of the shift from plantigrade to upright posture, which helped to reestablish the equilibrium between intraabdominal pressure and visceral support. Abdominal pressure is directed forward onto the abdominal wall and the almost horizontal, flattened pubic bones by the lumbosacral curvature, a unique human feature. The altered pelvic muscles and sacrum receive downward pressure that is directed backwards, filling the pelvic cavity to form the sidewalls and pelvic floor. The abdominopelvic cavity, the external vaginal opening (for parturition as well

as intercourse), rectum as well as urthra(for excretion) are all enclosed by the muscular and fascial structures that make up the pelvic floor and sides. 2types of fascia that make up fascial components are visceral (endopelvic) and parietal. Parietal fascia, which is distinguished histologically by regular collagen patterns, covers the pelvic skeletal muscles and serves as the attachment point for muscles to the bony pelvis. Similar to the mesentery of the intestines, visceral endopelvic fascia is less distinct and is found throughout the pelvis as a meshwork of loosely distributed collagen, elastin, and adipose tissue. It is via this meshwork that blood arteries, lymphatics, and nerves pass to reach the pelvic organs. Condenses of the pelvic visceral endopelvic fascia have historically been referred to be distinct "ligaments" in surgery, such as the uterosacral or cardinal ligaments.

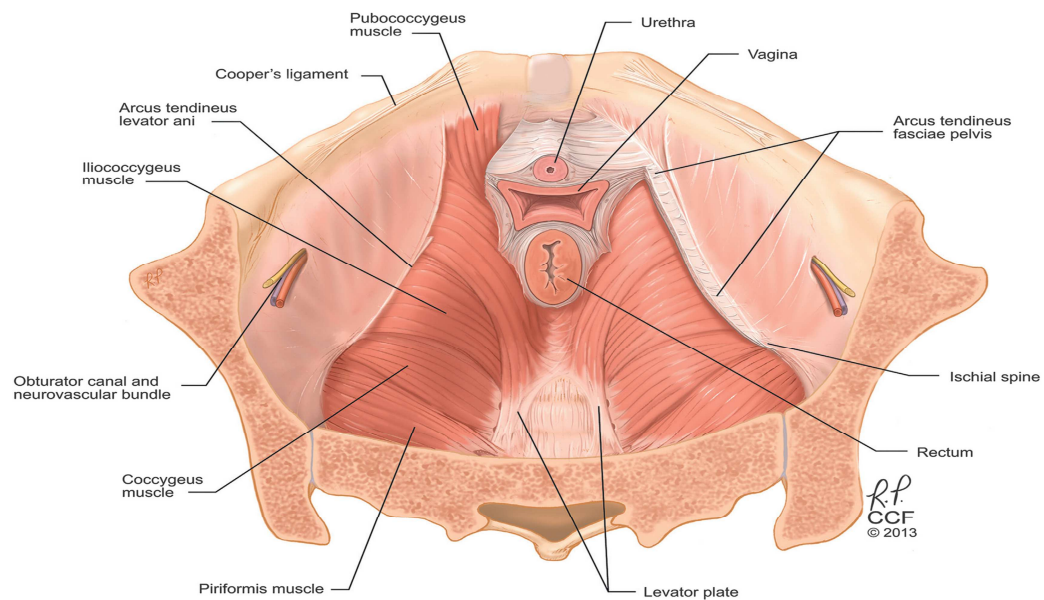


Figure 5: Relationships between sidewall as well as PFM along with attachments from an abdominal perspective. LA muscles' origins are visible on left, where arcus tendineus fasciae pelvis has been excised. Lateral vagina's attachment through endopelvic fascia (cut away) is visible on the right, where the arcus tendineus fasciae pelvis is still intact.

PFMs can be freely contracted as well as consistent tone, with exception of feces as well as voiding. Urogenital hiatus has been narrowed, anal sphincters along with urethral have been closed, as well as pelvic viscera have continuously been supported by this action. For preserving continence during acute stress, like sneezing or coughing, levator muscles along with skeletal elements of anal sphincters and urethral can all contract rapidly. TypeI (slow-twitch) fibers in the muscles supply steady tone, whereas typeII (fast-twitch) fibers allow for voluntary as well as reflex contractions. Despite that surgery as well as anatomy textbooks majorly portray LA muscles as "funnel-shaped" or as bowl, this represents the muscles' uncontracted state, as might be observed during cadaver dissection, rather than levator's typical activity. When LA muscle complex is tonically contracted in a woman with normal pelvic floor function, it has a complex 3D structure. Posterior muscle complex part, called iliococcygeus muscle, has upwardly biconvex, horizontal shape that resembles "butterfly wing," while anterior part, which consists of puborectalis along with pubococcygeus muscles, is oriented vertically as a sling around vagina, mid urethra, as well as anorectum. As a result, the horizontally oriented posterior part of the levator plate acts as a supportive diaphragm or "backstop" behind the pelvic viscera, while the anterior part of the LA complex closes the urogenital hiatus and draws the urethra, vagina, perineum, and anorectum toward the pubic bone. A more open urogenital hiatus, a loss of levator plate's horizontal position, and a more bowl-like shape are normal LA tone outcomes being lost because of direct muscle trauma or denervation. These alterations may be asymmetrical or bilateral. Compared to women with normal pelvic organ support, women with pelvic organ prolapse are more likely to exhibit such arrangements.¹⁸⁻²⁷

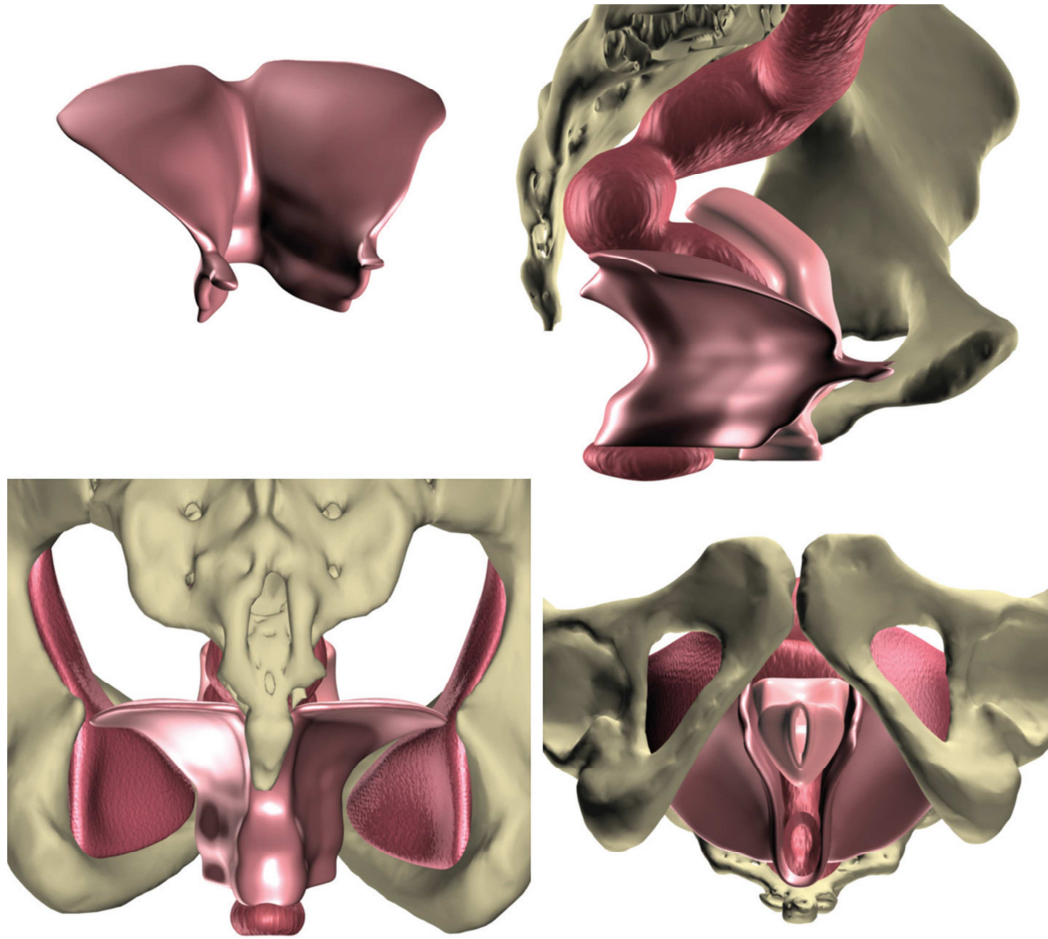


Figure 6: Digitally improved 3D reconstructions of female pelvic floor from pelvis MRI of a healthy, nulliparous 23year-old lady. Upper left: anterior image of LA muscle having appropriate resting tone. Upper right: sagittal LA muscle, vagina, bony pelvis, as well as rectum view. Lower left: posterior LA muscle, obturator internus muscles, and bony pelvis view. Lower right: lithotomy view. (From Barber MD. Contemporary views on female pelvic anatomy. Cleve Clin J Med. 2005;72:S3.)

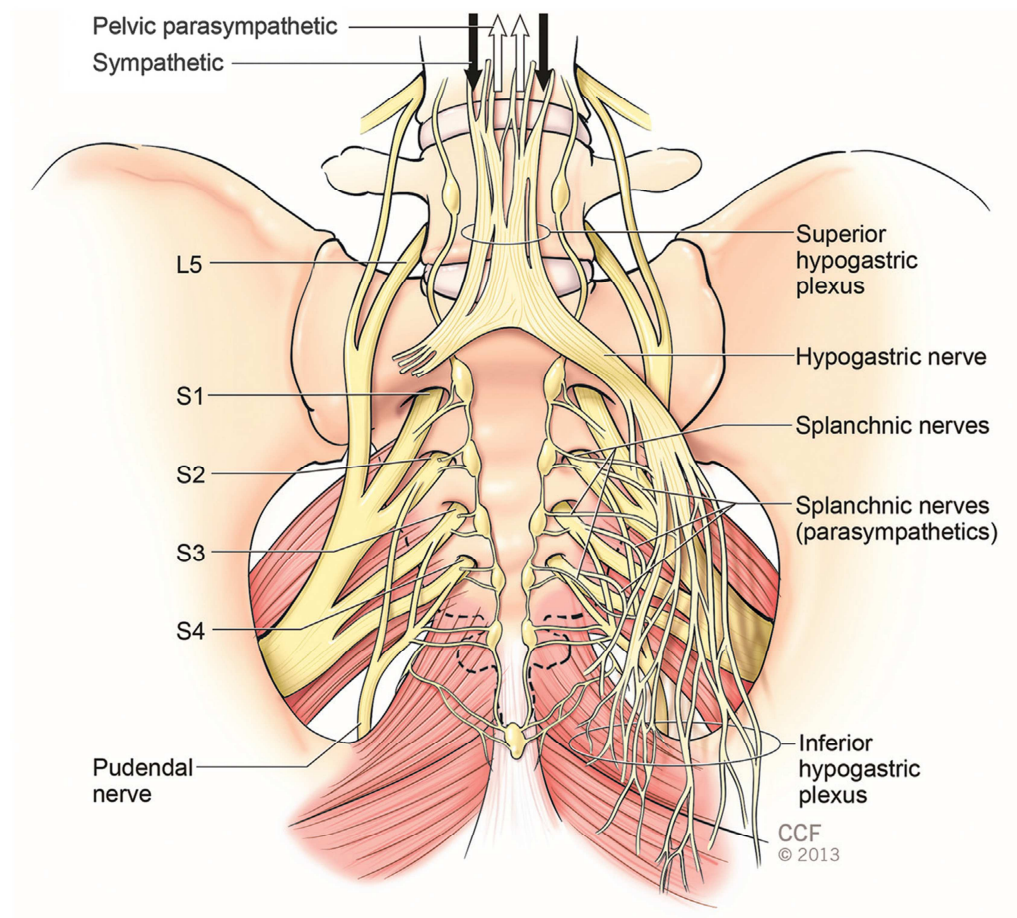
NERVES OF THE PELVIS

Figure 7: Nerves that enter pelvis have been sympathetic as well as parasympathetic. Directly above the sacral promontory until it splits to left, right sides of pelvis is the superior hypogastric plexus. Pudendal nerve leaves pelvis via larger sciatic foramen after leaving S2, S4 sacral nerve trunks moreover passing behind sacrospinous ligament at the ischial spine.

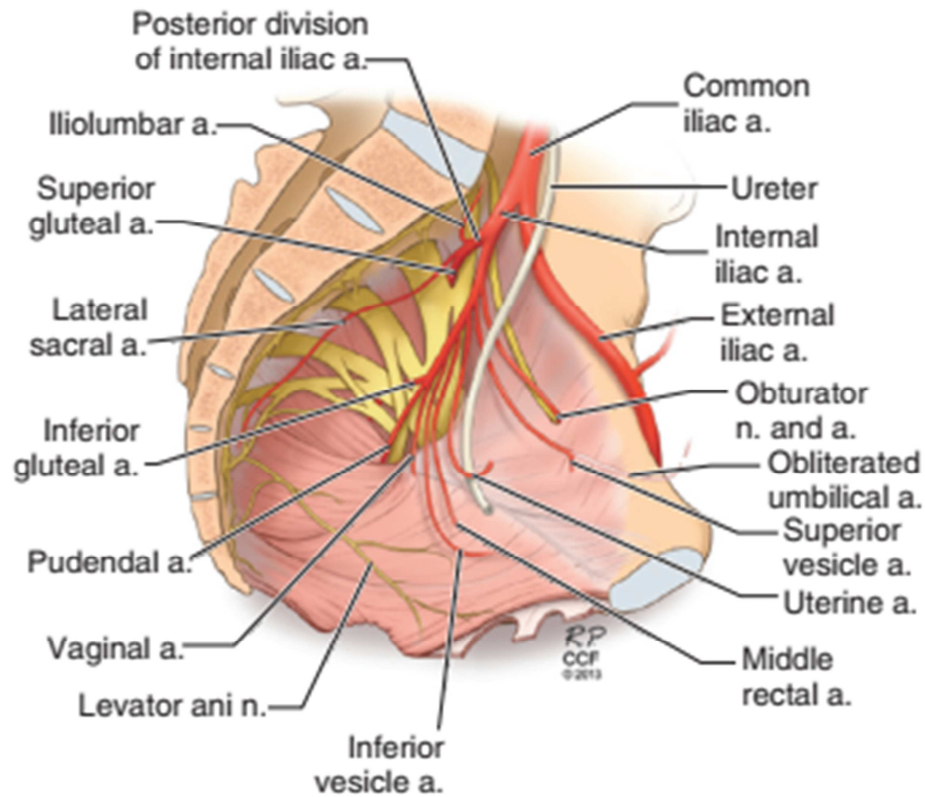


Figure 8: illustration of pelvic lateral wall's blood vessels as well as nerves. Yellow area is sacral plexus. LA muscles are supplied by the smaller branches that innervate PFMs (S3, S4). The internal iliac artery's anterior division is where the uterine artery begins. artery (a.); nerve (n.).²⁸⁻³⁰

PERINEUM

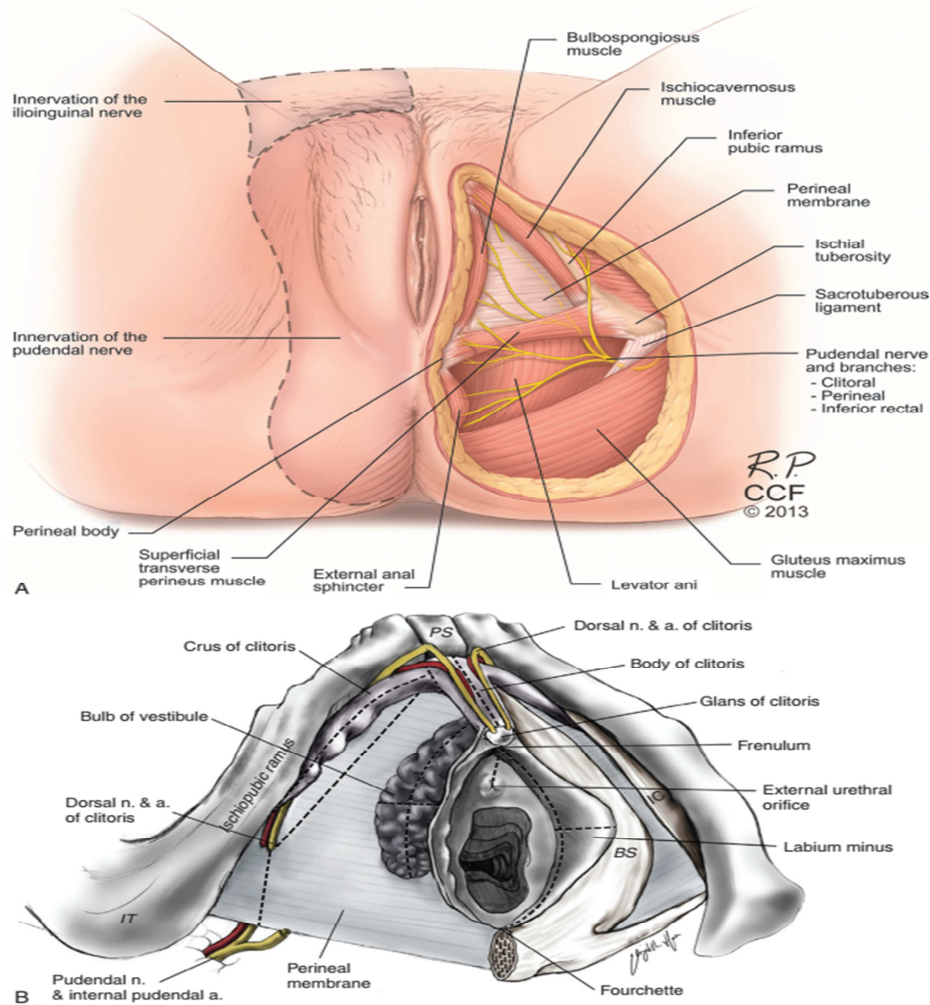


Figure 9: Perineal neurovascular anatomy, showing distribution of ilioinguinal, pudendal innervation (shaded on left) as well as muscles and nerves of the perineum. B, schematic representation of anterior perineal triangle's exposed superficial region that displays vulvar structures, including clitoris, as well as dorsal nerve and artery of clitoris. a. Artery n., nerve; PS, pubic symphysis; IC, ischiocavernosus muscle; IT, ischial tuberosity; BS, bulbospongiosus muscle.²¹

PELVIC FLOOR ASSESSMENT³¹

A thorough continence evaluation taking into account patient's weight, medication, presenting symptoms, surgical, medical, as well as obstetric history, as well as lifestyle factors, should be performed prior to evaluating pelvic floor. External visual evaluation as well as an internal evaluation have typically been included in pelvic floor assessment, nevertheless latter has not been always appropriate or advised.

PERFECTR method of pelvic floor muscle assessment

P (power) – muscular strength grade based on Modified Oxford Grading

E (endurance) – time(in sec) which allows individual to tighten their pelvic floor before muscular strength is 50% diminished (generally approx. 10sec/contraction)

R (repetition) – no. of PFMCs individuals may execute with 4second break in between each (generally approx.10)

F (fast) – amount of quick PFMCs individual can execute, using maximal force to contract along with maximal relaxation

E (elevation) – Does PFMC cause posterior vaginal wall to lift?

C (co-contraction) – During PFMC, do ancillary/abdominal muscles in lower abdomen contract?

T (timing) – PFMs contract involuntarily and synchronously during coughing

R (relax) – capability of relaxing among PFMC

Modified Oxford Grade scaling

Grade 0 – 0discernible contraction

Grade 1 – ‘flicker’ (very weak contraction)

Grade 2 – tension rise without squeeze or lift (weak contraction)

Grade 3 – mild contraction accompanied by a certain amount of lift as well as squeezing

Grade 4 – excellent contraction that results in some resistance along with elevation

Grade 5 – strong resistance, strong contraction

An internal examination should only be undertaken by a professional competent in pelvic floor assessment. Before conducting an internal examination, nurses need to check for:

- Infection, infestation or foreign body;
- Fragile tissues, soreness, pelvic pain, tension in the pelvic floor area;
- History of sexual abuse;
- Menstruation.

Delaying examination until the issue has been fixed would be preferable if any of the aforementioned conditions apply. An internal examination should not be performed if the patient:

- Is <18 years of age (due to consent issues);
- Has given birth in the previous six weeks;
- Has had pelvic surgery in the past three months.

External examination³¹

Patient should lie supine, with feet apart, knees bent, along with pelvis exposed, but with dignity preserved, for an external examination. Employees are required to follow all infection control protocols. Nurses will inspect patient's perineal area while using non-latex gloves, non-sterile, moreover applying lubricating gel. They will look for:

- Red, excoriated skin;
- Infections, infestations, piercings;
- Skin tags;

- Abnormal lumps;
- Faecal and/or urinary leakage;
- Pelvic organ prolapse;
- Signs of atrophic vaginitis and/or lichen sclerosus;
- Alterations to genital area that may indicate female genital mutilation

Internal examination³¹

Patient should be positioned similarly for an external examination as well as an inside evaluation. Nurses will lubricate their index finger, as well as insert it into vagina while wearing non-latex gloves. They will then:

- Sweep in circular motion for assessing pain, muscle symmetry, and look for any ridges or valleys that could be signs of scars from tears and/or episiotomy;
- Ask individual to cough, then assess prolapse (posterior, anterior, or vaginal) or fecal/ urine leakage when coughing;
- Ask individual for pulling in PFMs, assess their effectiveness using PERFECTR approach, and then grade their strength utilizing MOG(Modified Oxford Grading) classification system.

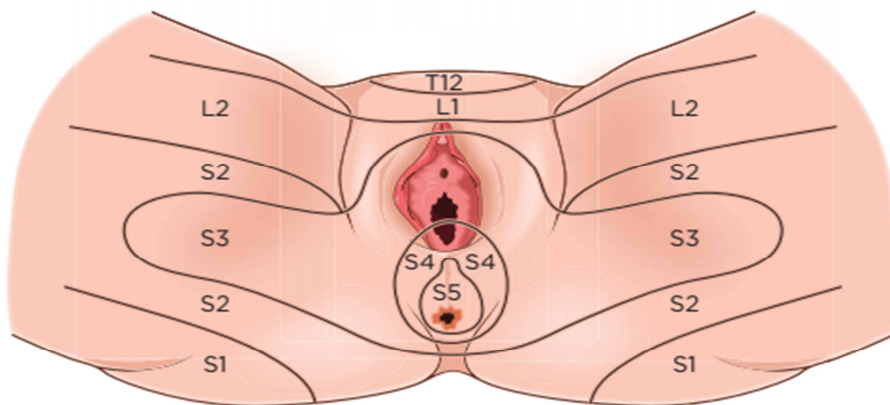


Figure 10: Female pelvic floor dermatomes

Checking for nerve damage

Nurses must assess dermatomes in pelvic area after doing a pelvic floor examination in order to detect any possible nerve injury, as this could postpone the benefits of pelvic floor rehabilitation.³¹

Assessment of the Superficial Pelvic Floor Muscles³²

The ischiocavernosus, bulbocavernosus, and superficial transverse perineal muscles are examples of superficial PFMs. Using imagined superimposed clock overlaid on vulva makes it simplest to locate these tiny muscles. 12o'clock is represented by clitoris, 3or 9by left or right ischial tuberosity, as well as 6by anus. Try palpating over labia majora at1 &2 or 10&11 o'clock to find ischiocavernosus muscle. Introitus's periphery has been palpated to locate bulbocavernosus. Beginning at 3or 9o'clock, the superficial transverse perineal muscle is palpated, and it continues to perineal body where the bilateral muscles attach.^{33,34} When palpated, muscles in this group are often tender, hyperactive, and have limited range of motion. Overactivity of ischiocavernosus muscle is indicated by pain when labia majora has gently been palpated at1 and2 or at10 and11. Superficial transverse perineal musculature may be dysfunctional if there is tenderness along 3or 9o'clock. Tenderness at vaginal opening and dyspareunia might result from bulbocavernosus being overactive. Myofascial discomfort, also known as superficial MSK dysfunction, can be detected by applying mild pressure to any of these areas. It's critical to acknowledge that pain since it influences how vigorously remainder of test is conducted.³²

Assessment of the Deep Pelvic Floor Muscles

At 5or7o'clock, evaluating finger is gently inserted 1–2knuckles (2–4cm) into vagina past the superficial muscles to palpate deep PFM layer, or LA, lateral to midline.

Rectum as well as anal sphincter are palpable at 6o'clock after entering vaginal canal (2–3finger widths). By finding coccyx behind rectum and feeling on either side, one can palpate the coccygeus and follow the muscle laterally to the ischial spine. The evaluation of the obturator internus muscle is part of the internal examination because of the interaction between the hip and pelvic floor muscles. By sliding the evaluating digit laterally within the vaginal canal to 9and 10o'clock, 1 can detect the right obturator internus. The active contraction of the obturator internus is palpated to assess its function. Put a hand on the outside of the flexed knee on the same side as the assessing digit to achieve this. With the palm on the knee, ask the patient to resist any active motion while gently pushing the knee outward (hip external rotation/abduction).³² The obturator internus will contract palpably as a result, rising gradually into the assessing finger. Similarly, the left obturator internus will be assessed by palpation at 2 and 3o'clock. Moving the palpating finger farther anterior and superior than 11or 1o'clock, midway between obturator internus and pubic symphysis, will reveal puborectalis and periurethral tissue. Flip inspecting digit over, palm up, to continue the inspection. At 12o'clock, behind the pubic symphysis, the urethra and inferior aspect of the bladder are palpated with the finger pad. Bladder, as well as urethra tissue, feel similar to the rectum when palpated, however they are narrower. Palpable pain or soreness may be a sign of trigger points or excessive muscular activation. Hyperirritable spot in skeletal muscle's taut bands is called trigger point. It's crucial to go slowly when palpating deeper muscles moreover to clarify that you will be feeling the muscles on the sides and bottom of the vaginal canal. Underactive PFMs will be less bulky, feel softer, as well as typically not unpleasant when palpated, while active trigger points throughout wide fibers of LA can cause discomfort and referred pain. When there is no pain or urgency for flatulence or feces, abnormal rectal tension is palpated as a hard roundness. However,

when there are no symptoms, this same roundness may indicate that the rectum is full of stool.³⁵ Overactive obturator internus contraction feels quite bulky and will feel thicker under the assessing digit and can cause pain. Abnormal tension in the urethra, periurethral fascia, and bladder can cause pain or urinary urgency when assessed³⁵. Palpation of overactive PFMs usually produces or intensifies pain, soreness, or discomfort moreover feels bigger and bulkier. It can also result in discomfort that is referred to other parts of the back, hips, pelvis. To support or disprove PFM and visceral involvement in the differential diagnosis, palpation evidence of pain presence or absence is adequate. It can be helpful to describe discomfort (aching, burning, tingling) for comprehending as well as expressing symptoms.¹⁸ The numeric rating scale (0–10)³⁴ is used in most studies that describe pelvic floor pain assessments; however, registering pain as "absent/pressure(0)", "mild (1–3)", "moderate(4–6)", or "strong (7–10)"^{37,38} may be adequate for both patient communication and PT referral. Patients' perceptions of their pain can be influenced by a variety of factors, including catastrophizing, pain beliefs, as well as pain interference.³⁹

Assessment of Pelvic Floor Muscle Strength and Relaxation

The International Continence Society currently advises using straightforward 4point rating system to categorize individual's capacity to contract PFMs: (1)strong, (2)normal, (3)weak, or (4)no contraction.^{40,41} Medical professionals may also observe a therapist use PERFECTR scale by Laycock and Jerwood as well as strength scale of 0to 5(Oxford scale⁴²) to grade muscle strength.⁴³ A typical contraction feels somewhat lifted and squeezed. A weak contraction just feels like a light squeeze; there is no lift. It is categorized as no contraction when there is neither lift nor squeeze. Twelve Laycock and Jerwood's "Pelvic Floor Assessment: The PERFECT Scheme" goes into great length about this.⁴³ For maximum accuracy, it is advised that the same

practitioner grade both the initial and follow-up examinations.⁴⁰ "Pull PFMs up and inward," "Squeeze like you are trying to pull fluid up through a straw into your vagina," or "Pull in like you are trying to hold back gas and pee" are some suggested cues to employ while a patient is contracting their PFM. The assessing practitioner should feel an anterior and inward lift in the PFMs with a vigorous contraction. In postpartum women, a complete lack of contraction may be sign of LA (pubovisceral muscle) tear. Like any other muscle group in the body, PFMs can contract and relax fully and actively as part of their normal function. It is best to pay attention to how long it can take the PFMs to relax after completing a contraction, especially if they are experiencing pain. Overactive PFM patients frequently exhibit delay and difficulty relaxing. A pelvic physical therapist can be informed of the main conclusions of the internal evaluation, and they will do a thorough, methodical evaluation and administer the necessary care. Other MSK components may still be present even if an internal check reveals no abnormalities. The PFD may be exacerbated by abnormalities in the MSK system that occur in the lower back, lower extremities, pelvis, or abdomen.³²

TECHNIQUES

PFMs can be evaluated using a variety of methods, such as MRI, USG, pressure manometry, and manual digital palpation. Among these, pressure manometry and manual palpation are easy, well-tolerated, and minimally intrusive techniques. Assessing pressure manometry with a perineometer is a trustworthy way to determine the PFM's strength objectively.⁴⁴

Digital palpation

Most popular method for directly measuring force is digital palpation, albeit each examiner uses a different set of grading systems to subjectively quantify it. Digital

palpation is defined as "the process of employing fingers or hands as part of evaluation, to acquire information about the tissues."⁴⁵ To do digital palpation, the subject is positioned supine, with the knees flexed and the hips abducted. In this posture, the researcher places the index finger 4–6cm away from the vaginal orifices, or in some cases, middle finger as well as index finger. The person then responds to the examiner's request to enter into a PFM.⁴⁶ 8 distinct ranking systems, including purely descriptive ones, were used for digital palpation. The remaining seven received grades ranging from 4 to 16 points. Digital palpation allows examiner to swiftly place their fingertips to assess irregularities during contraction, asymmetries, and sustained muscular force. This method is cost-effective, instructive, and adaptable.^{45,46} Additionally, the superficial and deep PFM contraction synchronization is evaluated.⁴⁶ However, only the physical strength and coordination exams receive numerical results; other assessments receive descriptions.

Dynamometry

Vaginal dynamometry may be a useful method for the quantitative assessment of female PFM strength.^{47–49} Dumoulin invented the Montreal dynamometer in 2003, and it has been used in numerous studies to assess PFM strength in Newtons (N).⁵⁰ Saleme CS et al. developed a dynamometric speculum that can evaluate PFM strength in multiple directions based on the vaginal canal's geometry.⁵¹ Strong PFM strength measurement repeatability, test-retest reliability, and the ability to investigate additional pathophysiological traits including muscle tone, contraction speed, and endurance have all been demonstrated in studies employing vaginal dynamometers.⁵² Nevertheless, dynamometry was restricted to supine measurements and did not distinguish between left and right PFM activity.⁵³ Another disadvantage of dynamometers is that they are unavailable since they are frequently utilized

exclusively by their inventors and are not marketed commercially, which precludes the possibility of reproducible observations.⁵⁴

Vaginal cones

Vaginal cones were created by Plevnik in 1985 and are commonly sold in sets of weights with a similar size but a variable mass. One type available in North America is a set of 5 cones of similar size, weighing between 20g (No.1) & 70g (No.5). They are inserted similarly to tampons and have a nylon thread attached for removal. The cone-shaped weights are placed in the vagina above the PFM and are kept there while the person stands or does a workout.⁵⁵ Several authors have confirmed positive results of vaginal cone training. As per Oláh KS et al., 9 out of 54 stress incontinence sufferers couldn't use cones since their vaginas were either too big or too little.⁵⁶ Haken J et al. also concluded that vaginal cones were not suitable for all women after comparing them to pelvic floor exercises in research of females having stress urine incontinence.⁵⁷

Perineometry

Pressure sensors as well as balloons are used in perineometry, an indirect force measurement technique, to track variations in internal pressure. To do perineometry, the researcher inserts a Kegel-invented vaginal sensor, which is intended to track pressure variations within the vaginal canal.⁴⁵ By recording lengthy, repeating contractions that reflect the entire muscle's ability, perineometry can be used to quantify MVC (maximum voluntary contractions) endurance. This includes both slow and rapid fibers.⁵⁸ Only while doing static isometric contractions are these measures possible. Consequently, the PFM's kinetic and physiological mobility forces cannot be measured. The medical advantages of active PFM monitoring in various situations were emphasized by the sole study that used a perineometer in both an upright and

supine position. Additional limitations include the effect of intra-abdominal pressure and the use of auxiliary muscles on pressure change.⁵⁴ The pressure caused by voluntary PFM contractions can be accurately measured using perineometry, however, readings from various devices differ, making it challenging to compare findings in a research context. Certain perineometers further compromise objectivity by converting pressure readings into arbitrarily graded or fluctuating percentages, which affects sensitivity and precision.⁵⁹

EMG

Vaginal probe as well as 2rectangular electrodes placed laterally on either side make up this apparatus. The device records the EMG activity in microvolts (mV), which are generated when a muscle contract.⁶⁰ EMG, which is a precise representation of the motor neurons' output from the ventral horn of the spinal cord to the muscles as a result of purposeful or spontaneous PFM activation, can be used to quantify the electrical impulse of skeletal muscles.⁶¹ Although increasing electrical stimulation and motor unit activation are necessary for force production, contractile force is not measured by these methods. Note that an electrical impulse does not necessarily translate into force or contraction of the muscles just because it is present.⁶¹ EMG was not used during active movements due to perineometric restrictions. With the exception of lift, vaginal palpation performed worse than surface EMG. PFM activity can be precisely measured using surface EMG. Furthermore, surface EMG should be used carefully for therapeutic purposes due to the possibility of interference from multiple other muscles and the possibility of varying electrode positions inside the vagina.⁶²

Imaging tools

More recently, MRI and real-time diagnostic ultrasound have been used to measure PFM activity during contraction.⁶³ The ultrasound (US) probe can be placed in the genital area, suprapubically, at the perineum, or in the vagina or rectum. MRI can be performed using 3D image acquisition techniques or conventional rapid image capturing techniques.⁶⁴ Kegel's evaluation of the PFM's migration following vaginal inspection in the supine position was not supported by Bø K et al.'s use of dynamic MRI.⁶⁵ This outcome is in line with findings from an earlier ultrasonography study when subjects were placed supine and an average lift of 11.2mm was seen. However, there appears to be broad consensus that both MRI and US should be regarded as exploratory imaging techniques when assessing pelvic floor issues in women. Further experiments on the sensitivity, reproducibility, and reliability of the data collected with these methods are required, particularly to understand how subject position affects the different displacement values.⁶⁶

Table 1: Comparison of different methods utilized for PFM measurement

Ref	Year of publication	Study design	Sample size	Techniques used	Outcomes
Volløyhaug I <i>et al.</i> ⁶⁷	2015	Cross-sectional	608	1- Digital palpation 2- Perineometer 3- Ultrasonography	All evaluation techniques for evaluating the constriction of the PFM showed a modest to significant connection. The ultrasound diagnostic had the highest association to the Modified Oxford scale and perineometry.
Da Roza T <i>et al.</i> ⁶⁸	2013	Cross-sectional	43	1- Digital palpation 2- Peritron manometer	There was a moderate correlation between manometer and Oxford scale.
Brink CA <i>et al.</i> ⁶⁹	1994		208	1- Digital palpation 2- EMG	A weak but significant correlation was found between digital scores and EMG
Gameiro MO <i>et al.</i> ⁷⁰	2013	Cross-sectional	50	1- Digital palpation 2- Perineometer	They observed a statistical correlation between both the methods in 76% of cases.
Frawley HC <i>et al.</i> ⁷¹	2006	Cross-sectional	20	1- Digital palpation 2- Perineometer	In some situations, both methodologies are accurate, albeit manometry has greater valid ratings.
Marques J <i>et al.</i> ⁷²	2013	Observational study	307	1- EMG 2- Digital palpation	There existed a link in between skin electromyography and digital palpation assessments of PFM excitability. In a study or clinical context, facts can be verified using either technique.
El-Haieg DO, <i>et al.</i> ⁷³	2019	Prospective comparative study	73	1- MRI 2- USG	MRI and USG had strong positive correlation with findings on palpation, these can be employed conjunction with other, impartial instruments to increase the precision of PFD assessment and effective management.
Hahn I <i>et al.</i> ⁷⁴	1996	Group comparative study	30	1- Vaginal cones 2- Digital palpation 3- Vaginal manometers	The measurement of the pelvic floor using vaginal cones and vaginal pressure as well as by vaginal cones and vaginal palpation did not correlate well.

LITERATURE FROM PREVIOUS STUDIES:

In research conducted by Duarte et al. (2024), the authors investigated the electromyographic activity of PFMs in women across various pelvic positions using an innovative vaginal educator. Cross-sectional research included 30 women who had been assessed using surface electromyography (sEMG) to measure muscle activity in anteversion, neutral and retroversion pelvic positions. Results showed that the vaginal educator increased PFM activation, particularly in the neutral position, with multiparous, sexually active, and older women demonstrating heightened muscle recruitment. The study suggests that this device may enhance biofeedback effectiveness during pelvic floor training, though further research has been needed for confirming its utility in women prone to pelvic floor dysfunction.⁷⁵

In research by Demissie et al. (2024), associated as well as prevalence elements of symptomatic PFDs (pelvic floor disorders) were examined among females in Debre Tabor Town, Northwest Amhara, Ethiopia. This community-based cross-sectional study included 402 women over the age of 15, and data were collected via face-to-face interviews using PFDI-20 (Pelvic Floor Distress Inventory). Outputs revealed 14.7% prevalence of PFDs, with urinary incontinence, pelvic organ prolapse, as well as fecal incontinence being most commonly reported symptoms. Significant risk factors identified included older age, multiparity, and early marriage. These findings emphasize the need for community awareness and preventive strategies to manage PFDs among Ethiopian women.⁷⁶

In research computed by Sun et al. (2024), PFMS and its influencing factors were assessed among women in good health at various phases of life using vaginal manometry. This multicenter cross-sectional study involved 5,040 participants divided into 3 groups: premenopausal parous, premenopausal nulliparous, as well as

postmenopausal women. Results showed that factors such as physical work, number of vaginal deliveries, diabetes, along with pelvic organ prolapse family history had been significant risk factors for low PFM strength. Protective factors included regular PFM exercises and sexual activity. Research underscores tailored interventions importance at different life stages to maintain optimal PFM function.⁷⁷

In a study conducted by Peinado-Molina et al. (2023), associated as well as prevalence PFD factors in females were examined. This observational study involved 1,446 women in Spain, who completed PFDI-20(Pelvic Floor Distress Inventory) to assess symptoms related to urinary incontinence, fecal incontinence, pelvic organ prolapse, along with pelvic pain. Findings revealed high prevalence of PFD, with urinary incontinence affecting 55.8% of participants, fecal incontinence 10.4%, prolapse 14.0%, and pelvic pain 18.7%. Factors such as age, BMI, number of vaginal births, menopausal status, instrumental births, and fetal macrosomia were significantly associated with PFD. These results underscore the importance of identifying risk factors for developing preventive strategies for PFD.⁷⁸

In a study conducted by Pandey and Batra (2022), the authors evaluated PFM strength (PFMS) in parous, nulliparous, as well as postmenopausal women and examined associated factors. The cross-sectional study, conducted at a tertiary care institute in India, involved 300 women who were assessed using vaginal digital palpation and perineometry. Results showed that nulliparous women had significantly higher PFMS compared to parous and postmenopausal women, with strength notably decreasing in the latter group due to age and years since menopause. Increased parity was found to correlate negatively with PFMS, while mode of delivery showed no significant impact. The study highlights the influence of age and menopause on pelvic floor strength, providing baseline reference values for clinical assessments.⁷⁹

In a study conducted by Fang et al. (2022), the authors examined PFM strength (PFMS) and its risk factors among South Chinese women in the early postpartum period. This retrospective study involved 21,302 women who were assessed via sEMG at Fujian Maternity and Child Health Hospital. Univariate analysis revealed that age and neonatal weight negatively influenced PFMS, while factors including BMI, parity (≤ 3), education level, as well as gestational weight gain positively impacted muscle strength. Cesarean section delivery also showed a protective effect on PFMS compared to vaginal, episiotomy, and forceps deliveries. The findings suggest that age, neonatal weight, and delivery mode significantly affect postpartum PFMS.⁸⁰

In research conducted by Kieres et al. (2021), authors evaluated KHQ as well as International Consultation on Incontinence Modular Questionnaire Short Form (ICIQ-SF)'s reliability for evaluating UI(urinary incontinence) in Polish females. The study involved 155 women aged 19-82 with various types of UI, who finished KHQ as well as ICIQ-SF. PCA as well as Cronbach's alpha had been utilized in assessing internal consistency as well as factor structure. Results demonstrated high reliability for both questionnaires, with KHQ showing Cronbach's alpha of 0.93 as well as ICIQ-SF at 0.7. These findings suggest that Polish versions of ICIQ-SF as well as KHQ are effective tools for assessing UI in clinical and research settings.⁸¹

In a study conducted by Li et al. (2020), the effects of various ES(electrical stimulation) protocols were evaluated for pelvic floor rehabilitation in postpartum females suffering from extremely weak muscle strength. This randomized controlled trial involved 67 postpartum women, who had been divided into 2 groups: 1 group received 5 sessions of TVES(transvaginal ES), while the other received 3 TVES sessions as well as 2 sessions of electromyogram (EMG)-triggered neuromuscular

stimulation. Both protocols showed improvements in pelvic muscle strength as computed by EMG as well as digital palpation. However, the study concluded that 5 sessions of TVES provided slightly greater benefits in pelvic muscle control and strength, suggesting it may be advantageous for postpartum women struggling with voluntary muscle contractions.⁸²

Sarit-apirak S et al., (2020) carried out research to look into the relationship between potential factors and PFM function and to analyze PFM function using Brink scale. Within the analysis, 579 women were included, whose mean age was 64.40 ± 10.11 years. While 55 women (9.5%) were able to contract their PFM both appropriately and strongly, 47 women (8.1%) were unable to do so at all. The average score on the Brink scale was 7.82 ± 2.56 . With mean scores of 7.56 ± 2.60 & 8.08 ± 2.50 , respectively, older women scored considerably lower than younger women. The mean scores for parous and nulliparous women were 7.76 ± 2.55 & 8.66 ± 2.63 , respectively (p-value=0.046). Higher overall scores and advanced age (correlation (r)=-0.106), advanced anterior (r=-0.095), apical compartment (r=-0.105) prolapse were found to be adversely correlated (p-value<0.05).⁸³

In a study conducted by Abe-Takahashi et al. (2020), the reliability and validity of PFM strength assessment using the MizCure perineometer were evaluated. The study involved 20 healthy women aged 20 to 45, where intra- and inter-rater reliabilities were assessed for vaginal pressure measurements taken in both supine and standing positions. Results showed that the MizCure perineometer had substantial to almost perfect intra-rater reliability and high inter-rater reliability, with significant correlations between the MizCure and Peritron perineometers, supporting the MizCure's validity as a reliable tool for measuring PFM strength. The findings

suggest that the MizCure perineometer may serve as an effective alternative in clinical settings, particularly where ease of access and use are priorities.⁸⁴

In a study conducted by Chmielewska et al. (2019), the authors compared the effects of PFM training with surface electromyographic (sEMG) biofeedback and Pilates exercises on the bioelectrical activity of PFMs in women with SUI. Over eight weeks, participants engaged in either sEMG biofeedback-assisted PFM training or Pilates exercises. The study measured changes in voiding diaries, quality of life questionnaires, and electromyographic characteristics of the PFMs at three intervals: baseline, post-treatment, and six-month follow-up. Results showed that while both interventions improved urinary incontinence symptoms, Pilates exercises had a greater positive effect on quality of life compared to sEMG biofeedback. However, no significant intergroup differences in electromyographic measurements were observed, suggesting both methods are effective for SUI management but may vary in their impact on quality of life.⁸⁵

Research carried out by Mendes et al. (2016), authors analyzed PFMS in primiparous women following cesarean as well as normal deliveries, considering sociodemographic factors, urinary incontinence, nutritional status, dyspareunia, perineal exercise during pregnancy, perineal condition, and newborn weight. Cross-sectional study, conducted 50–70 days postpartum, included 24 cesarean and 72 normal birth participants. Using the Peritron™ device for PFMS measurement, research demonstrated no significant difference in PFMS among 2 delivery groups. However, higher PFMS was observed in women with ≥ 12 years of education and those who engaged in perineal exercises during pregnancy, highlighting the potential benefits of perineal training in enhancing PFMS post-delivery.⁸⁶

Research by Sartori et al.(2015) stated, PFMS assessment reliability using transvaginal digital palpation (TDP) was evaluated in healthy, continent, multiparous women across different age groups. The study involved 150 participants, divided into four age-based groups, with TDP conducted in both anterior and posterior vaginal regions by three independent examiners. Results indicated no significant variation in PFM strength across age groups, and good intra-rater reliability was observed. However, inter-rater reliability ranged from moderate to good, highlighting the need for standardized training for accurate PFM strength assessments using TDP.⁸⁷

Research carried out by Chevalier et al. (2014), authors explored normal reference values of PFM strength in females having SUI moreover assessed relation among clinical, functional, and quality of life outcomes. This observational, analytical research included 218 women aged between 22 and 85 years. Clinical assessments included manual muscle testing and perineometry, with additional patient-reported outcomes collected via urinary incontinence and QoL questionnaires (EuroQoL-5D and SF-12). Findings indicated a significant correlation between manual muscle testing and perineometry measures of pelvic floor strength, although no significant relationship was observed between pelvic floor strength and the patients' reported quality of life.⁸⁸

In a study conducted by Halski et al. (2014), authors evaluated bioelectrical activity of PFMs and synergistic muscles in menopausal females having SUI, examining how pelvic tilt orientation affects muscle activation. This observational study included 16 menopausal and postmenopausal women who performed maximal pelvic floor contractions in both anterior and posterior pelvic tilt positions. Using sEMG, the study found no significant differences in PFM activation between the two pelvic positions, though higher activity was noted in some synergistic muscles during the posterior tilt.

These findings suggest that pelvic tilt may not influence PFM activation, though related muscles might respond differently depending on posture, underscoring the need for further research.⁸⁹

MATERIALS AND METHODS

STUDY AREA: Women were recruited from Gynecology and Urogynaecology outpatient clinics at KAHER'S KLE's Prabhakar Kore Hospital and Medical Research Centre, Belagavi.

STUDY POPULATION: Research comprised women aged 18 and over who came to gynecology outpatient section of the tertiary care facility for routine exams or other problems.

STUDY DESIGN: Cross-sectional research.

SAMPLE SIZE:

Sample size at 95 percentage confidence interval, 95% power –

$$n = \frac{\left(z_{1-\frac{\alpha}{2}} + z_{1-\beta}\right)^2 (SD_1^2 + SD_2^2)}{(\bar{x}_1 - \bar{x}_2)^2}$$
$$= \frac{(1.96 + 1.64)^2(3.25^2 + 3.51^2)}{(37.69 - 34.93)^2}$$

$$n = 38.7$$

at 10% attrition

$$n = 38.7 \times 1.10$$

$$n = 42.6$$

$$n \simeq 43$$

Required sample size = 43 x 3 = 129

Hence minimum sample required is 129.

Here 150 samples are taken

SAMPLING TECHNIQUE: Convenient sampling

TIME FRAME TO ADDRESS THE STUDY: July 2023 to June 2024.

INCLUSION CRITERIA:

- All women >18yrs who are sexually active coming to Gynaecology and Urogynaecology OPD at KLE's Prabhakar Kore Charitable Hospital and Medical Research Centre, Belagavi

EXCLUSION CRITERIA

- Pregnancy
- Women in postpartum period (upto 6months after delivery)
- Women in postoperative period (upto 6months post operatively)
- Cognitive / Physical disability
- Women who are not consenting

METHODOLOGY:

Subjects who met exclusion and inclusioncriteria have been recruited for research after receiving ethical approval, and each participant gave their informed consent.

- Enrolled subjects were subsequently categorized into 3 groups:
 - **Group A:** Nulliparous women
 - **Group B:** Premenopausal parous women
 - **Group C:** Postmenopausal women
- To ensure uniformity, all procedures were conducted using the same perineometer and person and following the same method throughout the study period.

Data collection procedure:

- Following the ethical committee's authorization, written informed consent was obtained, and women have been recruited based on the established exclusion and inclusion criteria. Detailed history has been obtained, and a physical examination was conducted for each participant.
- Following the explanation of the process, each woman was instructed to assume lithotomy position after voiding her bladder for digital manual palpation. With consent, the distal phalanx of index and middle fingers was inserted into distal vagina, and lady was instructed to contract against examiner's fingers and maintain contraction for as long as feasible. Procedure was executed thrice, and the intensity of the contraction has been evaluated utilizing the Modified Oxford Scale.
- PFMS has been then evaluated using the Pelvexiser Perineometer. A greased sterile cover is placed over the vaginal probe, which is then gently inserted into the vagina as well as attached to the pressure monitoring device. Baseline pressure is zeroed. The cuff is inflated until the pressure is felt in the vagina followed which the participant is then instructed to contract the pelvic floor muscle for 5 sec for 3 times with 30 seconds rest interval. The maximum peak pressure of each contraction was noted, and the average of three readings was taken to ensure unbiased results.
- QoL assessment in women along with PFMS weakness has been evaluated using standard King's health questionnaire, ensuring a comprehensive understanding of the impact on daily living.

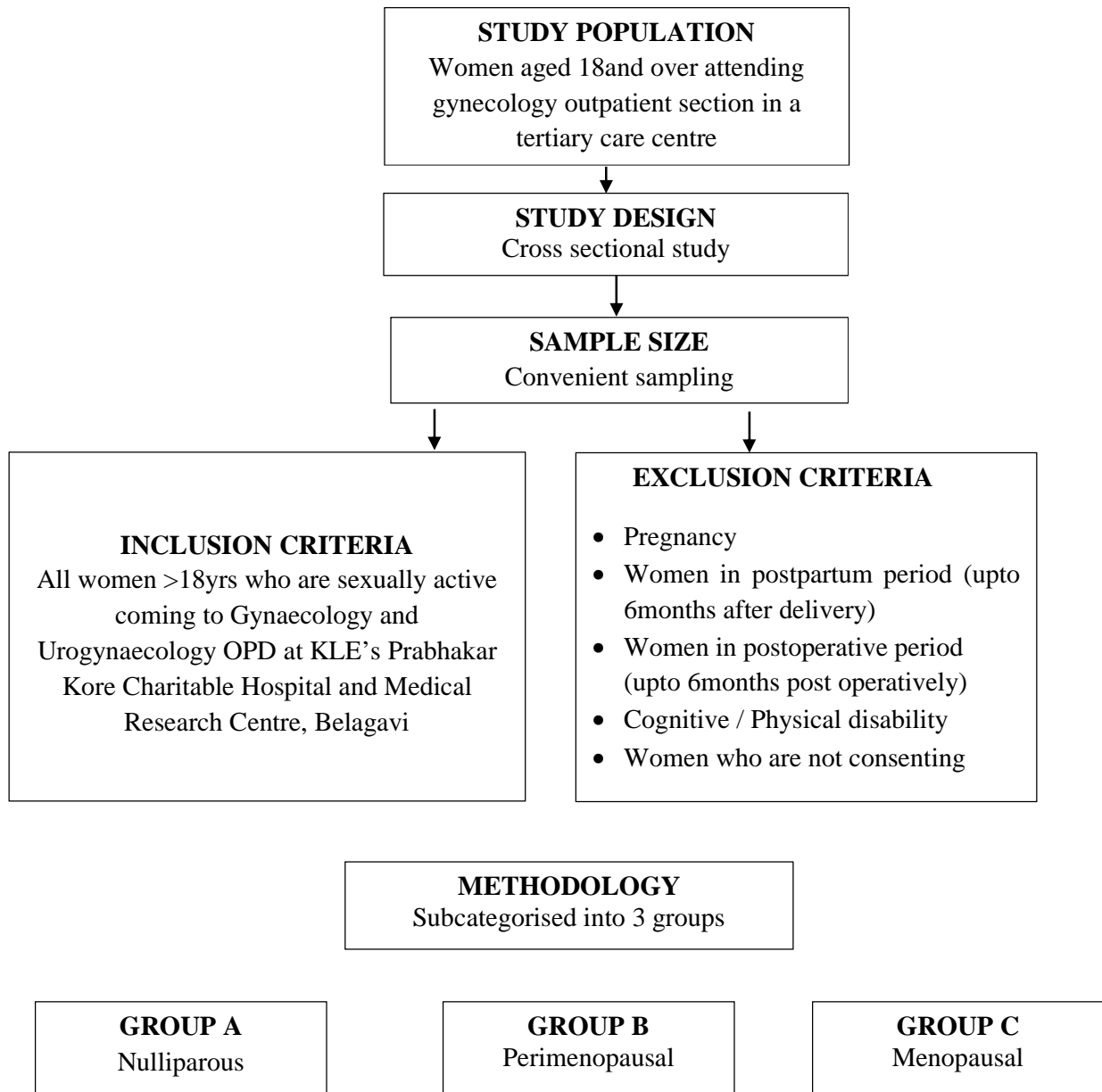
STATISTICAL ANALYSIS:

Data entry had been conducted utilizing M.S.Excel along with statistically analyzed employing SPSS version16(Statistical Package for the Social Sciences) for M.S. Windows. A descriptive statistical analysis had been conducted for examining various categorical as well as quantitative variables' distribution. Categorical data had been presented as n(%), whilst quantitative variables had been expressed as mean±standard deviation. Each data had been displayed in tabular format moreover have additionally been illustrated graphically utilizing bar/pie charts if suitable. Chi-Square test had been employed for assessing correlation among variables. Shapiro-Wilk test had been employed for assessing variables' normality. 2sample t-tests/Mann-Whitney U tests had been utilized in comparing means or distributions among the groups. PFM was assessed using MOS by vaginal digital palpation as well as perineometry. Linear regression analysis had been used for assessing as well as comparing mean PFMS along with its related components. Cut-off values were determined by concurrently optimizing sensitivity and specificity. p-value<0.05 or lower had been deemed statistically significant.

ETHICAL ISSUES

1. The study's objectives and procedures were elucidated to all patients.
2. Informed consent was obtained from all patients who agreed to participate in the trial.
3. The ability to withdraw from the study was maintained without any stipulation.
4. Absolute confidentiality concerning patient information was upheld during all phases of the investigation.

STROKE DIAGRAM



RESULTS

SOCIO DEMOGRAPHIC CHARACTERS

Table 2: Distribution of the subjects based on age groups

Age Groups (years)		Group			Total
		Nulliparous N=50	Peri menopausal N=50	Post menopausal N=50	
<30 years	n	34	6	0	40
	%	68.0%	12.0%	0.0%	26.7%
31-40 years	n	13	21	0	34
	%	26.0%	42.0%	0.0%	22.7%
41-50 years	n	3	20	13	36
	%	6.0%	40.0%	26.0%	24.0%
51-60 years	n	0	3	28	31
	%	0.0%	6.0%	56.0%	20.7%
>61 years	n	0	0	9	9
	%	0.0%	0.0%	18.0%	6.0%
Chi square-154.02					
P value-0.001					

Age range among the three groups exhibited considerable variation p-value of 0.001, indicating a statistically significant correlation among age as well as reproductive stage. The majority of nulliparous women were <30 years (68%), with a smaller proportion in the 31-40 age range (26%), whereas most postmenopausal women were >50years, with 56% between 51-60 years and 18% above 61 years. Perimenopausal women were mostly in the 31-40 years (42%) and 41-50 years (40%) categories.

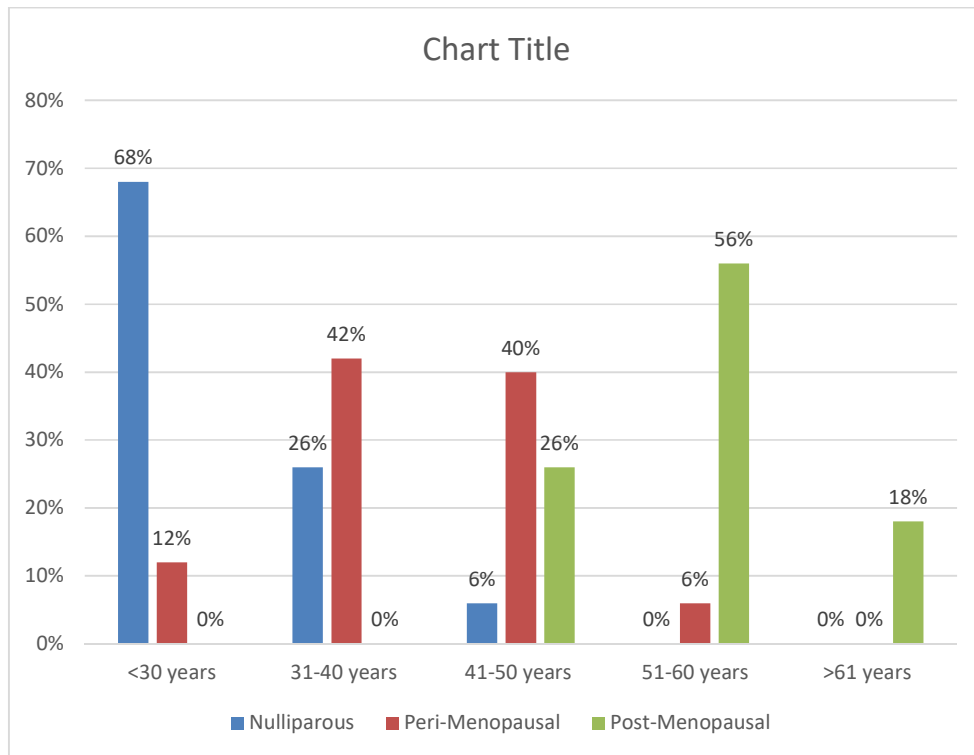


Figure 11: Distribution of the subjects based on age groups

Table 3: Distribution of the subjects based on socio- economic status

BMI		Group			Total
		Nulliparous N=50	Peri menopausal N=50	Post menopausal N=50	
<18.5	n	0	2	1	3
	%	0.0%	4.0%	2.0%	2.0%
18.5-24.9	n	23	17	10	50
	%	46.0%	34.0%	20.0%	33.3%
>25	n	27	31	39	97
	%	54.0%	62.0%	78.0%	64.7%
Chi-square-9.47					
P value-0.05					

BMI showed a marginally significant association with reproductive stage ($P = 0.05$), suggesting a trend where BMI increases with age and menopausal status. Underweight women (BMI < 18.5) were rare, accounting for only 2% of the total sample, mostly in the perimenopausal (4%) and postmenopausal (2%) groups. Normal BMI (18.5-24.9) was highest among nulliparous women (46%), decreasing to 34% in perimenopausal women and 20% in postmenopausal women. Overweight/obese women (BMI >25) increased significantly with age, from 54% in nulliparous women to 62% in perimenopausal women and 78% in postmenopausal women.

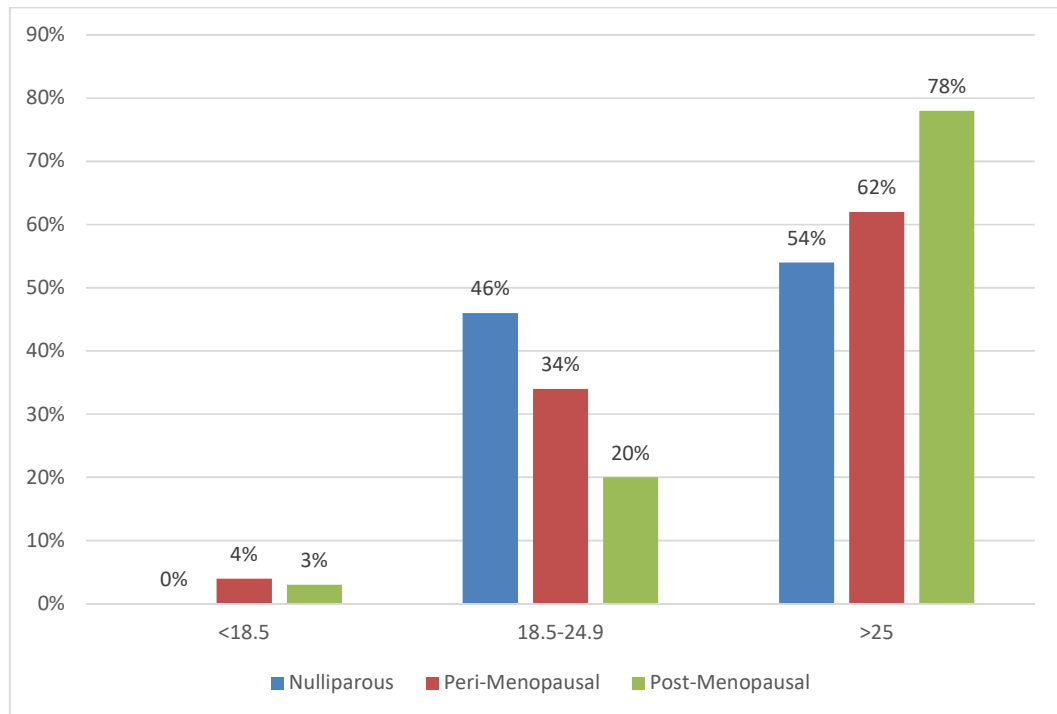


Figure 12: Distribution subjects based on socio-economic status

Table 4: Distribution of the subjects based on socio- economic status

BMI		Group			Total
		Nulliparous N=50	Peri menopausal N=50	Post menopausal N=50	
Upper Class	n	7	0	1	8
	%	14.0%	0.0%	2.0%	5.3%
Upper Middle Class	n	23	19	12	54
	%	46.0%	38.0%	24.0%	36.0%
Middle Class	n	8	0	3	11
	%	16.0%	0.0%	6.0%	7.3%
Lower Middle Class	n	12	31	33	76
	%	24.0%	62.0%	66.0%	50.7%
Lower Class	n	0	0	1	1
	%	0.0%	0.0%	2.0%	0.7%
Chi-square value- 35.70					
P value-0.001					

The upper-class was the least represented (5.3%), with only 14% of nulliparous women and 2% of postmenopausal women belonging to this group. The upper middle class formed a significant proportion (36%) of the total population, with 46% of nulliparous women, 38% of perimenopausal women, and 24% of postmenopausal women belonging to this group. The middle class formed 16%, while no perimenopausal women and only 6% of postmenopausal women were classified here. The lower middle class had the largest representation (50.7%), showing a significant increase among perimenopausal (62%) and postmenopausal (66%) women. The

lower-class category had the least representation (0.7%), with only one postmenopausal woman (2%) belonging to this group. The correlation was determined to be statistically significant.

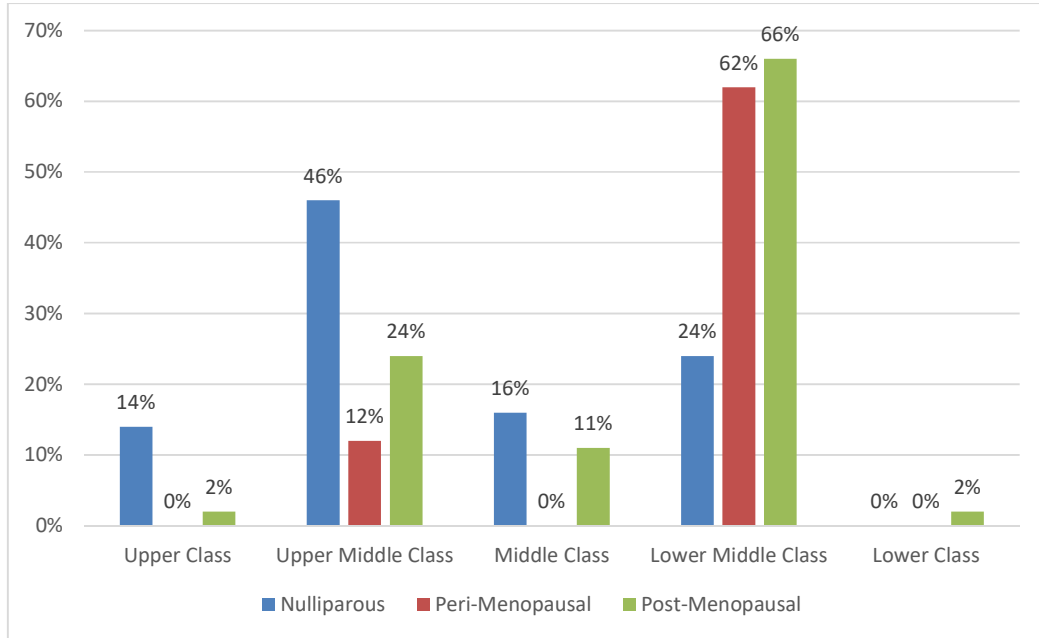


Figure 13: Distribution subjects based on socio-economic status

Table 5: Distribution of subjects based on mode of delivery

MODE OF DELIVERY		Group			Total
		Nulliparous N=50	Peri menopausal N=50	Post menopausal N=50	
Vaginal	n	0	34	39	48.6
	%	00.0%	68%	78%	00.0%
Cesarean	n	0	14	10	24
	%	00.0%	28%	20%	16%
Instrumental delivery	n	0	2	1	3
	%	00.0%	4%	2%	0.2%
Chi-square value- 52.02					
P value- <0.001, statistically significant					

Mode of delivery demonstrated statistically significant correlation with the reproductive stage ($P < 0.001$). Perimenopausal and postmenopausal women exhibited elevated rates of vaginal deliveries, at 70% and 80%, respectively. The rates of cesarean section (LSCS) were 28% among perimenopausal women and 20% among postmenopausal women. Small proportion of perimenopausal women (4%) and postmenopausal women (2%) had an instrumental delivery history.

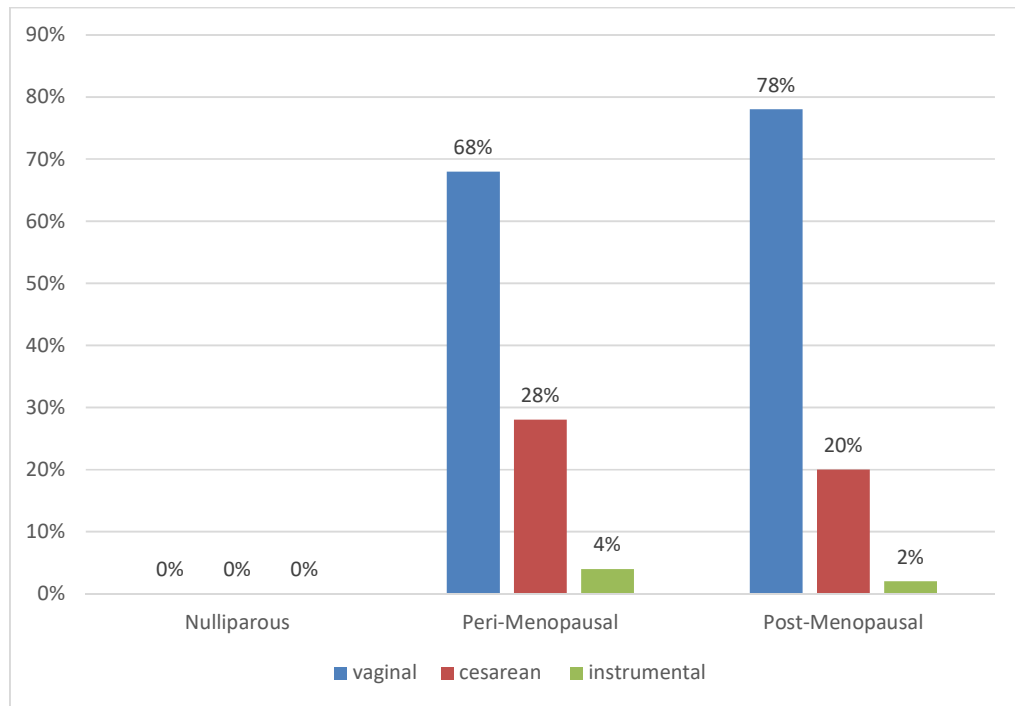


Figure 14: Distribution subjects based on mode of delivery

Table 6: Distribution of subjects based on number of parity

NUMBER OF PARITY		Group			Total
		Nulliparous N=50	Peri menopausal N=50	Post menopausal N=50	
0	n	50	0	0	50
	%	100%	0%	0%	33.3%
1	n	0	10	9	19
	%	0%	20%	18%	12.7%
2	n	0	23	18	41
	%	0%	46%	36%	27.3%
3	n	0	13	12	25
	%	0%	26%	24%	16.7%
4	n	0	3	10	13
	%	0%	6%	20%	8.7%
5	n	0	0	1	1
	%	0%	0%	2%	0.7%
6	n	0	1	0	1
	%	0%	20%	0%	0.7%
Chi-square value- 159.70					
P value-0.001, statistically significant					

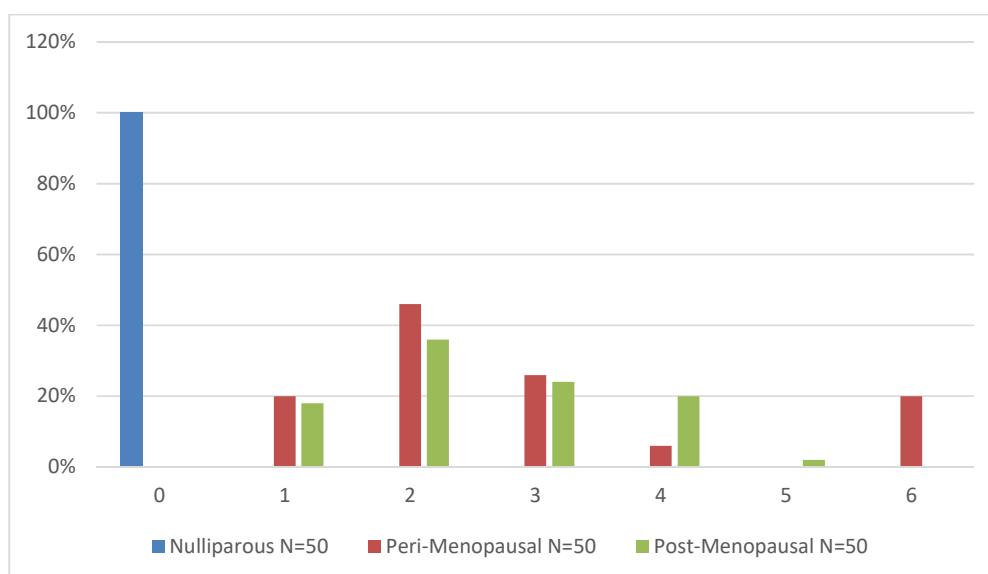


Figure 15: Distribution of subjects based on number of parity

- Nulliparous group (by definition) has 100% of women with 0 childbirths.
- Peri-menopausal women mostly had 2 children (46%), with smaller percentages having 1, 3, 4, or even 6.
- Post-menopausal women also mostly had 2 children (36%), followed by 3 (24%) and 4 (20%).
- Very high parity (5 or more births) is rare (only 2 women in total).
- Parity increases with age: None of the younger nulliparous group has given birth, while most older women (peri- and post-menopausal) have had 2 or more children.
- The most common number of children across the total sample is **2** (27.3%).
- Higher parity (4+) is more frequent in post-menopausal women than peri-menopausal.

Table 7: Distribution of subjects based on postnatal exercises done or not done

Postnatal exercises		Group			Total
		Nulliparous N=50	Peri menopausal N=50	Post menopausal N=50	
Done	n	0	6	0	6
	%	0%	12%	0%	4%
Not done	n	50	44	50	144
	%	100%	88%	100%	96%
Chi-square value- 12.5					
P value- <0.05, statistically significant					

Only Six perimenopausal women (12%) had performed postnatal exercises, while none of the nulliparous or postmenopausal women had done them. A staggering 100% of nulliparous and postmenopausal women, and 88% of perimenopausal women, had never performed postnatal exercises. The highest percentage of non-adherence was among postmenopausal women (100%). The correlation was determined to be statistically significant.

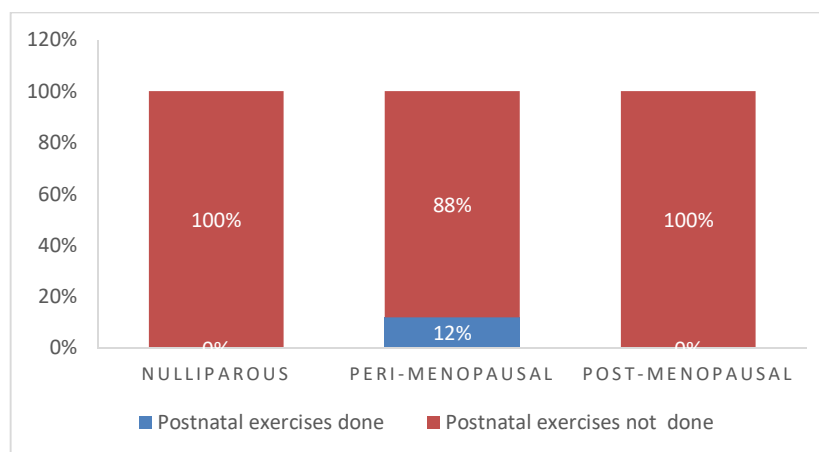
**Figure 16: Distribution of subjects based on postnatal exercises done or not done**

Table 8: Distribution of subjects based on complaints of anal incontinence

Any complaints of Anal incontinence		Group			Total N=150
		Nulliparous N=50	Peri menopausal N=50	Post menopausal N=50	
Yes	N	0	0	3	3
	%	0%	0%	6%	2%
No	N	50	50	47	147
	%	100%	100%	94%	98%
Chi-square value- 6.1224					
P value-0.05, statistically significant					

None of nulliparous or perimenopausal women reported symptoms of anal incontinence. 3 postmenopausal women (6%) reported experiencing anal incontinence.

Table 9: Distribution of subjects based on history of hormonal treatment

TOOK ANY HORMONAL TREATMENT		Group		
		Nulliparous N=50	Peri menopausal N=50	Post menopausal N=50
Yes	N	0	0	0
	%	0%	0%	0%
No	N	50	50	50
	%	100%	100%	100%

100% of nulliparous, perimenopausal, and postmenopausal women (n = 150) reported not using any hormonal treatment.

Table 10: Assessment of pelvic floor muscle strength using Vaginal manometry method using Perineometer (MMHG) and modified oxford scale in nulliparous, peri menopausal parous and post menopausal women

PELVIC FLOOR MUSCLE STRENGTH	Group		
	Nulliparous N=50	Peri menopausal N=50	Post menopausal N=50
Vaginal manometry (mm Hg)	29.7±3.4	20.2±7.1	17.7±7.23
P value – 0.001, statistically significant			

- Nulliparous women have the strongest pelvic floor muscles (29.7 mm Hg, ±3.4), indicating consistent high strength.
- Perimenopausal women show a notable decline (20.2 mm Hg, ±7.1) with greater variability.
- Postmenopausal women have the lowest strength (17.7 mm Hg, ±7.23), with similar variability to the perimenopausal group.

Table 11: Assesment of pelvic floor muscle strength using Modified Oxford Scale in nulliparous, peri menopausal parous and post menopausal women

PELVIC FLOOR MUSCLE STRENGTH USING MOS		Group			Total N=150
		Nulliparous N=50	Peri menopausal N=50	Post menopausal N=50	
A very weak PFMC	N	0	0	3	3
	%	0%	0%	6%	2%
A weak PFMC	N	0	8	21	29
	%	0%	16%	42%	19.3%
A moderate PFMC	N	5	2	20	27
	%	10%	4%	40%	18%
A good PFMC	N	34	16	5	55
	%	68%	32%	10%	36.6%
A strong PFMC	N	11	2	0	12
	%	22%	4%		8%
Chi square – 72.33					
P value<0.001, statistically significant					

- **Nulliparous women** have the best pelvic floor muscle condition:

68% have **good**, and 22% have **strong** muscle strength.

None had **weak** or **very weak** strength.

- **Peri-menopausal women** show a decline:

32% still have **good**, and 4% **strong** strength.

16% are in the **weak**, and 4% in **moderate** category.

- **Post-menopausal women** show a significant drop:

42% have **weak**, and 6% have **very weak** muscle strength.

Only 10% had **good**, and **none** had **strong** PFMC.

Table 12: Mean PFMS values in nulliparous, peri menopausal parous and post menopausal women

PELVIC FLOOR MUSCLE STRENGTH	Group		
	Nulliparous N=50	Peri menopausal N=50	Post menopausal N=50
Vaginal manometry (mm Hg)	29.7±3.4	20.2±7.1	17.7±7.23
Modified Oxford Scale	4.15±0.62	3.24±0.77	2.5±0.7

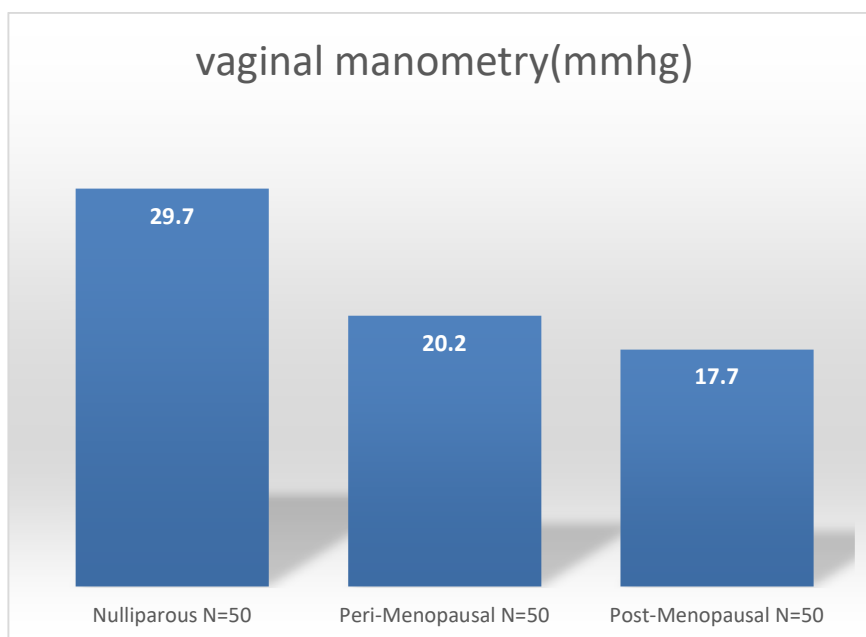


Figure 17: Mean vaginal manometric PFMS values in nulliparous, peri menopausal parous and post menopausal women

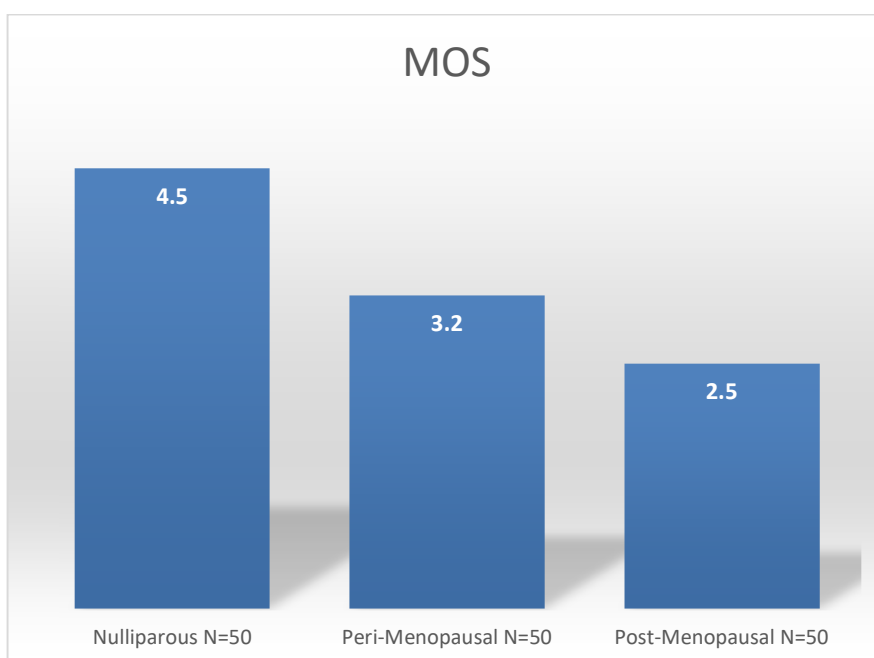


Figure 18: Mean vaginal manometric PFMS values in nulliparous, peri menopausal parous and post menopausal women

Vaginal Manometry:

Nulliparous women had the highest pelvic floor pressure (29.7 mm Hg).

Pressure decreases significantly in perimenopausal (20.2 mm Hg) and post-menopausal (17.7 mm Hg) women.

Greater variability in perimenopausal and post-menopausal groups suggests inconsistent strength in these groups.

Modified Oxford Scale:

Nulliparous: average score of 4.15/5, indicating strong muscle tone.

Peri-menopausal: reduced to 3.24, indicating moderate strength.

Post-menopausal: further decline to 2.5, suggesting weak to moderate strength.

Overall - Both objective (manometry) and subjective (MOS) assessments show a significant decline in PFM strength from nulliparous to post-menopausal women.

Table 13: Classification scale of Manometry based on this study

	Manometric values	
	Mean	Std. Deviation
A very weak PFM contraction	6.33	1.528
A weak PFM contraction	12.69	4.848
A moderate PFM contraction	20.13	4.574
A good PFM contraction	28.32	2.987
A strong PFM contraction	32.77	2.774

We employed linear regression to ascertain the existence of a linear association among subjective grading of PFMC and objective manometric pressure values.

- **Independent variable (X):** Grade code (1–5)
- **Dependent variable (Y):** Mean manometric value

The regression equation will be of the form:

$$\text{Manometry} = a + b \times \text{PFMC Grade}$$

This will tell us how much **manometric pressure increases** per unit increase in PFMC grade.

Linear Regression Results-

The regression equation is:

$$\text{Manometric Value} = -0.505 + 6.851 \times \text{Contraction Level}$$

Intercept (a): -0.505

Slope (b):6.851 (this means for each increase in contraction level, pressure increases by ~6.85 units)

R²: 0.993 — very strong fit, explaining 99.3% of the variance

p-value (slope): 0.00024 — highly significant (p < 0.05)

A robust, statistically significant linear correlation exists among PFM contraction intensity and manometric pressure. Pressure increases roughly linearly as contraction strength increases. Here's the regression plot showing a relationship among PFM contraction levels and manometric values. The best-fit linear regression line, indicated by the red dotted line, amply illustrates the robust rising trend.

Here since the same examiner is conducting both MOS and vaginal manometry , there are chances of subjective bias

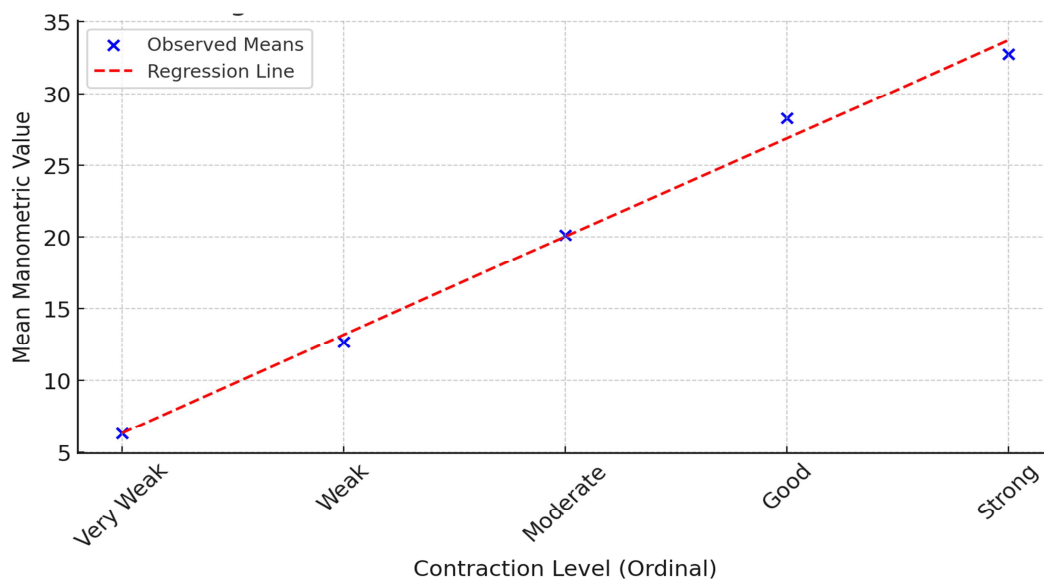


Figure 19: Linear regression graph comparing MOS and Perineometer

Table 14: Factors affecting the PFMs in nulliparous, peri menopausal parous and post menopausal women

	Group					
	Nulliparous N=50		Peri menopausal N=50		Post menopausal N=50	
	MOS	Vaginal manometry	MOS	Vaginal manometry	MOS	Vaginal manometry
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Age in Years						
<30	4.25±0.64	30.57±3.21	4.0±0.63	25.67±5.54	-	-
31-40	4.0±0.4	28.2±3.45	3.52±0.68	20.90±7.14	-	-
41-50	3.5±0.7	25.0±1.41	2.84±0.60	18.8±7.08	3.0±0.7	21.67±21.6
51-60	-	-	2.33±0.57	15.33±5.03	2.5±0.73	17.5±17.5
>61	-	-	-	-	2.11±0.60	13.22±13.2
BMI						
<18.5	-	-	2.5±0.7	10.0±5.65	1.0	5.0
18.5-24.9	4.55±0.51	31.7±2.84	3.75±0.6	25.06±5.79	2.33±	17.56±0.5
>25	3.75±0.44	27.7±2.92	3.03±0.7	18.27±6.26	2.64±	18.1±0.7
Mode of delivery						
Vaginal	-	-	3.06±0.69	18.46±6.8	2.43±0.7	16.78±7.12
LSCS	-	-	3.64±0.08	24.62±6.0	3.11±0.78	22.0±6.40
Instrumental labor			3.0	14.0	2.0	12.0

Parity						
0	4.15±0.62	29.7±3.49	-	-	-	-
1	-	-	4.00±0.66	27.90±0.9	6.332±2.89	20.67±7.48
2	-	-	3.23±0.685	19.30±0.70	6.725±2.83	19.89±6.73
3	-	-	2.92±0.64	18.25±0.53	3.957±2.09	15.82±6.66
4	-	-	2.67±0.57	14.00±0.51	3.464±2.40	14.60±6.53
5	-	-	2.0	-	1.0	5.00
6	-	-	-	10.00	.-	-
Postnatal exercises						
Done			4.17±0.40	26.0±3.34	-	-
Not done	5	32	2.60±0.54	14.0±5.09	2.55±0.76	17.732.55±0.767.23

This table offers insight into the factors that may influence pelvic health, as measured by MOS and vaginal manometry, across different stages of a woman's life.

1. Age Group:

- The MOS and vaginal manometry scores are presented across different age categories for each group.
- In the Nulliparous group, younger women (e.g., aged 31-40) tend to have higher MOS and vaginal manometry scores compared to older age groups.

2. BMI (Body Mass Index):

- The table categorizes women into three BMI ranges: <18.5, 18.5-24.9, and >25.

- **Peri-menopausal** women with BMI in range of **18.5-24.9** have a MOS of **3.75 ± 0.6** and a vaginal manometry score of **25.06 ± 5.79**, indicating how BMI may influence pelvic health during this stage.

3. Mode of Delivery:

- The scores are also affected by the delivery method, (whether it was, **vaginal LSCS** [Lower Segment Cesarean Section], or **Instrumental Labor** .

In the **Peri-menopausal** group, women who had a **vaginal delivery** show a lower MOS (**3.06 ± 0.69**) and vaginal manometry score (**14.0 ± 0**), (**12.0 ± 0**) compared to women who delivered via vaginal delivery or LSCS.

- In the **Peri-menopausal** and postmenopausal women who had a **instrumental delivery** show a lower MOS (**3.0 ± 0**), (**2 ± 0**) and vaginal manometry score (**18.46 ± 6.8**) compared to women who delivered via LSCS.

4. Parity (Number of Children):

- The **parity** (number of children a woman has) affects the clinical outcomes, with women in the **Post-menopausal** group showing a tendency for lower MOS and vaginal manometry scores as their parity increases. For example, women with **parity 1** have scores of **6.33 ± 2.89** (MOS) and **20.67 ± 7.48** (vaginal manometry), compared to women with higher parity.

5. Postnatal Exercises:

- The data shows a significant improvement in scores for women in the **Peri-menopausal** group who performed postnatal exercises.

- For instance, those who did postnatal exercises have higher MOS (4.17 ± 0.40) and vaginal manometry scores (26.0 ± 3.34) compared to those who did not do the exercises (MOS = 2.60 ± 0.54 and vaginal manometry = 14.0 ± 5.09).

General Observations:

- **Nulliparous** women tend to have better pelvic health scores (higher MOS and vaginal manometry scores) than those in the **Peri-menopausal** and **Post-menopausal** groups.
- **Post-menopausal** women generally show lower scores across all categories.
- Higher **BMI** appears to negatively impact the pelvic health scores, though this effect is less consistent across all groups.
- **Parity** affects MOS and vaginal manometry in the **Peri-menopausal** and **Post-menopausal** groups, with higher parity often leading to lower scores.
- **Postnatal exercises** seem to have a positive effect on pelvic health, particularly in the **Peri-menopausal** group.

**QUALITY OF LIFE ASSESSMENT IN NULLIPAROUS, PERI
MENOPAUSAL PAROUS AND POST MENOPAUSAL WOMEN USING
KING'S HEALTH QUESTIONNAIRE**

Table 15: Perceived health status and the impact of bladder problems on daily life

		Group			Total N=150
		Nulliparous N=50	Peri menopausal N=50	Post menopausal N=50	
Describe your health at present	Good	50 100%	36 72%	32 64%	118
	Fair	0 0%	14 28%	13 26%	27
	Poor	0 0%	0 0%	5 10%	5
Chi-square test p value – 0.000012, statistically significant					
How much bladder problem affects your life?	Not at all	49 98%	28 58%	31 62%	108
	Little	1 2%	19 38%	10 20%	30
	Moderately	0 0%	3 6%	8 16%	11
	A lot	0 0%	0 0%	1 2%	1
Chi-square test p value – 0.000006, statistically significant					

Does bladder problem affect your household task?	Not at all	50 100%	41 82%	31 62%	122
	Slightly	0	9 18%	18 36%	27
	Moderately	0	0	1 2%	1

Chi-square test p value – 0.000065, statistically significant

Does bladder problem affect normal activities outside the house?	Not at all	50 100%	30 60%	25 50%	105
	Slightly	0	18 36%	19 38%	37
	Moderately	0	2 4%	4 8%	6
	A lot	0 0%	0 0%	2 4%	2

Chi-square test p value – 0.00002, statistically significant

Self-perceived health differed significantly between groups (P = 0.000012).

- Good health was reported by 50 nulliparous, 36 perimenopausal, and 32 postmenopausal women. Fair health was reported by 14 perimenopausal and 13 postmenopausal women. Poor health was reported only by 5 postmenopausal women; none in the other groups selected this.

Impact of Bladder Problems on Quality of Life

Most nulliparous women (98%) reported no impact, suggesting preserved bladder function. Perimenopausal and postmenopausal women more often reported mild to moderate bladder issues, consistent with age-related pelvic floor changes. Only 1 woman in the postmenopausal group reported a significant impact, indicating that severe bladder dysfunction is rare.

Effect of Bladder Problems on Household Tasks and Work Activities

Household tasks are mostly unaffected in nulliparous and perimenopausal women, but nearly 40% of postmenopausal women report some limitations. Outdoor and job activities are more affected, especially among peri-menopausal and postmenopausal women, with a small number experiencing moderate to severe impact. Nulliparous women show minimal to no impact across all daily functions, reflecting better bladder control.

Table 16: Impact of bladder problems on physical and social activities

Does your bladder affect your		Group			Total N=150
		Nulliparous N=50	Peri menopausal N=50	Post menopausal N=50	
Physical activities?	Not at all	49	24	32	105
			48%	64%	
	Slightly	1	25	13	39
		2%	50%	26%	
Moderately	0	1	5	6	
		2%	10%		
	A lot	0	0	0	0
P value-<0.0002, statistically significant					
Ability to travel	Not at all	50	25	24	144
		100%	50%	48%	
	Slightly	0	24	20	44
			48%	40%	
Moderately	0	1	4	5	
		2%	8%		
	A lot	0	0	2	2
				4%	
P value-<0.0002, statistically significant					
Limit your social life	Not at all	50	39	39	128
		100%	78%	78%	
	Slightly	0	9	10	19

			18%	20%	
	Moderately	0	2	1	
			4%	2%	3
	A lot	0	0	2	
				4%	2
P value-<0.0002, statistically significant					
Limit your ability to see and visit friends	Not at all	50	45	32	
		100%	90%	64%	127
	Slightly	0	5	16	
			10%	32%	21
	Moderately	0	0	1	
				2%	1
	A lot	0	0	1	
				2%	1
P value-<0.0002, statistically significant					

All p-values are statistically significant – which implies that bladder issues have significantly impact of social and physical activities in these women groups

Effect of Bladder Problems on Physical Activities

49 nulliparous, 24 perimenopausal, and 32 postmenopausal women reported that their bladder problems did not affect their physical activities at all._1 nulliparous woman, 25 perimenopausal women (50%), and 18 postmenopausal women (36%) reported slight limitations._1 perimenopausal woman (2%) and 5 postmenopausal women (10%) reported moderate restrictions, while 1 postmenopausal woman (2%) reported severe limitation ("a lot").

Effect of Bladder Problems on the Ability to Travel

50 nulliparous, 24 perimenopausal, and 20 postmenopausal women reported that bladder issues did not affect their travel. 24 perimenopausal (48%) and 20 postmenopausal women (40%) reported slight difficulty travelling due to bladder dysfunction. 1 perimenopausal woman (2%) and 4 postmenopausal women (8%) reported moderate limitations, while 2 postmenopausal women (4%) reported severe difficulty travelling.

Effect of Bladder Problems on Social Life

50 nulliparous, 39 perimenopausal, and 39 postmenopausal women reported no impact on social life. 9 perimenopausal (18%) and 10 postmenopausal women (20%) reported slight limitations. 2 perimenopausal and 1 postmenopausal woman reported moderate social restrictions. 2 postmenopausal women reported that bladder problems significantly restricted their social participation.

Effect of Bladder Problems on Overall Lifestyle Activities

50 nulliparous, 45 perimenopausal, and 32 postmenopausal women reported no limitations. 5 perimenopausal and 16 postmenopausal women reported slight limitations. 1 postmenopausal woman reported moderate impact, and another reported severe limitations.

Table 17: Effect of bladder problems on sexual life and family life

Does your bladder affect your		Group			Total N=150
		Nulliparous N=50	Peri menopausal N=50	Post menopausal N=50	
Relationship with your partner	Not applicable	48 96%	23 46%	29 58%	100
	Not at all	2 4%	26 52%	17 34%	45
	Slightly	0	1 2%	4 8%	5
P value- <0.0004 highly significant					
Affect your sex life	Not applicable	0	1 2%	5 10%	6
	Not at all	50 100%	46 92%	40 80%	136
	Slightly	0	3 6%	5 10%	8
P value- 0.012 statistically significant					
Affect your family life	Not applicable	0	1 2%	4 8%	5
	Not at all	50 100%	49 98%	44 88%	143
	Slightly	0	0	2 4%	2
P value- 0.0047 borderline significant					

Effect on Relationship with Partner

Significant difference between groups ($p < 0.001$). Most women reported no impact: 48 nulliparous, 23 perimenopausal, 29 postmenopausal. Slight impact reported by 1 perimenopausal and 4 postmenopausal women.

Effect on Sexual Life

Statistically significant difference ($p = 0.012$). No impact in 50 nulliparous, 46 perimenopausal, 40 postmenopausal. Slight impact in 3 perimenopausal, 5 postmenopausal.

Effect on Family Life

Borderline significance ($p = 0.047$). No impact: 50 nulliparous, 49 perimenopausal, 44 postmenopausal. Slight impact: 2 postmenopausal women.

Bladder issues are more likely to affect intimate and family relationships in postmenopausal women, with statistically significant differences across menopausal status.

Table 18: Emotional impact of bladder problems

Does your bladder problems make you		Group			Total N= 150
		Nulliparous N=50	Peri menopausal N=50	Post menopausal N=50	
Feel depressed	Not at all	50 100%	42 84%	39 78%	31
	Slightly	0	8 16%	7 14%	15
	Moderately	0	0	3 6%	3
	A lot	0	0	1 2%	1
P value- 0.15 statistically not significant					
Feel anxious and nervous	Not at all	50 100%	40 80%	41 82%	131
	Slightly	0	9 18%	8 16%	17
	Moderately	0	1 2%	1 2%	2
	A lot	0	0	0	0
P value- 0.022 statistically significant					
Feel bad about yourself	Not at all	50 100%	35 70%	36 72%	121
	Slightly	0	14 28%	13 26%	27
	Moderately	0	1 2%	1 2%	2
	A lot	0	0	0	0
P value- 0.001 statistically significant					

Effect of Bladder Problems on Depression

50 nulliparous, 42 perimenopausal, and 39 postmenopausal women reported that their bladder problems did not make them feel depressed. 8 perimenopausal (16%) and 7 postmenopausal (14%) women reported feeling slightly depressed due to bladder issues. 3 postmenopausal women (6%) reported moderate depression, and 1 postmenopausal woman (2%) reported feeling "a lot" of depression due to bladder dysfunction.

Effect of Bladder Problems on Anxiety and Nervousness

50 nulliparous, 40 perimenopausal, and 41 postmenopausal women reported that bladder issues did not make them feel anxious or nervous. 9 perimenopausal (18%) and 8 postmenopausal (16%) women reported mild nervousness or anxiety related to bladder problems. 1 perimenopausal and 1 postmenopausal woman reported moderate levels of anxiety.

Effect of Bladder Problems on Self-Perception and Self-Esteem

50 nulliparous, 35 perimenopausal, and 36 postmenopausal women reported that bladder issues did not make them feel bad about themselves. 14 perimenopausal (28%) and 13 postmenopausal (26%) women reported that their bladder issues slightly affected how they felt about themselves. 1 perimenopausal and 1 postmenopausal woman reported that bladder problems had a moderate impact on their self-esteem.

Table 19: Impact of bladder on sleep and energy levels

Do your bladder problems		Group			Total N=150
		Nulliparous N=50	Peri menopausal N=50	Post menopausal N=50	
Affect sleep	Never	50 100%	36 72%	30 60%	116
	Sometimes	0	14 28%	20 40%	
Chi-square statistic: 24.03 P value-< 0.001 statistically significant					
Make you feel tired	Never	50 100%	47 94%	45 90%	142
	Sometimes	0	3 6%	5 10%	
Chi-square statistic: 4 P value-< 0.1 no statistical significance					

Effect of Bladder Problems on Sleep

50 nulliparous, 36 perimenopausal, and 30 postmenopausal women reported that bladder issues never affected their sleep. 14 perimenopausal (28%) and 20 postmenopausal (40%) women reported that their bladder problems sometimes disrupted their sleep.

Effect of Bladder Problems on Energy Levels and Fatigue

50 nulliparous, 47 perimenopausal, and 45 postmenopausal women reported that bladder problems never made them feel tired or worn out. 3 perimenopausal (6%) and 5 postmenopausal (10%) women reported feeling occasionally tired due to their bladder problems.

Table 20: Eoping strategies for bladder problems

Coping strategies		Group			Total N=150
		Nulliparous N=50	Peri menopausal N=50	Post menopausal N=50	
Wear pads to keep dry	Never	50 100%	48 96%	48 96%	146
	Sometimes	0	2 4%	2 4%	4
	Often	-	-	-	
P value-0.36 not significant					
Restrict fluid intake	Never	50 100%	23 46%	26 52%	107
	Sometimes	0	20 40%	8 16%	28
	often	0	7 14%	16 32%	23
P value-<0.0001 highly significant					
Change underclothes because they get wet	Never	50 100%	44 88%	45 90%	139
	Sometimes	0	5 10%	4 8%	9
	often	0	1 2%	1 2%	2
P value-0.19 not significant					
Worry in case you smell	Never	49 98%	38 76%	39 78%	126
	Sometimes	1 2%	11 22%	10 20%	22
	often	0	1 2%	1 2%	2
P value-0.026 statistically significant					

Wear Pads to Keep Dry

Interpretation: There is no statistically significant difference across the groups for Wear pads to keep dry.

Restrict Fluid Intake

Interpretation: There is a highly significant difference among the three groups in their responses on Restrict fluid intake.

Change Underclothes Because They Get Wet

Interpretation: There is no statistically significant difference across groups for Changing underclothes.

Use of Pads to Stay Dry

50 nulliparous, 48 perimenopausal, and 48 postmenopausal women reported never using pads to stay dry. 2 perimenopausal and 2 postmenopausal women reported using pads sometimes.

Regulating Fluid Intake to Manage Bladder Symptoms

50 nulliparous, 23 perimenopausal, and 26 postmenopausal women reported never restricting their fluid intake. 20 perimenopausal (40%) and 8 postmenopausal (16%) women reported sometimes limiting fluid intake. 7 perimenopausal (14%) and 14 postmenopausal (28%) women reported frequently controlling their fluid intake. 2 postmenopausal women (4%) reported always controlling their fluid intake.

Changing Underclothes Due to Leakage

50 nulliparous, 44 perimenopausal, and 45 postmenopausal women reported never changing their underclothes due to wetness. 5 perimenopausal and 4 postmenopausal women reported sometimes needing to change their underclothes. 1 perimenopausal and 1 postmenopausal woman reported often needing to change underclothes due to leakage.

Concerns About Odor Due to Bladder Problems

49 nulliparous, 38 perimenopausal, and 39 postmenopausal women reported never worrying about bladder-related odor. 1 nulliparous, 11 perimenopausal, and 10 postmenopausal women reported sometimes worrying about odor. 1 perimenopausal and 1 postmenopausal woman reported frequently worrying about bladder-related odor.

Table 21: Types and severity of bladder problems

		Group			Total N=150
		Nulliparous N=50	Peri menopausal N=50	Post menopausal N=50	
Frequency	A little	1 2%	13 26%	8 16%	22
	Moderately	0	8 16%	16 32%	24
	A lot	0	1 2%	2 4%	3
	Not applicable	49 98%	28 26%	24 48%	101
P value-0.0002 highly significant					
Nocturia	A little	0	18 36%	14 28%	32
	Moderately	0	4 8%	11 22%	15
	A lot	0	0	1 2%	1
	Not applicable	50 100%	28 56%	26 52%	104
P value-0.0035 highly significant					
Urgency	A little	2 4%	14 28%	10 20%	26
	Moderately	0	9 18%	11 22%	20
	A lot	0	2 4%	3 6%	5
	Not applicable	48	25 50%	26 52%	99
P value-0.013 statistically significant					
Urge incontinence	A little	2 4%	14 28%	11 22%	27

	Moderately	0	8 16%	10 20%	18
	A lot	0	2 4%	3 6%	5
	Not applicable	48 96%	26 52%	26 52%	100
P value-0.0206 moderately significant					
Stress incontinence	A little	2 4%	5 10%	5 10%	12
	Moderately	0	19 38%	11 22%	30
	A lot	0	2 4%	8 16%	10
	Not applicable	48 96%	24 48%	26 52%	98
P value-0.0001 highly significant					
Nocturnal enuresis	A little	0	11 22%	2 4%	13
	Moderately	1 2%	2 4%	5 10%	8
	Not applicable	49 98%	37 74%	43 96%	129
P value-0.0017 highly significant					
Intercourse incontinence	A little	0	10 20%	0	10
	Moderately	0	0	1 2%	1
	Not applicable	50 100%	40 80%	49 98%	139
P value-0.01 statistically significant					
Urinary tract infections	A little	0	1 2%	0	1
	Moderately	0	0	1 2%	1
	Not applicable	0	0	1 2%	1
P value-1.0 statistically not significant					
Bladder pain	A lot	0	0	1 2%	1
	Not applicable	50 100%	50 100%	49 98%	149
P value- 0.3 statistically not significant					

Frequency of Urination

1 nulliparous, 13 perimenopausal, and 8 postmenopausal women reported experiencing mild frequency issues. 8 perimenopausal and 16 postmenopausal women reported moderate frequency issues. 1 perimenopausal and 2 postmenopausal women reported severe frequency issues.

Nocturia

18 perimenopausal and 14 postmenopausal women reported occasional nocturia, while 4 perimenopausal and 11 postmenopausal women experienced moderate symptoms. 1 postmenopausal woman reported severe nocturia, indicating that, while rare, it can significantly affect sleep quality and overall well-being.

Urgency

14 perimenopausal and 10 postmenopausal women reported mild urgency, while 9 perimenopausal and 11 postmenopausal women reported moderate urgency. 2 perimenopausal and 3 postmenopausal women reported severe urgency.

Urge Incontinence

14 perimenopausal and 11 postmenopausal women reported mild symptoms, while 8 perimenopausal and 10 postmenopausal women reported moderate symptoms. 2 perimenopausal and 3 postmenopausal women reported severe urge incontinence.

Stress Incontinence

5 perimenopausal and 5 postmenopausal women reported mild symptoms. 19 perimenopausal and 11 postmenopausal women reported moderate symptoms, showing that stress incontinence is a frequent complaint. 8 postmenopausal women reported severe stress incontinence, making this one of the most burdensome symptoms.

Nocturnal Enuresis

11 perimenopausal and 2 postmenopausal women reported occasional bedwetting, while 1 perimenopausal and 5 postmenopausal women reported moderate episodes. No perimenopausal women, but 5 postmenopausal women experienced this symptom, indicating a progressive worsening with age.

Intercourse Incontinence

10 perimenopausal women reported mild symptoms, while 1 postmenopausal woman experienced moderate symptoms.

Urinary Tract Infections

1 perimenopausal and 1 postmenopausal woman reported occasional UTIs.

Bladder Pain

Only 1 postmenopausal woman reported experiencing severe bladder pain.

Table 22: Quality of life in nulliparous, peri-menopausal and post-menopausal women

	Nulliparous N=50	Peri menopausal N=50	Post menopausal N=50
QOL	36.04±1.0093	38.91±6.40	41.34±9.6
P value -0.0051, statistically significant			

- Nulliparous group has the lowest average QOL score (~36.04), but with very little variability (small error bar). Peri-Menopausal and Post-Menopausal groups have higher QOL scores (~38.91 and 41.34 respectively). The Post-Menopausal group shows the highest QOL but also the largest variability (error bar is longest).

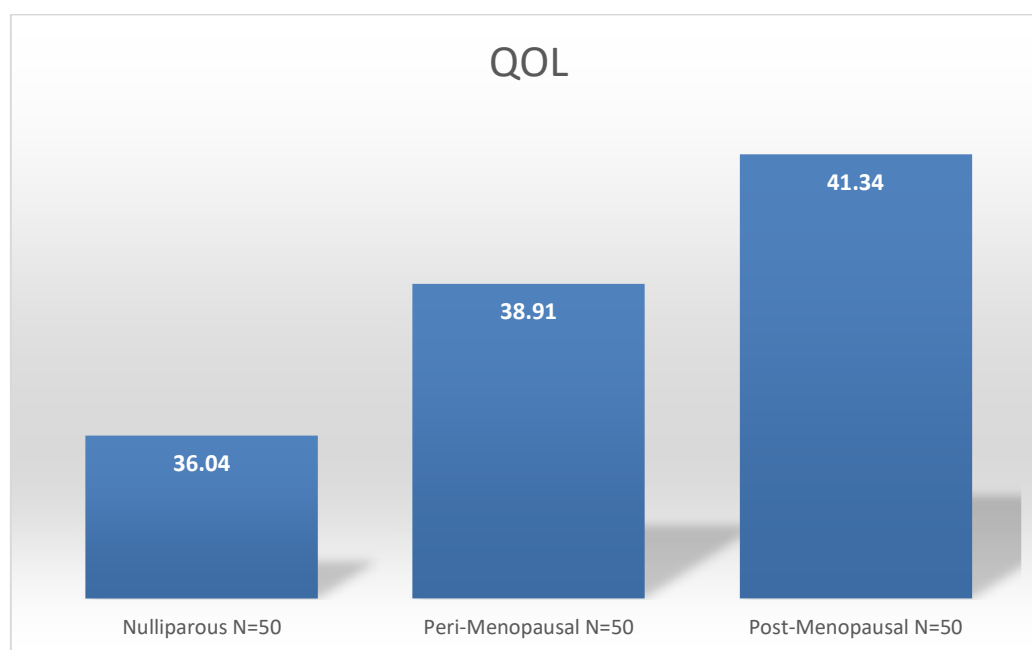


Figure 20: Quality of life in nulliparous, peri-menopausal and post-menopausal women

Table 23: Individual factors affecting pelvic floor muscle strength and quality of life in women

	Age					P Value
	<30 years (n=39)	31-40 years(n=24)	41-50 years (n=36)	51-60 years(n=37)	>61 years(n=5)	
Vaginal Manometry	29.75 ± 3.794	23.94 ± 6.968	20.44 ± 6.942	17.29 ± 6.900	13.22 ± 5.191	<0.0001
MOS	4.15 ± 0.622	3.71 ± 0.629	2.97 ± 0.664	2.48 ± 0.724	2.11 ± 0.601	<0.0001
QOL	34.73 ± 1.739	35.64 ± 2.655	38.23 ± 6.250	40.35 ± 6.770	42.11 ± 8.283	<0.0001

One-way ANOVA test is used to compare the means between different groups

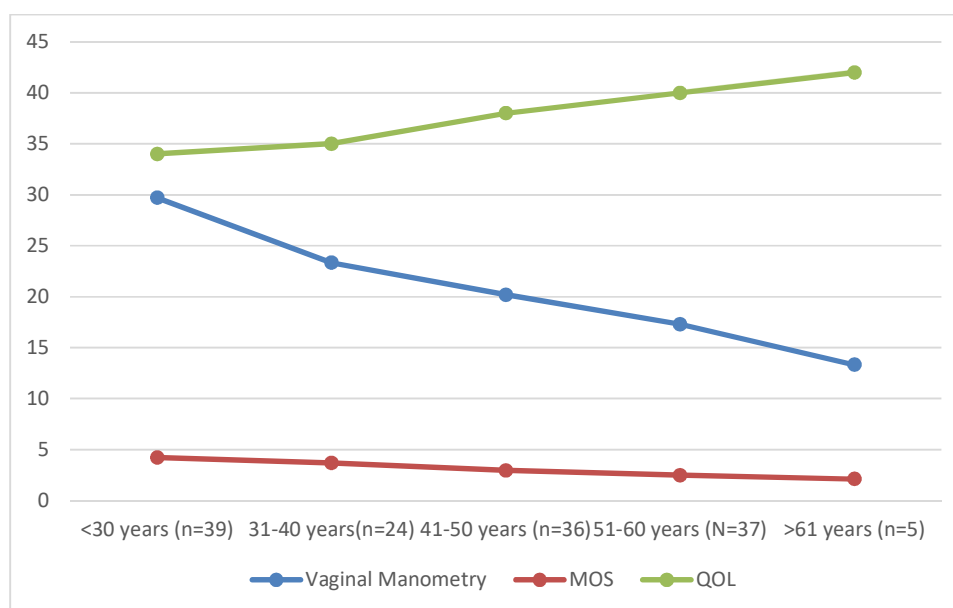


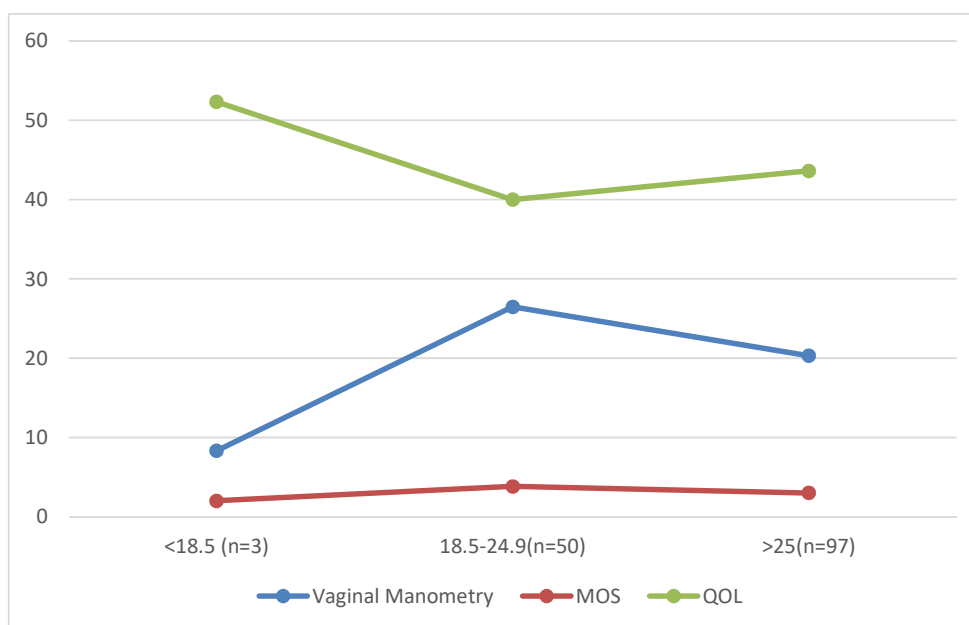
Figure 21: Effect of age on PFMS and vaginal manometry – line graph

Women aged <30 years had the highest vaginal manometry values at 29.75 ± 3.794 cmH₂O, which steadily decreased to 13.32 ± 5.19 cmH₂O in women aged >61 years. The statistical significance of this fall is indicated by the p-value of 0.001. In a similar vein, Modified Oxford Scale (MOS) scores, which rate the strength of the pelvic floor contraction on scale from 0-5, likewise significantly decreased as people aged. Younger women aged <30 years had the highest scores at 4.15 ± 0.622 , whereas women aged >61 years had the lowest scores at 2.11 ± 0.601 . The P-value (0.001) confirms that the reduction in MOS scores with age is statistically significant. The QoL (quality of life) scores, which measure degree of impairment caused by pelvic floor dysfunction, showed an increasing trend with age. Younger women aged <30 years had a lower QoL score of 34.73 ± 1.739 , indicating better QoL. In contrast, women aged >61 years reported higher QoL scores of 42.11 ± 8.283 , indicating greater impairment and discomfort. The P-value (0.04) suggests that this increase in QoL scores with age is statistically significant.

Table 24: Effect of BMI on PFMS and QOL

	BMI			P value
	<18.5 (n=3)	18.5-24.9(n=50)	>25(n=97)	
Vaginal Manometry	8.33 ± 4.93	26.48 ± 7.18	20.31 ± 7.32	<0.001
MOS	2.0 ± 1.0	3.82 ± 1.00	3.02 ± 0.80	<0.001
QOL	52.33 ± 11.06	40.00 ± 5.77	43.62 ± 9.43	<0.001

One-way ANOVA test (because there are more than 2 groups) is used to compare the means between different groups

**Figure 22: Effect of BMI on PFMS and QOL- line graph**

Vaginal manometry values were highest in women with a BMI of 18.5–24.9 at 27.11 ± 6.803MMHG and lowest in underweight women with a BMI of <18.5 at 8.33 ± 4.933MMHG. Women with a BMI of >25 had vaginal manometry values of 20.94 ± 7.493MMHG. The P-value (0.001) indicates that the difference in vaginal manometry values across BMI groups is statistically significant. The Modified Oxford Scale

(MOS) scores followed a similar pattern, with the highest values in women with a normal BMI 3.89 ± 0.970 and the lowest in underweight women 2.00 ± 1.000 . Overweight women had intermediate MOS scores at 3.89 ± 0.970 . The p-value of 0.0001 indicates that the relationship among BMI and MOS scores is statistically significant. Women with a normal BMI (35.60 ± 2.168), overweight women (37.93 ± 6.000), and underweight women (49.00 ± 10.536) had the greatest QoL scores. The P-value (<0.0001) suggests that the differences in QoL scores across BMI groups were statistically significant.

Table 25: Effect of socioeconomic status on PFMS and QOL

	Socioeconomic status					P Value
	Upper class (>9098) n=8	Upper middle class (4549-9097) n=54	Middle class (1364-2728) n=11	Lower middle class (1364-2728) n=76	Lower class (<1364) n=1	
Vaginal Manometry	30.0 ± 4.54	24.54 ± 7.21	27.64 ± 4.27	19.92 ± 7.91	8.0 ± 0.0	<0.001
MOS	4.12 ± 0.64	3.56 ± 0.86	3.91 ± 0.7	2.97 ± 0.89	1.0 ± 0.0	<0.001
QOL	35.0 ± 0.0	36.61 ± 5.31	35.0 ± 0.0	38.39 ± 5.98	50.0 ± 0.0	<0.001

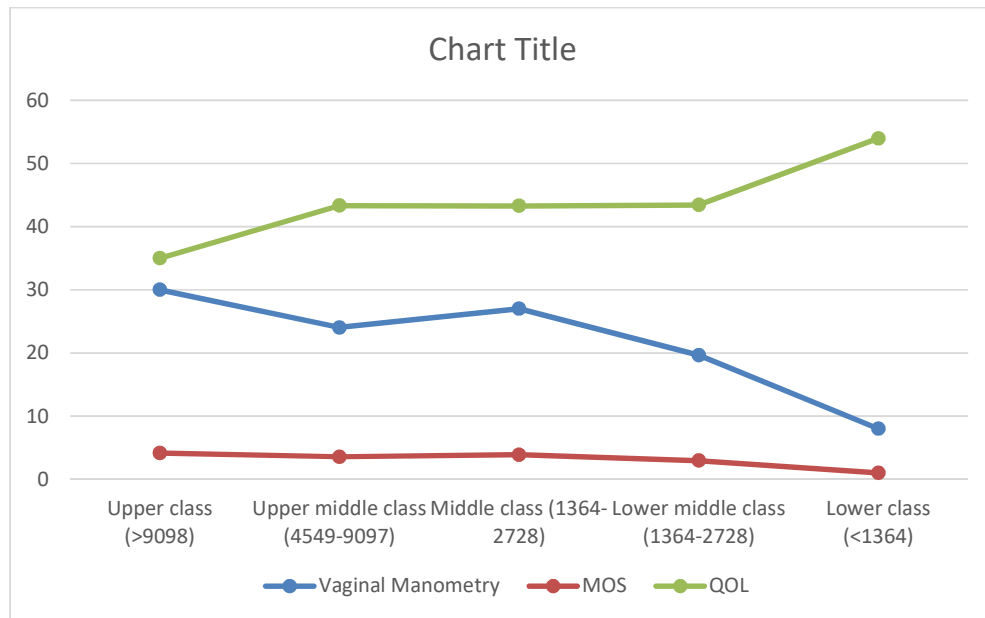


Figure 23: Effect of socioeconomic status on PFMS and QOL

Impact of Socioeconomic Status on Pelvic Floor Strength and Quality of Life

Vaginal Manometry was highest in upper-class women (30.0 mmHg) and lowest in lower-class women (8.0 mmHg). MOS Scores followed a similar trend: highest in the upper class (4.13) and lowest in the lower class (1.00). QoL Scores (higher = worse) were worst in the lower class (50.0) and best in the upper class (35.0).

P-values:

Vaginal Manometry & MOS: 0.001

QoL: <0.001

→ Indicates a **significant association** between socioeconomic status and all three measures.

Table 26: Effect of parity on PFMS and QOL

	Parity							P Value
	0 n=50	1 n=19	2 n=41	3 n=25	4 n=13	5 n=1	6 n=1	
Vaginal Manometry	29.72 ± 3.156	17.70 ± 7.039	23.48 ± 6.029	29.72 ± 3.156	17.70 ± 7.039	23.48 ± 6.029	29.72 ± 3.156	<0.001
MOS	4.10 ± 0.580	2.73 ± 0.777	3.42 ± 0.830	4.10 ± 0.580	2.73 ± 0.777	3.42 ± 0.830	4.10 ± 0.580	<0.001
QOL	36.0 ± 1.41	36.20 ± 7.88	43.45 ± 11.20	44.95 ± 11.20	43.58 ± 6.97	64.0 ± 0.001	44.00 ± 0.001	<0.001

One-way ANOVA test (because there are more than 2 groups) is used to compare the means between different groups

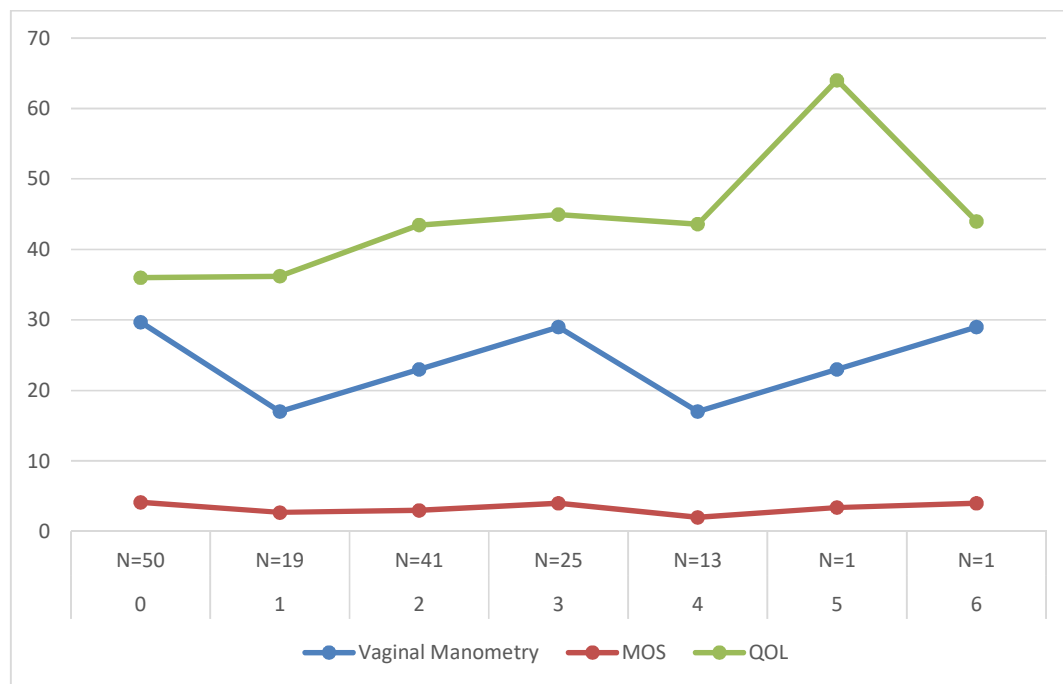


Figure 24: Effect of parity on PFMS and QOL

Vaginal Manometry was highest in nulliparous women (29.72 mmHg) and declined with more childbirths, reaching a low in women with 5–6 births (as low as 5.00 mmHg). MOS Scores followed the same pattern: highest in nulliparous women (4.10) and lowest in those with 5 or more births (1.00–2.00). QoL Scores (higher = worse) increased with parity: lowest in nulliparous women (36.0), and worst in those with 5 childbirths (64.0), indicating greater impact.

P-values:

- Manometry & MOS: 0.001
 - QoL: <0.001
- Strong, statistically significant relationship between increasing parity and reduced pelvic muscle strength and worsened QoL.

Figure 27: Effect of mode of delivery on PFMS and QOL

	Nil n=50	Vaginal n=73	LSCS n=24	Instrumental delivery n=3	P Value
Vaginal Manometry	29.72 ± 3.16	17.88 ± 7.12	23.48 ± 6.03	13.33 ± 1.15	<0.001
MOS	4.1 ± 0.58	2.74 ± 0.78	3.42 ± 0.83	2.67 ± 0.58	<0.001
QOL	35.0 ± 0.0	39.25 ± 7.09	35.78 ± 2.5	44.67 ± 2.89	<0.001

One-way ANOVA test (because there are more than 2 groups) is used to compare the means between different groups

Impact of Delivery Mode on Pelvic Floor Strength and Quality of Life

- Vaginal Manometry was: Highest in women with no delivery history (29.72 mmHg). Lowest in those with instrumental deliveries (13.33 mmHg). Higher in LSCS (23.48 mmHg) than vaginal deliveries (17.88 mmHg)
- MOS Scores: Highest and similar in women with no delivery, vaginal, or LSCS deliveries (~4.1–4.2). Lower in those with instrumental deliveries (2.74–3.42)
- QoL Scores (higher = worse): Best in women with no delivery (35.0). Worse in vaginal (39.25) and LSCS (35.78) deliveries. Worst in instrumental delivery group (44.67)

P-values:

- Manometry: 0.001
 - MOS & QoL: <0.001
- Strong statistical association between mode of delivery and pelvic floor outcomes.

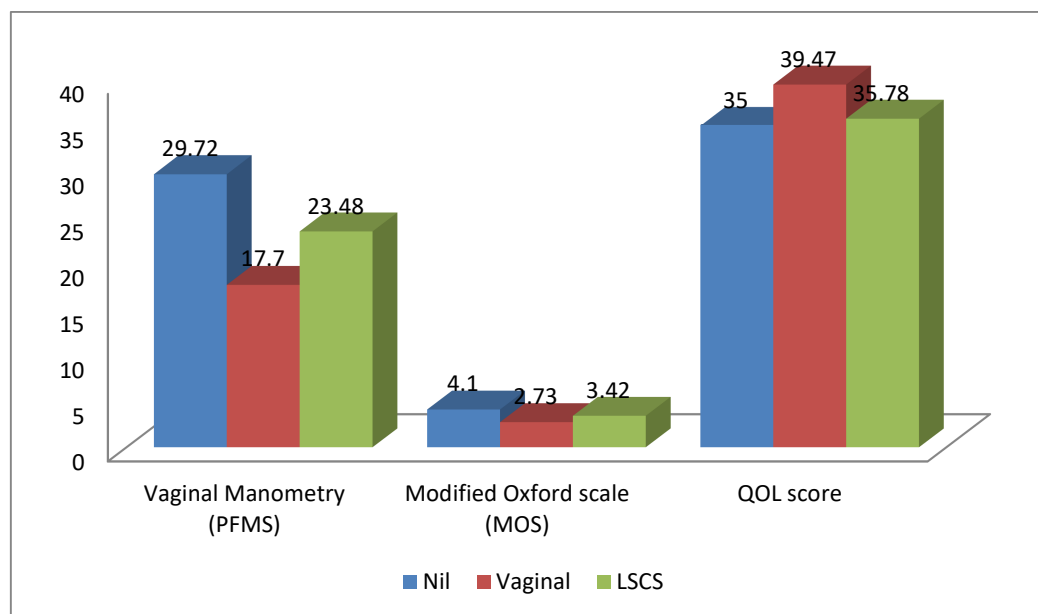


Figure 25: Effect of mode of delivery on PFMS and QOL

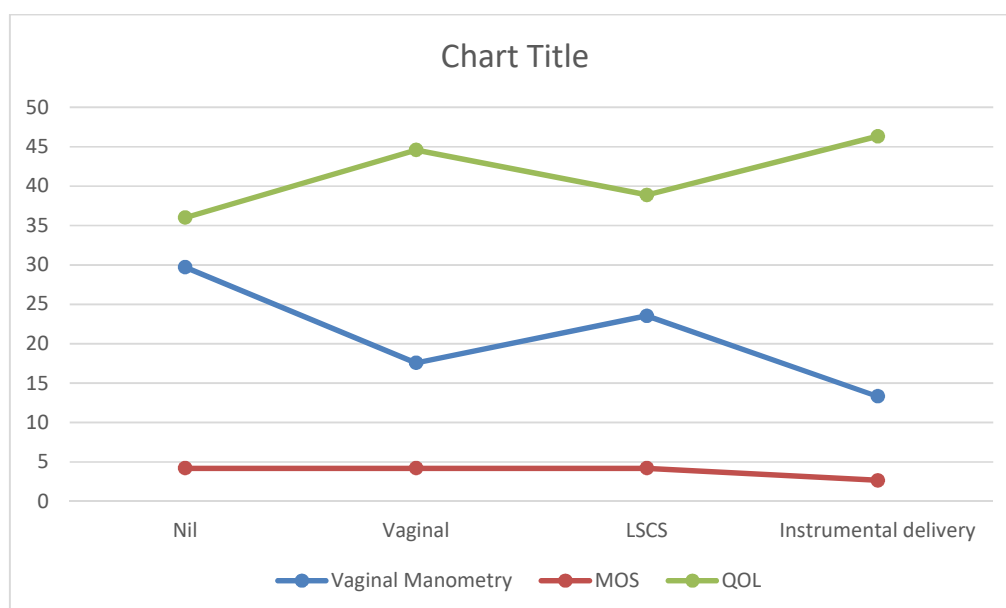


Figure 28: Effect of postnatal exercises on PFMS and QOL in parous women

	Postnatal exercises		
	Done N=5	Not done N=95	P Value
Vaginal Manometry	26.00 ± 3.347	22.48 ± 8.073	0.291
MOS	4.17 ± 0.408	3.27 ± 0.949	0.022
QOL	34.50 ± 1.225	37.51 ± 5.599	0.192

Mann-Whitney U Test is performed since there are only 2 groups

Vaginal manometry values were higher in women who had performed postnatal exercises (26.00 ± 3.34 mm hg) compared to those who had not performed them (22.48 ± 8.073 mm hg). A p value of 0.291 is not statistically significant. MOS scores were significantly higher in women who had performed postnatal exercises (4.17 ± 0.40) compared to those who had not performed them (3.27 ± 0.949). The p-value of 0.02 is statistically significant. QoL have been better (lower) in women who had performed postnatal exercises (34.50 ± 1.225) compared to those who had not

performed them (37.51 ± 5.599). However, the P-value (0.192) indicates that this difference in QoL scores was not statistically significant.

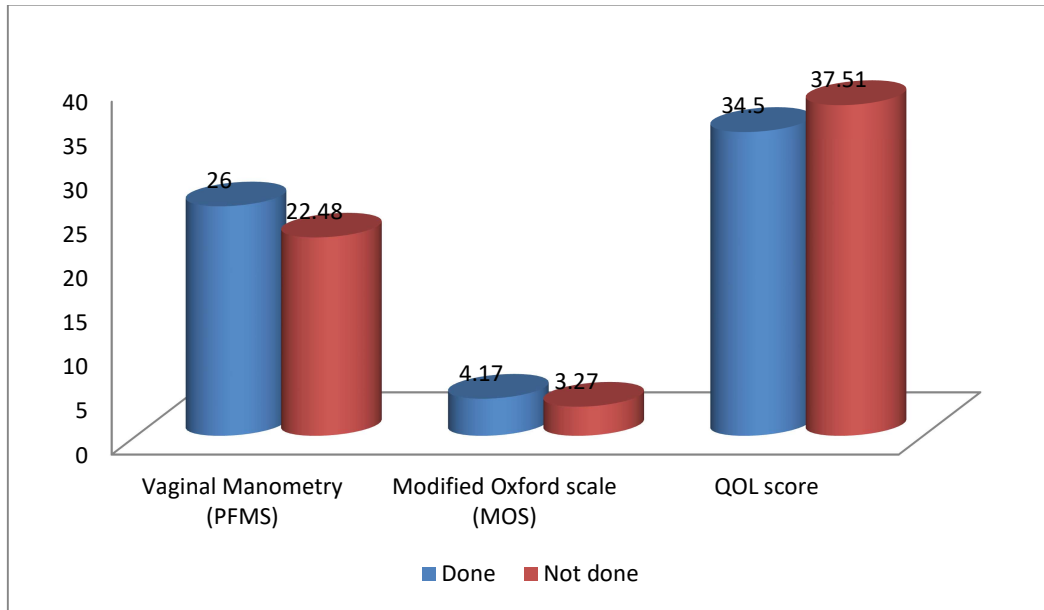


Figure 27: Effect of postnatal exercises on the PFMS and QOL- bar chart

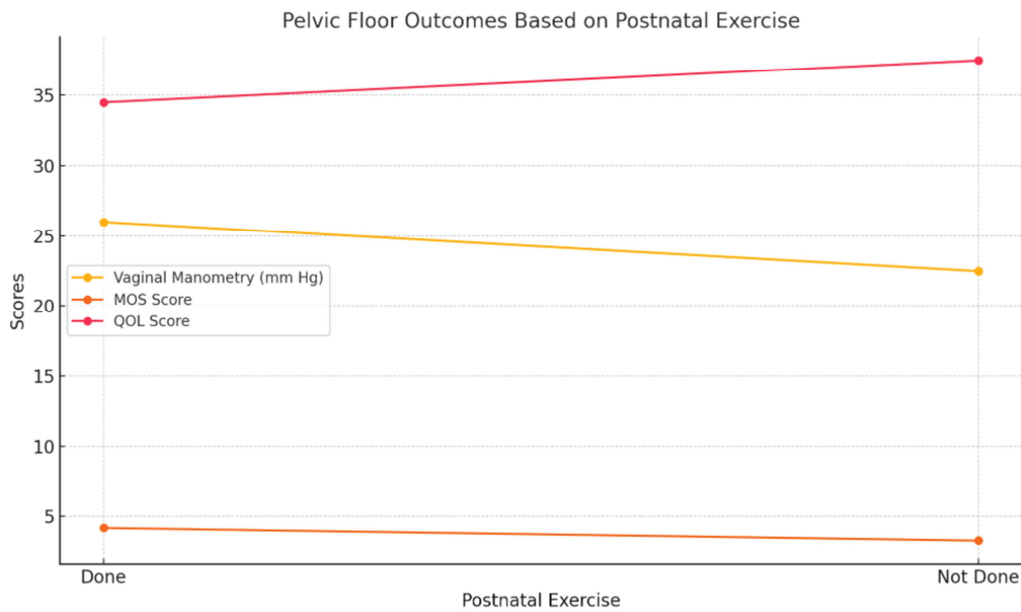


Figure 28: Effect of postnatal exercises on the PFMS and QOL- line chart

DISCUSSION

Women's general quality of life, pelvic organ support, and urine continence are all significantly impacted by PFMS. Present research intends to analyze effect of pelvic floor dysfunction on QoL and measure PFMS using perineometer readings and vaginal digital palpation. Women have been recruited from gynaecology as well as urogynecology outpatient clinics and categorized into nulliparous, premenopausal multiparous, and postmenopausal groups for this cross-sectional research, which has been carried out in tertiary care hospital. Understanding relationships between age, parity, and hormonal changes is vital for early identification as well as treatment of PFDs, as these factors have a substantial impact on PFMS.

Age:

The present study found that average age of postmenopausal women has been 56.02yrs, followed by that of perimenopausal women (39.62 years) and nulliparous women (28.82 years). Age range among the three groups exhibited considerable variation p-value of 0.001, indicating a statistically significant correlation among age as well as reproductive stage. PFMS and QOL was significantly reduced with increase in age (p-value:<0.0001).

According to Sarit-apirak et al., growing older is substantially linked to decreased PFM strength. The Brink scale scores of women over 65 were substantially lower than those of younger women (mean 7.56 ± 2.60 vs. 8.08 ± 2.50 , $p=0.014$). Furthermore, there has been a negative correlation among PFM strength & age (r is equal to -0.91 , p is equal to 0.010), suggesting that muscle performance gradually declines with age.⁸³

Chevalier et al. reported that mean age of research population has been 39.93 ± 12.27 yrs, ranging from 22-85 yrs. Study found that age was important factor in SUI prevalence, with older women being more affected.⁸⁸

The median age of postmenopausal women was 58 yrs, that of parous women was 27, and that of nulliparous women was 21 yrs, according to Pandey M et al. Before menopause, age was found to have a substantial impact on PFMS; however, following menopause, the number of yrs since menopause had a bigger detrimental effect on PFMS than age itself.⁷⁹

According to Mendes EPB et al., participants range in age has been 13 -37 yrs/o, with average age of 21.7 ± 4.8 yrs.⁸⁶

Sartori DV et al., found that aging significantly impacted PFMS, sexual activity, and orgasm frequency. Sexual activity and orgasm frequency declined after age 51, with a marked reduction in women over 60 years ($p=0.001$).⁹⁰

Gandhe S et al., studied elderly women aged 55-70 yrs with SUI.⁹¹

Ptak M et al., included women aged 45 to 60 yrs who had SUI. Study found that SUI is more prevalent in the perimenopausal period, where decreased estrogen levels contribute to tissue weakness and reduced PFMS.⁹²

BMI: In present research, No significant difference in BMI across groups, but a slight increase was observed in postmenopausal women. PFMS and QOL was significantly reduced with increase in BMI (p -value: <0.001)

Sarit-apirak et al, found no significant correlation among BMI and PFM function (mean Brink scale scores: 7.84 ± 2.53 for BMI <25 vs. 7.80 ± 2.59 for BMI ≥ 25 , $p=0.867$).⁸³

According to Chevalier et al., the study participants' mean BMI was within the normal range at 24.49 ± 3.54 . The research found that because extra weight puts pressure on the pelvic floor, weakening the muscles, a higher BMI is linked to a higher incidence of urine incontinence.⁸⁸

In Pandey M et al., average BMI was 27.45 kg/m² in nulliparous, 28.01 kilogram/m² in parous, as well as 34.63 kilogram/m² in postmenopausal women, indicating progressive increase in BMI with age. According to the research, women who are postmenopausal may have weaker PFM as a result of having a higher BMI.⁷⁹

Mendes EPB et al., classified women based on their nutritional status (BMI categories) but found no significant association among BMI and PFMS. At time of postpartum examination, most of women were within the acceptable weight range, and there were no discernible variations in PFMS among BMI groups.⁸⁶

In Sartori DV et al., BMI increased significantly with age, showing a positive correlation ($r=0.215$, $p=0.011$). Compared to younger women (G1), older women (G4) had a substantially higher BMI ($p = 0.042$). There may be a connection among obesity and sexual dysfunction because women who reported no sexual activity had a considerably higher BMI than those who did (p less than 0.001).⁹⁰

Ptak M et al., didn't detect significant association among BMI and SUI severity ($p=1.0$), suggesting that other factors, such as delivery and hormonal changes, may play greater role in pelvic floor dysfunction.⁹²

Socioeconomic Status:

In the present study, Lower middle-class was highest in perimenopausal (62%) and postmenopausal (66%) women, indicating a higher economic burden on aging

women. PFMS and QOL was significantly reduced in lower socioeconomic status (p-value:<0.001)

In Mendes EPB et al., Women with 12 or more years of education had significantly higher PFMS values (42.0 ± 26.3 cmH₂O) compared to those with lower education levels (p=0.036). Higher education levels, according to the authors, may be linked to increased access to perineal activities and improved health awareness.⁸⁶

Mode of Delivery:

Women in the current study had vaginal births in 70% of perimenopausal and 80% of postmenopausal women, which is associated with a higher risk of pelvic floor dysfunction.

The strength of the PFM was significantly affected by the mode of delivery, the strength was maximum in nulliparous and least in instrumental delivery. The PFMS was less in vaginal delivery than compared to C section.

Women in the current study had vaginal births in 70% of perimenopausal and 80% of postmenopausal women, which is associated with a higher risk of pelvic floor dysfunction. The strength of the PFM was significantly affected by the mode of delivery, the strength was maximum in nulliparous and least in instrumental delivery. The PFMS was less in vaginal delivery than compared to C section.

The strength of the PFM was not significantly impacted by the mode of delivery, according to Sarit-apirak et al. There was no statistically significant difference in Brink scale ratings among vaginal delivery and cesarean section (7.76 ± 2.55 vs. 7.84 ± 2.67 , p=0.893). This implies that maturity and parity may have a greater impact on PFM strength than vaginal birth alone.⁸³

In Chevalier et al., 64.4% of women had a normal vaginal delivery for their first labor, while 17.5% had a cesarean section, and 18% had an instrumental delivery. The second labor showed 78.3% vaginal deliveries, and the third labor had 81.5% vaginal deliveries, indicating that vaginal birth remains the dominant mode of delivery. 73% of women underwent an episiotomy, which could have implications for pelvic floor function. According to the research, women who gave birth vaginally were more likely than those who underwent a cesarean section to develop urine incontinence.⁸⁸

According to Pandey M et al., vaginal birth is the most common delivery method in this demographic, with 74% of premenopausal women and 97% of postmenopausal women having had a vaginal delivery. 26% of premenopausal and 3% of postmenopausal women had cesarean sections. According to the research, there was no statistically significant difference in PFMS between premenopausal and postmenopausal women based on the route of delivery ($P = 0.337$ and $P = 0.906$, correspondingly).⁷⁹

Mendes EPB et al., compared PFMS among normal vaginal delivery and cesarean section. With no statistically significant difference ($p=0.697$), the mean PFMS for cesarean delivery was 25.4 cmH₂O (± 14.7) and for normal birth it was 24.0 cmH₂O (± 16.2).⁸⁶

In Ptak M et al., All participants had at least one vaginal delivery. According to the research, severe symptoms of SUI were more common among women who had given birth three or more times. Vaginal childbirth was identified as a major contributor to PFMS weakening, leading to higher risk of urinary incontinence (UI).⁹²

Parity :

In the present study the PFMS is reducing trend as age increases . Parity among the three groups exhibited considerable variation p-value of 0.001, indicating a statistically significant correlation among parity in different age groups . PFMS and QOL was significantly reduced with increase in parity (p-value:<0.001)

It was discovered that parity has a major effect on PFMS. Parous women had significantly lower Brink scale scores compared to nulliparous women (7.76 ± 2.55 vs. 8.66 ± 2.63 , $p=0.046$).⁸³

In Chevalier et al., mean number of pregnancies per woman was 1.89 ± 1.21 , with a mean of 1.56 deliveries. Multiple deliveries were reported by 2.45% of the study participants. The study confirmed that multiparity negatively impacts pelvic floor muscle function, supporting the need for early pelvic floor rehabilitation.⁸⁸

In Pandey M et al., Parity was significantly associated with lower PFMS ($P = 0.007$). Higher parity was linked to decreased PFMS in both premenopausal and postmenopausal women.⁷⁹

In Gandhe S et al., Multiparity was associated with increased pelvic floor weakness, confirming that repeated pregnancies and vaginal births contribute to muscle deterioration.⁹¹

In Ptak M et al., found that higher parity (≥ 3 vaginal deliveries) was associated with a greater decline in PFMS. Women who had fewer than three vaginal deliveries benefited more from pelvic floor muscle training (PFMT) than those who had multiple births ($p=0.025$).⁹²

Postnatal Exercise Practices:

In the present study, Only Six perimenopausal women (12%) had performed postnatal exercises, while none of the postmenopausal women had done them. A staggering 100% of postmenopausal women, and 88% of perimenopausal women, had never performed postnatal exercises. The highest percentage of non-adherence was among postmenopausal women (100%). The correlation was determined to be statistically significant. Women who performed perineal exercises during pregnancy had significantly higher PFMS (26.00 ± 3.347 mmhg) compared to those who did not (22.48 ± 8.073).⁸⁶

In Pandey M et al., women who performed perineal exercises during pregnancy had significantly higher PFMS (42.6 ± 25.4 cmH₂O) compared to those who did not (11.8 ± 4.9 cmH₂O, $p=0.010$).⁸⁶

Pelvic Floor Muscle Strength using Modified Oxford Scale:

In present study, 42.9% of postmenopausal women had weak contractions, while only 16.3% of perimenopausal women and none of the nulliparous women had weak contractions. Good PFM contraction was observed in 68% of nulliparous women but only in 10% of postmenopausal women. No postmenopausal women had strong contractions. Nulliparous women had the maximum MOS (4.15 ± 0.62) and decreased significantly in perimenopausal and postmenopausal women (3.24 ± 0.77 and 2.5 ± 0.7) and PFMS shows statistical difference among nulliparous, perimenopausal and postmenopausal women

Similarly in Pandey M et al., the mean MOS in nulliparous , parous and post menopausal were 4.66 ± 0.48 , 3.9 ± 0.87 and 2.5 ± 0.54 respectively.

Pelvic Floor Muscle Strength using pressure manometry (Perineometer)

In the present study nulliparous women had maximum mean PFMS of 29.7 ± 3.4 and has decreased significantly in perimenopausal 20.2 ± 7.1 , with postmenopausal women having the least 17.7 ± 7.23 . Similarly in Pandey M et al., the mean pressure manometry in nulliparous, parous and post menopausal were 40.04 ± 2.3 , 37.69 ± 3.23 and 34.93 ± 3.54 respectively.

Bladder Symptoms and Their Severity

In the current research, there has been statistically significant correlation p -value = 0.03 between urinary frequency and weak pelvic floor contractions in 42.9% of postmenopausal women. Postmenopausal women experienced considerably higher rates of nocturia ($P = 0.001$), which had an impact on the quality of their sleep. Urinary Urgency affects both perimenopausal and postmenopausal women, though not statistically significant. Urge Incontinence was more common in postmenopausal women ($P = 0.64$), but present across all groups. Stress Incontinence was higher in postmenopausal women ($P = 0.03$), indicating weaker pelvic floor support. Nocturnal Enuresis was more prevalent in postmenopausal women ($P = 0.03$), suggesting worsening bladder control. Intercourse Incontinence was more frequent in perimenopausal women ($P = 0.01$), likely due to transitional hormonal changes.

High prevalence rates of bladder symptoms, involving SUI (47.5%), urgency urine incontinence (43.7%), and defecatory difficulties (29.4%), were described by Sarit-apirak et al. These symptoms were negatively correlated with PFM function, indicating that weaker pelvic muscles are associated with increased bladder dysfunction.⁸³

In Chevalier et al., 41.4% of women reported experiencing urinary leakage. 46.3% suffered from stress incontinence, particularly during coughing, laughing, or jumping (68.1%), confirming that PFM weakness is a primary factor in incontinence. 37.3% of women reported urine loss during intercourse. 49.1% reported experiencing an urgent desire to urinate, indicating a high prevalence of urge incontinence. 30.4% of women reported fecal incontinence, highlighting the importance of pelvic floor assessment beyond urinary symptoms.⁸⁸

In Mendes EPB et al., Urinary incontinence (UI) was more prevalent during pregnancy than postpartum. Among women with persistent UI two months postpartum, most had also experienced UI during pregnancy. UI and PFMS did not significantly correlate p-value of 0.448, indicating that postpartum UI is influenced by factors other than muscle strength.⁸⁶

In Gandhe S et al., All participants had SUI, confirmed using the Questionnaire for Urinary Incontinence Diagnosis (QUID). Prevalence of SUI was 75-80%, making it a major concern in ageing women. A significant improvement in QUID scores was observed after perineometer-based pelvic floor training.⁹¹

In Ptak M et al., All participants had stage 1 SUI. The study confirmed that women with higher parity had more severe SUI symptoms (p=0.025). Pelvic floor muscle training (PFMT) significantly reduced bladder symptoms, with greater improvement seen in women with fewer than three vaginal deliveries.⁹²

Impact on Daily Life and Quality of Life

Present study, 42% of perimenopausal and 48% of postmenopausal women experienced some limitation in physical activities. Travel was significantly affected in postmenopausal women (P = 0.001), likely due to concerns about leakage. Some

social limitations were reported, with 20% of postmenopausal women experiencing slight restrictions. A minimal percentage of postmenopausal women reported moderate-to-severe emotional suffering, despite observation of mild instances of melancholy, anxiety, and low self-esteem.

Sarit-apirak et al. used the PFBQ (Pelvic Floor Bother Questionnaire) to measure pelvic floor dysfunction. The research found that incontinence, urine urgency, and pelvic organ prolapse had a major negative impact on everyday living and wellbeing, resulting in a lower QoL.⁸³

Chevalier et al. evaluated QoL using SF-12 and EuroQol-5D. According to 50.6% of women, their everyday lives were greatly impacted by their urinary problems. 63.4% discussed their symptoms with family or friends, and 87.3% sought medical advice, indicating high awareness but also significant burden.⁸⁸

Sartori DV et al., focused on sexual function and pelvic floor endurance rather than daily life limitations. However, there may have been an effect on QoL because PFMS was considerably greater in sexually active women than in non-sexually active women ($p=0.033$).⁹⁰

According to Gandhe S et al., SUI is a condition that negatively impacts QoL and is both socially and hygienically upsetting. One of the most important non-invasive treatment options was highlighted: physical therapy.⁹¹

The ICIQ-LUTS questionnaire, which addresses physical limitations, social restrictions, emotional effects, sleep, and weariness, was used to measure QoL. Women who completed PFMT showed statistically significant improvements in QoL, particularly in: Household duties and outdoor activities ($p=0.025$); Social interactions and travel ($p<0.001$); Emotional well-being and reduced anxiety ($p<0.001$).⁹²

Sleep and Energy Levels

In the present study, Postmenopausal women had significantly more sleep disturbances ($P = 0.02$), primarily due to nocturia. Bladder dysfunction did not strongly correlate with fatigue ($P = 0.53$), but sleep disruption could contribute to energy depletion.

In Ptak M et al., PFMT significantly improved sleep quality and reduced fatigue ($p=0.006$). Women who underwent PFMT had fewer nighttime awakenings due to bladder urgency, supporting the role of pelvic floor rehabilitation in sleep improvement.⁹²

Coping Mechanisms for Bladder Dysfunction

In the present study, Most women did not rely on absorbent pads for bladder control ($P = 0.91$). Significant fluid intake regulation among postmenopausal women ($P = 0.001$), may contribute to dehydration risks. Changing Underclothes was not a major concern for most women, indicating that severe leakage is not widespread. Occasional concern in some perimenopausal and postmenopausal women, but not a major issue overall.

In Chevalier et al., 40.7% of women reported using pads to manage urine leakage, with an average of 2.38 pads per day. 31.8% of participants reported reducing fluid intake to control symptoms, which could increase the risk of dehydration and other health complications.⁸⁸

In Ptak M et al., PFMT significantly reduced the need for panty liners, fluid intake restriction, and frequent underwear changes ($p<0.001$). Women who performed

PFMT reported less embarrassment about their symptoms, leading to improved social confidence.⁹²

Use of Hormonal Therapy and Anal Incontinence

In the present study, None of the participants had taken hormonal therapy. Only postmenopausal women (6.1%) reported anal incontinence (P = 0.04).

In Chevalier et al., 23.2% of menopausal women had received hormonal treatment, suggesting some reliance on hormonal therapy to manage pelvic floor dysfunction. 25.3% of women reported gas incontinence, while 30.4% reported fecal incontinence.⁸⁸

In Ptak M et al., All participants underwent intravaginal estrogen therapy alongside PFMT. Hormonal therapy alone did not significantly impact SUI, but when combined with PFMT, it enhanced QoL improvements.⁹²

Pelvic Floor Muscle Strength (Modified Oxford Scale):

In present study, 42.9% of postmenopausal women had weak contractions, while only 16.3% of perimenopausal women and none of the nulliparous women had weak contractions. Good PFM contraction was observed in 60% of nulliparous women but only in 10.2% of postmenopausal women. No postmenopausal women had strong contractions.

Sarit-apirak et al assessed PFM strength using the Brink scale, which evaluates squeeze pressure, contraction duration, and vertical displacement. PFM strength was significantly lower in older women and those with higher stages of anterior and apical prolapse ($r=-0.90$, $p<0.05$). 55 women (9.5%) experienced strong contractions of their

pelvic muscles, whereas 47 women (8.1%) could not contract them at all. PFM function was negatively connected with parity and hysterectomy history.⁸³

In Chevalier et al., Strength assessment using the perineometer showed a mean score of 7.64 ± 2.55 , with most women falling in the moderate strength range. The Modified Oxford Scale results showed: 27.9% had very weak muscle strength; 17.8% had weak muscle strength; 37.5% had very strong contractions. A strong correlation was found between manual palpation and perineometer assessment, supporting the reliability of both methods in evaluating pelvic floor strength.⁸⁸

According to Pandey M et al., there was a noticeable decrease in muscle strength following childbirth, with PFMS among 41 and 50cmH₂O in 50% of nulliparous women, among 21 and 30cmH₂O in 81% of parous women.⁷⁹

In Mendes EPB et al., PFMS was assessed using a perineometer (Peritron™ 9301). There was no discernible difference in PFMS among cesarean and regular deliveries. Education level and prenatal perineal exercises were the strongest predictors of higher PFMS values.⁸⁶

In Sartori DV et al., PFMS was measured using a perineometer and electromyography (EMG). Women who had sexual intercourse had significantly longer PFM contraction time ($p=0.033$). Women who experienced orgasm also had higher PFM contraction time ($p=0.018$), indicating that stronger PFMS correlates with better sexual function. No statistical difference in PFMS between women with and without orgasm was found in absolute strength values.⁹⁰

In Gandhe S et al., PFMS has been measured using a perineometer. Strength was classified as weak, moderate, normal, strong, or very strong. Baseline assessments showed a higher number of women with weak contractions. After training, significant

improvement was noted, with a shift from weak to moderate and moderate to normal endurance levels. This study supports the perineometer as a valid tool for assessing and improving PFMS.⁹¹

Ptak M et al. found that PFMT significantly increased pelvic floor strength, with women in Group A (PFM + TrA training) gaining more than those in Group B (PFM alone). Women with fewer than three vaginal deliveries benefited more from PFMT than those with multiple births ($p=0.025$). TrA co-activation significantly enhanced pelvic floor contraction efficiency, confirming that combined core and pelvic floor strengthening improves PFMS outcomes.⁹²

Quality of Life (QoL) Scores:

In the present study, Postmenopausal women had the highest QoL impact score (41.34 ± 9.6), followed by perimenopausal women (38.91 ± 6.40) and nulliparous women (36.04 ± 1.0093). The P-value (0.9), however, indicates that there isn't statistically significant variation in groups' QoL.

In the current research, there has been statistically significant correlation $p\text{-value} = 0.0002$ between urinary frequency and the age groups in 4% of postmenopausal women had a lot of urinary symptoms.

Postmenopausal women experienced considerably higher rates of nocturia ($P = 0.003$), which had an impact on the quality of their sleep.

Urinary Urgency affects both perimenopausal and postmenopausal women, though not statistically significant. Urge Incontinence was more common in postmenopausal women ($P = 0.0206$), but present across all groups.

Stress Incontinence was higher in postmenopausal women ($P = 0.0001$), indicating weaker pelvic floor support.

Nocturnal Enuresis was more prevalent in postmenopausal women ($P = 0.00017$), suggesting worsening bladder control.

Intercourse Incontinence was more frequent in perimenopausal women ($P = 0.01$), likely due to transitional hormonal changes.

In the present study, Postmenopausal women had the highest QoL impact score (41.34 ± 9.6), followed by perimenopausal women (38.91 ± 6.40) and nulliparous women (36.04 ± 1.0093). The P-value (0.0051), however, indicates that there isn't statistically significant variation in groups' QoL.

Sarit-apirak et al. indicate that pelvic floor dysfunction significantly diminishes quality QoL, particularly in women with advanced pelvic organ prolapse as well as incontinence. The necessity of PFM training and early intervention to enhance functional results and general well-being is supported by this finding.⁸³

Chevalier et al. didn't find significant association among PFM strength as well as reported QoL, suggesting that subjective symptom burden and objective muscle strength are not necessarily the same.⁸⁸

In Sartori DV et al., Sexual dysfunction increased significantly with age, impacting the overall QoL in older women.⁹⁰

Gandhe S et al. discovered that pelvic floor training significantly improved QUID (urinary incontinence distress scores). Pre-training QUID scores were high, but after strengthening with the perineometer, significant reductions were observed, indicating improved quality of life.⁹¹

In Ptak M et al., ICIQ-LUTS scores improved significantly after PFMT, with greater benefits observed in women with fewer than three vaginal deliveries ($p < 0.001$). Improvements were seen in social life, travel, physical activity, and emotional well-being, reinforcing the role of PFMT in enhancing daily function and self-esteem.⁹²

CONCLUSION

This study highlights a progressive decline in PFMS and an increasing burden of bladder dysfunction as women transition from nulliparous to perimenopausal and postmenopausal stages. Pelvic floor muscle strength calculated by MOS and vaginal manometry using perineometer has statistically significant linear correlation.

Here since the same examiner has conducted both vaginal manometry and Modified Oxford Scale, subjective bias noted. Hence vaginal manometry can be preferred over MOS to avoid subjective bias. Factors affecting pelvic floor muscle strength are age, BMI, socioeconomic status, parity, mode of delivery, postnatal exercises and menopausal status. Due to their notably lower PFM, postmenopausal women had greater rates of stress incontinence, urge incontinence, nocturia, and anal incontinence. This, in turn, had an impact on their physical mobility, social engagement, and quality of sleep. Despite these issues, none of the participants had taken hormonal therapy, indicating a reliance on non-hormonal management strategies. Perimenopausal women emerged as a critical group where symptoms begin to manifest, making early intervention with pelvic floor exercises, bladder training, and lifestyle modifications essential to delay progression. The absence of strong PFM contractions in postmenopausal women underscores the importance of preventive measures before menopause to maintain bladder control and overall pelvic health. Early intervention with pelvic floor exercises, lifestyle modifications, and bladder training could prevent the worsening of symptoms and improve the overall QoL.

SUMMARY

Demographics and General Characteristics

- Age: Postmenopausal women had the highest mean age (56.02 years), followed by perimenopausal (39.62 years) and nulliparous women (28.82 years).
- BMI: No significant difference in BMI across groups, but a slight increase was observed in postmenopausal women.
- Mode of Delivery: Vaginal delivery, which happened to 70% of perimenopausal and 80% of postmenopausal women, is a risk factor for pelvic floor dysfunction.
- Socioeconomic Status: Lower middle-class was highest in perimenopausal (62%) and postmenopausal (66%) women, indicating a higher economic burden on aging women.

Pelvic Floor Muscle Strength (Modified Oxford Scale)

- PFM Weakness: 42.9% of postmenopausal women had weak contractions, while only 16.3% of perimenopausal women and none of the nulliparous women had weak contractions.
- Good PFM contraction was observed in 60% of nulliparous women but only in 10.2% of postmenopausal women.
- No postmenopausal women had strong contractions.

Bladder Symptoms and Their Severity

- Urinary Frequency: 2% of postmenopausal women had lot of bladder frequency problems

- Nocturia: Significantly more frequent in postmenopausal women ($P = 0.0035$), affecting their sleep quality.
- Urinary Urgency: Affects all age groups, P value-0.013 statistically significant
- Urge Incontinence: More common in postmenopausal women ($P = 0.0206$), but present across all groups.
- Stress Incontinence: Higher in postmenopausal women ($P = 0.0001$), indicating weaker pelvic floor support.
- Nocturnal Enuresis: More prevalent in postmenopausal women ($P = 0.0017$), suggesting worsening bladder control.
- Intercourse Incontinence: More frequent in perimenopausal women ($P = 0.01$), likely due to transitional hormonal changes.

Impact on Daily Life and Quality of Life

- Physical Limitations: 26% of perimenopausal and 18% of postmenopausal women experienced some limitation in physical activities. Travel was significantly affected in postmenopausal women ($P = <0.002$), likely due to concerns about leakage.
- Social Limitations: Some social limitations were reported, with 20% of postmenopausal women experiencing slight restrictions.
- Emotional Impact: Mild depression, anxiety, and self-esteem issues were observed, but only a small subset of postmenopausal women reported moderate-to-severe emotional distress.

Sleep and Energy Levels

- Bladder Issues Affecting Sleep: Postmenopausal women had significantly more sleep disturbances ($P = <0.001$), primarily due to nocturia.

- **Fatigue and Energy Levels:** Bladder dysfunction did not strongly correlate with fatigue ($P = 0.1$), but sleep disruption could contribute to energy depletion.

Coping Mechanisms for Bladder Dysfunction

- **Use of Pads:** Most women did not rely on absorbent pads for bladder control ($P = 0.36$).
- **Fluid Restriction:** Significant fluid intake regulation among postmenopausal women ($P < 0.0001$), which may contribute to dehydration risks.
- **Changing Underclothes:** Not a major concern for most women, indicating that severe leakage is not widespread. P value-0.19 not significant.
- **Concerns About Odor:** Occasional concern in some perimenopausal and postmenopausal women, but not a major issue overall. P value-0.026 statistically significant.

Use of Hormonal Therapy and Anal Incontinence

- **Hormonal Therapy:** None of the participants had taken hormonal therapy.
- **Anal Incontinence:** Only postmenopausal women (6.1%) reported anal incontinence ($P = 0.04$).

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ANNEXURE –I - INFORMED CONSENT FORM

“Assessment of Pelvic Floor Muscle Strength in Women and Its Associated factors – A Cross Sectional Study in a Tertiary care centre.”

Name of Student/Principal Investigator:

Name of Guide/Co Investigators:

Explanation of procedure: If you agree to enroll yourself in my study, then your detailed present and past history will be taken to know if you are eligible for this study or not. If you have even one of the exclusion criteria, you will not be enrolled in the study. If you are eligible, questionnaire with examination will be done. Examination will be done per vaginally by manual digital palpating and by perineometry to assess the pelvic floor muscle strength. Questionnaire will be asked to assess its affect on quality of life.

Withdrawal from participation in the study: Participation in this study in voluntary. You will be free to decide whether to participate in this study or continue participation once enrolled. In case you decide to withdraw your participation, you are free to do so. However, please convey the decision to the principal investigator.

Possible benefits from participating in the study: The benefits of taking part in this research is, your participation being valuable contribution to medical research to improvise treatment currently practiced. Early detection of pelvic floor muscle weakness resulting in early intervention to correct it using kegel’s exercises and postnatal exercises. The data gathered will help population at large.

Possible risks from participating in the study: There are no risks involved in participating in this study. (The benefits of taking part in this research is, your participation being valuable contribution to medical research to improve treatment currently practiced. Early detection of pelvic floor muscle weakness resulting in early intervention to correct it using kegel's exercises and postnatal exercises. The data gathered will help population at large.

Privacy and confidentiality: The information collected from you will be coded, to prevent any person to identify you. Your identity will never be revealed. The data collected from you will be kept confidential and only processed or aggregated data will be used for publication.

Financial incentives: You will not receive any payment for participating in this study.

Cost of investigations done during the course of study will be paid by the principal investigator

Authorization for publication of aggregated data: Results obtained after processing of the aggregated data will be published for scientific purpose and or presented to scientific groups. However, your identity will never be revealed.

Questions: In case of any questions with regard to this study, you are free to contact: Dr. Harsha Hegde, Chairperson, Ethical committee of JNMC, 0831-2473777 Extension 4052.

Legal rights: By signing this consent form, we are not waving any of your legal rights

CONSENT STATEMENT

I am making a voluntary decision to participate in the study “**Assessment of Pelvic Floor Muscle Strength in Women and Its Associated factors – A Cross Sectional Study in a Tertiary Care Centre**”

My signature below indicates that I have decided to participate and I have read the information provided above or the information provided above has been read to me in the language that I understand best. I was given the opportunity to ask questions and that they have been answered to my satisfaction.

Name of the participant:

Signature or left thumb impression of the participant:

Name of the witness:

Signature or left thumb impression of the witness:

Name of the investigator:

Signature of the investigator:

ANNEXURE –II

MASTER CHART

SL NO.	OP Number	Age	Occupation	Address	Socioeconomic status	BMI	Married life	Obstetric score	Mode of delivery	Episiotomy, Prolonged labour, Instrumental delivery, Perineal tear history	postnatal exercises done	Previous pelvic surgeries	Associated conditions	Menopause attained	Any complaints of urinary incontinence	15.ii How much do you think bladder problem affects your life ?	15.iii.a.	15.iii.b.	Physical/ social limitation 15.iv.a.	15.iv.b	15.iv.c	15.iv.d	Personal relationships 15.v.a	15.v.b	15.v.c	Emotions 15.vi.a	15.vi.b	15.vi.c	Sleep/ energy 15.vii.a	15.vii.b	Do you do any of the following ? If so, how much ? 15.viii.a	15.viii.b	15.viii.c	15.viii.d	We would like to know what your bladder problems are and how much they affect you and how much it will affect you ? 15.ix.a	15.ix.b	15.ix.c1	15.ix.c2	15.ix.d	15.ix.e	15.ix.f	15.ix.g	15.ix.h	QOL score	Took any hormonal treatment	Any c/o anal continence?	Modified Oxford scale	PFMS using Perinometer					
1	7566494	34	teacher	hukkeri	upper middle class	23	10	nulligravida	nil	nil	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	4	32		
2	7636980	22	housewife	alarwadi, belagavi	lower middle class	26	3	nulligravida	nil	nil	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	4	30		
3	7110917	21	housewife	vaibhav nagar, belagavi	upper class	23	2	nulligravida	nil	nil	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	5	36		
4	8276982	19	BSE student	hukkeri	lower middle class	19	6m	nulligravida	nil	nil	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	4	30
5	7515162	22	teacher	yalparatti	lower middle class	20	1.5	nulligravida	nil	nil	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	5	34
6	7649590	31	sister	ashoka nagar	upper middle class	22	1.5	A1	nil	nil	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	4	26
7	6820376	26	housewife	azam nagar, belagavi	lower middle class	22	6	nulligravida	nil	nil	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	4	30	
8	87905462	24	tailor	belagavi	upper middle class	23	4	nulligravida	nil	nil	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	4	28	
9	62435352	28	shopkeeper	vadgaon	middle class	26	5	nulligravida	nil	nil	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	3	24		
10	65436572	25	housewife	belagavi	upper class	20	2	nulligravida	nil	nil	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	4	30	
11	67231420	21	housewife	hukkeri	middle class	19	2	nulligravida	nil	nil	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	5	32	
12	7528160	28	housewife	baihongal	upper middle class	33	6	nulligravida	nil	nil	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	3	26	
13	7631532	26	engineer	panchakhshari nagar, gadag	upper class	25	1	A1	nil	nil	2	lap cholecystectomy	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	4	28			
14	7566494	43	housewife	khanapur	lower middle class	30	28	A2	nil	nil	2	DHL	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	3	24		
15	7576432	30	engineer	sadhashivnagar, belagavi	upper class	34	18	A1	nil	nil	2	DHL	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	4	30			
16	7186838	29	IT	camp. belagavi	upper middle class	28	3.5	A1	nil	nil	2	nil	nil	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	4	32			
17	7678479	26	enginner	belagavi	upper class	26	2	A1	nil	nil	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	4	30			
18	71866838	29	homemaker	hukkeri	upper middle class	23	1	A1	nil	nil	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	5	34			
19	7552681	33	homemaker	gandhi nagar	upper middle class	30	12	A1	nil	nil	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	4	28			
20	7651670	34	homemaker	pune	upper middle class	26	7	A1	nil	nil	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	4	28			
21	7691042	48	homemaker	baihongal	lower middle class	30	15	A1	nil	nil	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	4	26			
22	7609343	35	teacher	gandinagar, belagavi	upper middle class	30	12	nulligravida	nil	nil	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	4	30				
23	7325468	38	homemaker	bailhongal	lower middle class	26	12	A1	nil	nil	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	4	30				
24	7572444	32	homemaker	belagavi	middle class	23	7	nulligravida	nil	nil	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	4	30				
25	3460018	41	homemaker	hosur	middle class	33	12	A2	nil	nil	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	2	4	4	4	4	35	2	2	4	28		
26	7605260	23	homemaker	belagavi	upper middle class	27	2	A1	nil	nil	2	nil	nil	2	2	2	1	1	2	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	2	1	4	4	1	1	1	2	4	4	4	4	35	2	2	4	30		
27	7405493	34	homemaker	khanapur	middle class	24	4	A1	nil	nil	2	nil	nil	2	2	2	1	1	2	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	2	4	4	4	4	35	2	2	4	30		
28	7508672	25	homemaker	belagavi	upper middle class	33	3	A1	nil	nil	2	nil	nil	2	2	2	1	1	2	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	2	4	4	4	4	35	2	2	4	30			
29	7546340	24	homemaker	kadoli	upper middle class	32	1	nulligravida	nil	nil	2	nil	nil	2	2	2	1	1	2	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	2	4	4	4	4	35	2	2	3	28			
30	7519432	29	homemaker	kittur	lower middle class	26	6	nulligravida	nil	nil	2	nil	nil	2	2	2	1	1	2	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	2	4	4	4	4	35	2	2	4	30			
31	7478961	40	housewife	thindalaga, belagavi	upper middle class	34	8	A1	nil	nil	2	D and C	nil	1	1	2	1	1	2	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	2	4	4	4	4	35	2	2	3	20			
32	7437662	30	homemaker	kittur	upper middle class	30	6	A2	nil	nil	2	D and C	nil	2	2	2	1	1	2	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	2	4	4	4	4	35	2	2	4	32			
33	7479904	24	BSE student	pathihal	middle class	24	8	A1	nil	nil	2	nil	nil	2	2	2	1	1	2	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	2	4	4	4	4	35	2	2	5	34			
34	7566975	21	accountant	kadoli	upper middle class	22	1	A1	nil	nil	2	nil	nil	2	2	2	1	1	2	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	4	4	1	1	1	2	4	4	4	4	35	2	2	5	30				
35	7081459	21	homemaker	itagi, khanapur	upper class	23	2	A1	nil	nil	2	nil	nil	2	2	2	1	1	2	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	4	4	1	1	1	2	4	4	4	4	35	2	2	4	28				
36	7646043	32	homemaker	savadatti	upper middle class	22.6	4	A2	nil	nil	2	DHL	nil	2	2	2																																					

SL NO.	OP Number	Age	Occupation	Address	Socioeconomic status	BMI	Married life	Obstetric score	Mode of delivery	Epistomomy, Prolonged labour, Instrumental delivery, Perineal tear history	postnatal exercises done	Previous pelvic surgeries	Associated conditions	Menopause attained	Any complaints of urinary incontinence	15.ii.How much do you think bladder problem affects your life ?	15.iii.a.	15.iii.b.	Physical/ social limitation 15.iv.a.	15.iv.b	15.iv.c	15.iv.d	Personal relationships 15.v.a	15.v.b	15.v.c	Emotions 15.vi.a	15.vi.b	15.vi.c	Sleep/ energy 15.vii.a	15.vii.b	Do you do any of the following ? If so, how much ? 15.viii.a	15.viii.b	15.viii.c	15.viii.d	We would like to know what your bladder problems are and how much they affect you-and how much it will affect you ? 15.ix.a	15.ix.b	15.ix.c1	15.ix.c2	15.ix.d	15.ix.e	15.ix.f	15.ix.g	15.ix.h	QOL score	Took any hormonal treatment	Any c/o anal continence?	Modified Oxford scale	PFMS using Perinometer			
5	7601206	46	home maker	old goodshed road belgavi	upper middle class	22	27	p111e2	vaginal	E	2	tubectomy	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	4	34						
6	7688660	48	home maker	wadgaon belgavi	lower middle class	25	14	p313	vaginal	E	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	3	26						
7	7690060	52	home maker	ankner belgavi	lower middle class	31	30	p414	vaginal	E	2	tubectomy	nil	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	2	1	1	1	2	1	1	4	4	46	2	2	2	10				
8	7300859	38	home maker	gokak belgavi	lower middle class	26	22	p313	lscs	nil	2	tubectomy	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	4	30						
9	7691397	46	home maker	naravali belgavi	lower middle class	33	30	p212	vaginal	E	2	tubectomy	nil	2	1	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	1	2	1	2	2	2	2	4	4	4	4	47	2	2	2	6					
10	7681397	34	home maker	hukkeri	lower middle class	24	5	p212	vaginal	E	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	4	4	1	1	1	1	1	1	1	1	1	4	4	35	2	2	4	20			
11	7700625	30	home maker	alnawar	lower middle class	23	9	p313	vaginal	E	1	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	4	4	1	1	1	1	1	1	1	1	1	4	4	35	2	2	4	24			
12	7701031	26	home maker	thimmapur	lower middle class	24	5	p111	lscs	nil	1	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	4	4	1	1	1	1	1	1	1	1	1	4	4	35	2	2	5	26			
13	7536387	48	home maker		upper middle class	32	30	p212	vaginal	E	2	tubectomy	nil	2	1	1	1	2	2	2	2	1	1	2	2	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	4	4	36	2	2	3	12			
14	7613107	45	home maker	raibagh	lower middle class	24.6	26	p616	vaginal	E	2	tubectomy	nil	2	1	2	2	2	2	2	2	1	2	2	2	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	41	2	2	2	10			
15	7609716	29	home maker	hukkeri	lower middle class	27	6	p111	vaginal	E	2	tubectomy	nil	2	1	1	1	1	2	1	1	1	2	2	2	1	1	1	1	1	4	4	1	1	1	1	1	1	1	1	1	4	4	4	24	2	2	3	16		
16	7615434	33	teacher	belgaum	upper middle class	23	9	p212	vaginal	E	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	4	4	1	1	1	1	1	1	1	1	1	1	4	4	35	2	2	4	26		
17	1455310	34	home maker	gokak	lower middle class	29	10	p313	vaginal	E	2	tubectomy	nil	2	1	1	1	1	2	2	2	1	1	2	2	2	1	1	1	1	1	1	1	3	1	1	1	1	1	1	1	1	4	4	40	2	2	3	19		
18	5586441	31	home maker	gokak	upper middle class	23.6	7	p212	lscs	nil	1	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	4	4	1	1	1	1	1	1	1	1	1	4	4	35	2	2	4	22			
19	7616731	45	home maker	chandgad	lower middle class	28	28	p111	vaginal	E	2	nil	nil	2	1	2	1	1	2	2	1	1	2	2	2	1	1	1	1	1	4	4	1	1	1	1	1	1	1	1	1	1	1	4	4	35	2	2	3	19	
20	7232527	40	home maker	ganesh pur	upper middle class	28	12	p212	lscs	nil	2	tubectomy	nil	2	1	2	2	1	1	2	2	2	1	1	1	2	1	1	2	1	1	1	1	2	1	1	1	1	1	1	1	4	4	4	4	36	2	2	3	19	
21	7320288	24	home maker	yarnal	lower middle class	24	5	p111a1	lscs	nil	1	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	4	4	1	1	1	1	1	1	1	1	1	1	4	4	35	2	2	4	26		
22	7589102	41	home maker	KITTUR	lower middle class	32	20	p212	lscs	nil	2	tubectomy	nil	2	1	2	1	2	2	2	1	1	2	2	2	1	1	1	2	1	1	1	1	2	1	1	1	1	1	1	1	4	4	37	2	2	3	19			
23	7600915	35	home maker	maruti galli	upper middle class	26	8	p212a2	vaginal	E	2	tubectomy	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	4	4	1	1	1	1	1	1	1	1	1	1	4	4	35	2	2	4	24		
24	7618151	32	tailor	mudalgi, belgavi	lower middle class	26	11	p313	vaginal	E	2	tubectomy	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	4	4	1	1	1	1	1	1	1	1	4	4	4	4	35	2	2	3	22	
25	7621280	42	home maker	gandhi nagar, belgavi	lower middle class	32	20	p313	vaginal	E,forceps, perineal tear	2	tubectomy	DM	2	1	3	2	1	2	2	2	1	1	2	2	2	2	2	2	2	1	1	3	1	1	1	1	1	1	1	1	1	4	4	43	2	2	3	14		
26	7479845	46	homemaker	hirekoppa	upper middle class	30	30	p212	vaginal	E	2	tubectomy	HTN	2	1	2	2	2	2	2	1	1	2	2	2	1	1	2	2	1	1	3	1	2	2	2	2	3	2	4	4	4	4	46	2	2	3	16			
27	7596852	51	home maker	dodmangodi belgavi	lower middle class	28	30	p313	vaginal	E	2	tubectomy	HTN	2	1	2	1	2	2	2	1	1	2	2	2	1	1	2	1	1	2	1	2	1	2	1	2	1	1	1	4	4	4	4	43	2	2	3	16		
28	7621486	35	home maker	shivapur belgavi	lower middle class	12	26	p21	vaginal	E,forceps, perineal tear	2	tubectomy	nil	2	1	2	2	2	2	2	1	1	2	2	2	2	2	2	1	2	3	2	2	4	4	4	4	4	4	4	4	48	2	2	3	14					
29	6745737	40	teacher	patil galli belgavi	upper middle class	28	20	p212	lscs	nil	2	tubectomy	nil	2	1	2	1	1	1	2	1	1	2	2	2	1	1	2	1	1	4	4	1	1	1	1	1	1	1	1	1	4	4	37	2	2	3	16			
30	7105674	40	moushi	belgavi	lower middle class	24	22	p313	vaginal	E	2	tubectomy	nil	2	1	2	1	2	2	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	2	4	4	33	2	2	3	16
31	7224341	30	engineer	sadashivnagar belgavi	upper middle class	23	4	p1	lscs	nil	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	4	4	1	1	1	1	1	1	1	1	1	4	4	35	2	2	4	30			
32	7621844	39	home maker	belgavi	lower middle class	32	20	p414	vaginal	E	2	tubectomy	nil	2	1	3	1	1	1	2	1	1	2	2	2	1	1	1	1	1	1	4	4	1	1	1	1	1	1	1	1	4	4	38	2	2	3	16			
33	6230303	31	home maker	hukkeri	lower middle class	32	8	p111	lscs	nil	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	4	4	1	1	1	1	1	1	1	1	1	4	4	35	2	2	4	36			
34	7622379	47	home maker	mppan belgavi	lower middle class	33	20	p212	lscs	nil	2	tubectomy	nil	2	1	2	1	2	2	2	1	1	2	2	2	1	1	1	1	1	3	1	1	2	1	1	2	4	4	4	4	4	36	2	2	2	20				
35	45122512	38	home maker	belgaum	upper middle class	26	20	p212	vaginal	E	2	tubectomy	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	4	4	1	1	1	1	1	1	1	1	1	4	4	35	2	2	4	26			
36	75985716	34	home maker	gandi nagar	lower middle class	27	12	p212	vaginal	E	2	tubectomy	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	4	4	1	1	1	1	1	1	1	1	1	4	4	35	2	2	4	26			
37	7610664	40	homemaker	hindwadi, belgavi	upper middle class	29	20	p313	vaginal	E	2	tubectomy	nil	2	1	1	1	2	2	2	1	1	2	2	2	1	1	2	1	1	4	4	1	1	1	1	1	1	1	1	1	4	4	34	2	2	3	16			
38	7621856	50	homemaker	sangualin goa	upper middle class	34	23	p313	vaginal	E	2	nil	HTN	2	1	2	1	2	2	2	1	2	3	2	2	2	2	1	2	3	2	1	1	3	3	1	1	1	4	4	47	2	2	2	16						
39	7624275	31	homemaker	tillari, belgavi	upper middle class	25	9	p111	lscs	nil	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	4	4	1	1	1	1	1	1	1	1	4	4	35	2	2	5	30				
40	7625417	36	homemaker	budihal	lower middle class	24	18	p212	vaginal-1, lscs-1	E	2	nil	nil	2	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	4	4	1	1	1	1	1	1	1	1	1	1	4	4	35	2	2	4	28			
41	7625908	43	homemaker	vadgaon	upper middle class	32	23	p212	lscs	nil	2	tubectomy	nil	2	1	1	1	1	2	2	1	1	2	2	2	1	1	1	1	1	4	4	2</																		

SL NO.	OP Number	Age	Occupation	Address	Socioeconomic status	BMI	Married life	Obstetric score	Mode of delivery	Episiotomy, Prolonged labour, Instrumental delivery, Perineal tear history	postnatal exercises done	Previous pelvic surgeries	Associated conditions	Menopause attained	Any complaints of urinary incontinence	15.ii.How much do you think bladder problem affects your life ?	15.iii.a.	15.iii.b.	Physical/ social limitation 15.iv.a.	15.iv.b	15.iv.c	15.iv.d	Personal relationships 15.v.a	15.v.b	15.v.c	Emotions 15.vi.a	15.vi.b	15.vi.c	Sleep/ energy 15.vii.a	15.vii.b	Do you do any of the following ? If so , how much ? 15.viii.a	15.viii.b	15.viii.c	15.viii.d	We would like to know what your bladder problems are and how much they affect you.and how much it will affect you ? 15.ix.a	15.ix.b	15.ix.c1	15.ix.c2	15.ix.d	15.ix.e	15.ix.f	15.ix.g	15.ix.h	QOL score	Took any hormonal treatment	Any c/o anal continence?	Modified Oxford scale	PFMS using Perinometer							
7	7234578	60	homemaker	bailahongal	upper middle class	33	36	p3l3	vaginal	nil	2	nil	nil	1	1	2	2	2	2	3	2	2	3	3	2	3	2	2	2	2	1	3	2	3	2	2	2	3	4	4	4	4	4	54	2	2	3	28							
8	7678408	59	homemaker	ganbag	lower middle class	23	23	p2l2	vaginal	e	2	nil	nil	1	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	4	4	4	4	35	2	2	2	10					
9	7667768	50	homemaker	hebbal, belagavi	lower middle class	30	35	p2l2a2	vaginal	e	2	nil	nil	1	1	2	2	2	2	2	1	1	2	2	2	1	1	1	1	1	1	2	1	1	1	1	3	3	4	4	4	4	4	4	36	2	2	3	12						
10	7686185	70	homemaker	karadigudda belagavi	lower middle class	18	50	p5l5	vaginal	nil	2	nil	HTN, DM	1	5	4	2	4	4	4	4	3	1	1	2	4	2	2	2	1	1	4	3	2	2	1	1	2	2	4	4	4	4	4	60	2	2	1	5						
11	7519416	52	homemaker	raigad	upper middle class	22	29	p1l1	lscs	nil	2	nil	nil	1	1	2	1	3	3	3	2	2	2	2	2	2	1	2	2	1	1	3	1	2	1	2	2	2	4	4	4	4	4	45	2	2	2	10							
12	7714818	49	homemaker	terani	upper middle class	28	30	p2l2	vaginal	e, pl	2	tubectomy, dj stenting	nil	1	1	3	2	4	3	4	4	4	3	3	3	2	2	2	2	2	2	2	4	2	2	3	3	4	4	4	4	4	4	64	2	2	2	10							
13	7727955	49	homemaker	yargatti	lower middle class	23	30	p3l3	vaginal	e	2	tubectomy	nil	1	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	35	2	2	2	26					
14	77279901	58	homemaker	chandgad	lower middle class	26	36	p2l2	vaginal	e	2	tubectomy	nil	1	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	4	4	4	35	2	2	2	24
15	7727959	54	homemaker	sankeshwar	lower middle class	24	32	p4l4	vaginal	e	2	tubectomy	nil	1	1	2	1	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	4	4	4	4	38	2	2	3	24				
16	7727894	63	homemaker	belagavi	lower middle class	29	40	p3l3	vaginal	e	2	tubectomy	nil	1	1	1	1	1	1	1	2	1	2	1	1	1	1	1	2	1	1	2	1	1	2	1	1	2	2	2	1	4	4	4	4	32	2	2	2	16					
17	7688660	50	homemaker	chikkodi	lower middle class	30	30	p1l1	lscs	e	2	nil	nil	1	1	2	2	2	2	2	1	2	1	1	1	1	1	2	1	1	1	3	1	1	1	1	1	4	4	2	4	4	4	4	34	2	2	3	22						
18	7698752	52	homemaker	bellad bagewadi	middle class	26	32	p2l2	lscs		2	tubectomy	nil	1	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	35	2	2	4	26						
19	7704056	72	homemaker	shivaji nagar belagavi	lower middle class	26	46	p4l4	vaginal		2	tubectomy	nil	1	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	35	2	2	3	20						
20	7727877	54	daily wage worker	kalkundri	poor	28	35	p3l3	vaginal	e	2	nil	nil	1	1	3	2	3	3	3	2	2	3	2	2	2	2	2	2	1	1	2	2	2	2	2	2	3	4	4	4	4	4	50	2	1	1	8							
21	7698669	56	homemaker	gandni nagar, belagavi	upper middle class	24	35	p2l2	vaginal	e	2	tubectomy	nil	1	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	35	2	2	3	24						
22	7033500	60	daily wage worker	nadihalli	lower middle class	28	40	p2l2	vaginal	nil	2	tubectomy	nil	1	1	3	2	2	2	2	2	2	2	2	2	3	2	2	2	1	1	3	1	1	1	1	1	2	2	3	1	4	4	4	4	47	2	2	2	10					
23	7682566	48	homemaker	shivaji nagar belagavi	lower middle class	28	28	p2l2d1	vaginal	nil	2	tubectomy	nil	1	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	35	2	2	4	26						
24	7045123	66	homemaker	bagewadi	lower middle class	28	45	p3l3	vaginal	e	2	tubectomy	T2DM, HTN	1	1	2	2	3	3	2	2	1	2	2	2	2	2	2	2	1	1	3	1	2	2	2	2	2	1	4	4	4	4	46	2	2	2	12							
25	7472037	65	homemaker	kednur, belagavi	lower middle class	32	50	p3l3	vaginal	e	2	tubectomy	POP, T2DM, COPD	1	1	1	2	2	2	2	1	2	2	3	2	1	1	1	2	2	1	3	1	1	1	1	2	2	2	2	4	4	4	4	42	2	1	2	10						
26	7519523	50	daily wage worker	muchanalli, belagavi	lower middle class	36	36	p4l4	vaginal	e, pl	2	tubectomy	POP, T2DM	1	1	1	2	2	2	2	1	2	2	3	2	2	2	2	2	2	1	3	1	1	1	1	2	2	4	4	3	2	4	4	4	4	43	2	2	2	10				
27	7551122	52	homemaker	urubinahatti	middle class	30	30	p2l2a1	vaginal	e	2	tubectomy	T2DM, HTN	1	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	35	2	2	3	20						
28	7565042	50	homemaker	khanapur	lower middle class	36	32	p1l1a1	vaginal	e	2	tubectomy	nil	1	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	35	2	2	3	24						
29	6950705	58	homemaker	kadapatti	lower middle class	36	35	p2l2a2	vaginal	e	2	tubectomy	T2DM, HTN	1	1	2	1	2	2	2	1	1	2	2	2	1	1	1	1	1	1	2	1	2	2	2	3	2	4	3	3	41	2	2	2	12									
30	7560569	60	homemaker	hukkeri	lower middle class	26	43	p4l4	vaginal	e	2	tubectomy	POP, T2DM	1	1	3	2	3	3	3	3	2	1	1	3	3	3	3	2	1	3	2	2	2	2	2	2	4	4	4	4	57	2	1	2	10									
31	7566694	62	business women homemaker	karwar	upper middle class	30	45	p2l2	vaginal	e	2	tubectomy	POP,T2DM, HTN	1	2	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	35	2	2	3	20						
32	7212724	52	homemaker	dandeli	middle class	32	38	p1l1a2	lscs	nil	2	tubectomy	T2DM, HTN	1	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	35	2	2	3	22						
33	7429890	52	homemaker	mudalagi	lower middle class	28	35	p1l1	vaginal	e	2	nil	nil	1	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	35	2	2	4	26					
34	7580111	50	homemaker	mamadapur	upper middle class	28	33	p2l2	lscs	nil	2	tubectomy	nil	1	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	35	2	2	3	22					
35	7745036	48	homemaker	belagavi	upper middle class	28	33	p3l3	lscs	nil	2	tubectomy	nil		2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	35		2	3	22					
36	7746005	49	homemaker	hukkeri	upper middle class	24	24	p2l2	lscs	nil	2	tubectomy	hypothyroidism	1	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	35	2	2	4	30						
37	7730704	52	homemaker	nehru nagar belagavi	upper middle class	26	30	p1l1	lscs	nil	2	tubectomy	nil	1	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	35	2	2	3	24							
38	7747220	50	homemaker	hukkeri	upper class	26	33	p3l3	vaginal	e, pl	2	tubectomy	HTN	1	1	1	1	2	2	2	1	1	2	2	2	1	1	1	2	1	1	3	1	1	1	1	1	2	4	4	4	4	35	2	2	3	22								
39	7745837	60	homemaker	chandgad	lower middle class	24	40	p4l4	vaginal	e	2	tubectomy	POP	1	1	3	2	2	2	2	2	2	2	2	2	1	1	1	2	1	1	3	1	1	1	1	1	1	1	1	1	4	4	4	4	41	2	2	2	10					
40	7745829	48	homrmaker	savdatti	lower middle class	26	26	p2l2	vaginal	e	2	tubectomy	nil	1	2	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	35	2	2	3	28					
41	7727176	62	homemaker	bailhongal	lower middle class	33	45	p3l3	vaginal	e	2	tubectomy	POP,HTN, DM	1	1	3	2	2	2	2	2	2	2	2	2	1	1	1	2	1	1	3	1	1	1	1	1	1	1	1	3	4	4	4	4	41	2	2	2	12					
42	7743864	60	homemaker	gokak	lower middle class	26	40	p4l4	vaginal	e	2	tubectomy	HTN, DM	1	1	1	1	2	2	2	1	1	2	2	2	1	1	1	2	1	1	3	1	1	1	1	1																		

SL NO.	OP Number	Age	Occupation	Address	Socioeconomic status	BMI	Married life	Obstetric score	Mode of delivery	Episiotomy, Prolonged labour, Instrumental delivery, Perineal tear history	postnatal exercises done	Previous pelvic surgeries	Associated conditions	Menopause attained	Any complaints of urinary incontinence	15.ii. How much do you think bladder problem affects your life ?	15.iii.a.	15.iii.b.	Physical/ social limitation 15.iv.a.	15.iv.b	15.iv.c	15.iv.d	Personal relationships 15.v.a	15.v.b	15.v.c	Emotions 15.vi.a	15.vi.b	15.vi.c	Sleep/ energy 15.vii.a	15.vii.b	Do you do any of the following ? If so, how much ? 15.viii.a	15.viii.b	15.viii.c	15.viii.d	We would like to know what your bladder problems are and how much they affect you.and how much it will affect you ? 15.ix.a	15.ix.b	15.ix.c1	15.ix.c2	15.ix.d	15.ix.e	15.ix.f	15.ix.g	15.ix.h	QOL score	Took any hormonal treatment	Any c/o anal continence?	Modified Oxford scale	PFMS using Perineometer
49	7749667	54	homemaker	shahapur	lower middle class	28	26	p313	vaginal	E,PL,ID	2	tubectomy	3rd degree uv prolapse, cystocele HTN	1	1	2	2	2	2	2	2	2	3	3	3	2	2	2	2	2	1	2	1	1	2	1	2	2	4	4	4	4	4	43	2	2	2	12
50	7751440	59	homemaker	khanapur	lower middle class	30	40	p414	vaginal	E	2	tubectomy	2nd degree uv prolapse, cystocele HTN	1	1	2	2	2	2	2	2	2	3	3	3	2	2	2	2	2	1	2	1	1	2	1	2	2	4	4	4	4	4	43	2	2	2	10