STM JOURNALS

International Journal of
Midwifery Nursing and Practices

ISSN: 2584-0800
Volume 3, Issue 1, 2025
January–June
DOI (Journal): 10.37591/IJMNP

https://journals.stmjournals.com/ijmnp

Research IJMNP

Pelvic Floor Muscle Strengthening in Antenatal Period Among Primigravida Cases at Jorhat, Assam

Bandita Goswami[1,*], Ankur Jyoti Bora[2], Ankita Kalita[3]

Abstract

Aim: *The study aimed to evaluate the effectiveness of pelvic floor muscle (PFM) strengthening exercises during the antenatal period among primigravida women in Jorhat, Assam, with a focus on improving pelvic floor muscle strength and its impact on pregnancy outcomes.* ***Purpose:*** *To assess whether pelvic floor muscle exercises (specifically Kegel exercises) can enhance PFM strength in pregnant women, using the Modified Oxford Grading Scale (MOS), and to compare these effects with a control group receiving standard antenatal care without specific exercises.* ***Methodology:*** *This case-control study was carried out at Jorhat Medical College and Hospital (JMCH) in Assam. A total of 14 primigravida women aged 20–30 years, with gestational ages between 20 and 24 weeks, were recruited and divided into two groups: Group A (experimental) and Group B (control). Group A engaged in daily Kegel exercises for 12 weeks, while Group B received routine antenatal care without specific exercises. PFM strength was evaluated through vaginal palpation and the Modified Oxford Grading Scale (MOS) at both the beginning and conclusion of the study. Data were analyzed using independent and paired t-tests, with statistical significance determined at $p<0.05$.* ***Results:*** *The mean age of participants in Group A was 22.14 years (SD=1.95), and in Group B, 25.00 years (SD=3.16). Pre-intervention PFM strength (Pre_1) was comparable between the two groups ($p=0.718$). Post-intervention scores (Post_1) showed significant improvement in Group A (mean Post_1 score of 4.29) compared to Group B (mean Post_1 score of 2.57), with a statistically significant difference between groups ($p<0.001$). Within Group A, a significant increase in PFM strength was observed post-intervention ($p=0.002$), while Group B showed no significant change ($p=0.356$).* ***Conclusion:*** *Pelvic floor muscle strengthening exercises, particularly Kegel exercises, performed during the antenatal period, significantly improved pelvic floor muscle strength in primigravida women. These findings suggest that incorporating PFM exercises into antenatal care can have positive outcomes on maternal health. Further research with larger sample sizes is recommended to validate these results.*

Keywords: Pelvic floor muscles (PFM), antenatal exercises, pregnancy outcomes, Modified Oxford Grading Scale (MOS), Kegel exercises

***Author for Correspondence**
Bandita Goswami
E-mail: banditagoswami22@gmail.com

[1]Researcher, Department of Physiotherapy, Jorhat Medical College, Jorhat Medical College and Hospital, Jorhat, Assam, India
[2]Senior Physiotherapist cum course Coordinator, Department of physiotherapy, Jorhat Medical College and Hospital, Jorhat, Assam, India
[3]Lecturer, Department of Physiotherapy, Jorhat Medical College, Jorhat Medical College and Hospital, Jorhat, Assam, India

Received Date: December 26, 2024
Accepted Date: February 15, 2025
Published Date: February 25, 2025

Citation: Bandita Goswami, Ankur Jyoti Bora, Ankita Kalita. Pelvic Floor Muscle Strengthening in Antenatal Period Among Primigravida Cases at Jorhat, Assam. International Journal of Midwifery Nursing and Practices. 2025; 3(1): 35–42p.

INTRODUCTION

The female reproductive system is essential for producing eggs, managing specific hormones, and supporting fertilized eggs as they grow into mature fetuses. A female's reproductive years typically range from the start of menstruation (menarche) to menopause, defined as 12 consecutive months without a menstrual period. During this time, eggs are released in a cycle from the ovaries, ready for potential fertilization by sperm. This cycle of egg release is a natural part of the menstrual process [1]. Pregnancy is a natural process where the body adapts to nourish and support both the mother and the growing baby. Ideally, childbirth occurs through

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vaginal delivery when the baby is full-term, usually between 37 and 42 weeks of pregnancy [2]. The pelvic floor muscles (PFM) create a support structure that stretches from the base of the spine at the back to the pubic bone at the front, helping support the uterus, bladder, and bowel [3]. These muscles include a deeper layer called the pelvic diaphragm (pubococcygeus, puborectalis, and iliococcygeus muscles) and a superficial layer, called the urogenital diaphragm (including perineal muscles like the ischiocavernosus, bulbospongiosus, and transversus perinei superficialis). Muscles involved in the control of the urethra and sphincter are also part of the pelvic floor [4, 5]. Pelvic floor muscle exercises (PFME) assist women in enhancing the strength and tone of these muscles, which can help address a range of pelvic floor problems, including urinary incontinence, fecal incontinence, bladder obstruction, pelvic organ prolapse, pain, and sexual dysfunction [6, 7]. Regular training of these muscles can also lead to better labor outcomes [8, 9]. Vaginal palpation and the Modified Oxford Grading Scale are utilized to evaluate the strength and endurance of these muscles [10–13]. Antenatal care, which focuses on the health and well-being of both the mother and baby, should ideally start soon after conception and be maintained throughout the pregnancy. A key goal is identifying any risks early and managing pregnancy-related issues or underlying conditions [14, 15]. Physiotherapy during pregnancy plays a crucial role, including exercises such as pelvic floor training, core stability, and breathing techniques to promote maternal health [16–18].

MATERIALS AND METHODS

The study was carried out in the Obstetrics and Gynecology Department of Jorhat Medical College and Hospital (JMCH), Assam, India. It was designed as a prospective case-control study, employing a consecutive sampling method. A total of 14 pregnant women participated, divided into two groups: Group A (experimental) and Group B (control). The experimental group performed pelvic floor muscle strengthening exercises (Kegel exercises) for 12 weeks, while the control group did not participate in any specific exercises. The inclusion criteria required participants to be aged between 20 and 30 years, with a gestational age of 20 to 24 weeks, and experiencing a singleton pregnancy. All participants exhibited healthy sensory-motor function in their lower limbs. Exclusion criteria included any history of gestational diabetes, high-risk pregnancies, miscarriage, musculoskeletal deformities, or conditions affecting cardiovascular, neuromuscular, or psychological health. The study duration was 12 weeks, with participants in the experimental group being evaluated every 4 weeks. Data collection centered on pelvic floor muscle strength, which was measured using the Modified Oxford Grading Scale (MOS). All data were analyzed statistically using SPSS software version 26, with a significance level set at $p<0.05$. In this study, we evaluated pelvic floor muscle strength through vaginal palpation. The participants were positioned in a supine stance with their hips and knees flexed at a 45° angle. We used disposable gloves and lubricating gel for the procedure. We inserted the index finger (or both index and middle fingers for bidigital vaginal palpation) into the vagina until the second phalanx, and instructed the participants to contract their pelvic floor muscles as if trying to hold in urine and feces simultaneously. The contraction strength was rated using the Modified Oxford Grading Scale (MOS), with scores ranging from 0 (no contraction) to 5 (strong contraction). In the experimental group, participants performed Kegel exercises daily for 12 weeks. Each exercise session involved 10 repetitions per set, with three sets per day. During each contraction, participants held the contraction for 10 sec, followed by a 4 sec rest between repetitions. The participants were instructed not to engage their abdominal, gluteal, or leg muscles during the exercises, focusing solely on the pelvic floor muscles. The control group received routine antenatal care without any specific exercise regimen. At the end of the 12-week period, we reassessed pelvic floor muscle strength for all participants (Figure 1).

RESULT

The average age of participants in Group A was 22.14 years, with a standard deviation of 1.95 (Figure 2), whereas the mean age in Group B was slightly higher at 25.00 years, with a larger standard deviation of 3.16 (Figure 3), suggesting greater variability in Group B. Tables 1 and 2 display the descriptive statistics for Age, Gestational Period, and the Pre_1 and Post_1 variables. Table 2 presents the Pre_1 and Post_1 scores for both groups. These scores were statistically analyzed using paired t-

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tests to test whether the average Pre_1 score differs significantly from the Post_1 score within each group. After analyzing the data, the following results were observed:

The analysis compared pre- and post-intervention scores between Group A and Group B using independent and paired t-tests. For **Pre_1 Scores**, Group A had a mean of 2.14, and Group B had a mean of 2.29 (Table 3). An independent t-test showed no significant difference between these pre-intervention scores (t=–0.369, p=0.718), with **Levene's Test for Equality of Variances** (F=0.318, p=0.583) indicating equal variances. The 95% confidence interval for the mean difference (–0.986 to 0.700) included zero, confirming that Pre_1 scores were similar between the groups before the intervention (Table 4).

Figure 1. Pelvic floor muscle strengthening exercises (Kegel exercises).

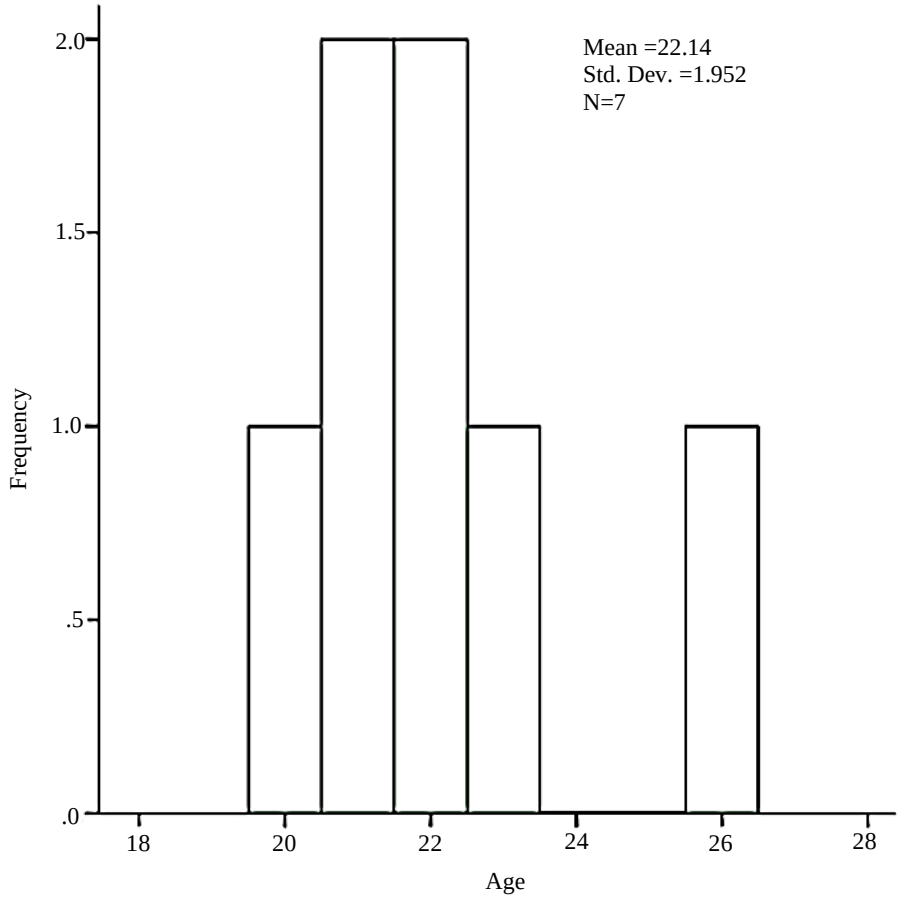

Figure 2. Group A (standard deviation of 1.95).

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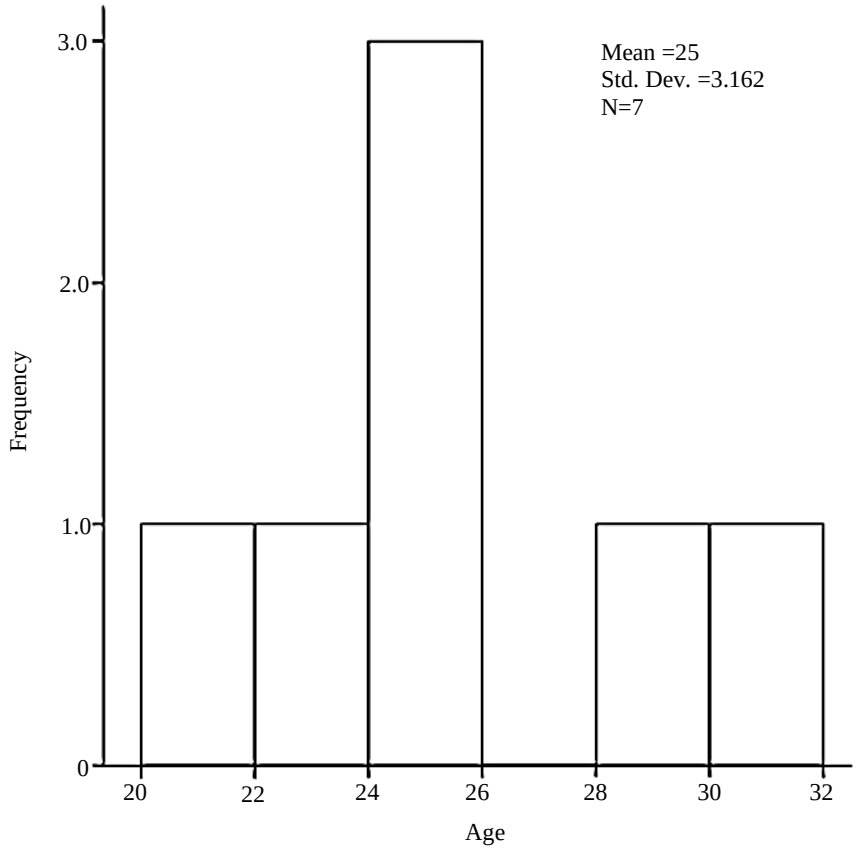

Figure 3. Group B: (standard deviation of 3.16).

Table 1. Descriptive statistics for age, gestational period, and the pre_1 and post_1 variables (Group A).

	N	Range	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	*Statistic*	*Statistic*	*Statistic*	*Statistic*	*Statistic*	*Std. Error*	*Statistic*	*Std. Error*
Age	7	6	22.14	1.952	3.810	1.418	.794	2.523	1.587
Gestational period in weeks	7	4	22.71	1.890	3.571	–1.088	.794	–1.028	1.587
Pre_1	7	2	2.14	.690	.476	–.174	.794	.336	1.587
Post_1	7	1	4.29	.488	.238	1.230	.794	–.840	1.587
Valid N (listwise)	7								

Table 2. Descriptive statistics for age, gestational period, and the pre_1 and post_1 variables (Group B).

	N	Range	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	*Statistic*	*Statistic*	*Statistic*	*Statistic*	*Statistic*	*Std. Error*	*Statistic*	*Std. Error*
Age	7	9	25.00	3.162	10.000	.443	.794	–.528	1.587
Gestational period in weeks	7	4	23.29	1.496	2.238	–2.347	.794	5.580	1.587
Pre_1	7	2	2.29	.756	.571	–.595	.794	–.350	1.587
Post_1	7	1	2.57	.535	.286	–.374	.794	–2.800	1.587
Valid N (listwise)	7								

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Table 3. Group statistics (Pre_1).

	Group	N	Mean	Std. Deviation	Std. Error Mean
Pre_1	A	7	2.14	.690	.261
	B	7	2.29	.756	.286

Table 4. Independent samples test (Pre_1).

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	*Sig.*	*t*	*df*	*Sig. (2-tailed)*	*Mean Difference*	*Std. Error Difference*	*95% Confidence Interval of the Difference*	
									Lower	*Upper*
Pre_1	Equal variances assumed	.318	.583	–.369	12	.718	–.143	.387	–.986	.700
	Equal variances not assumed			–.369	11.902	.718	–.143	.387	–.987	.701

Table 5. Group Statistics (Post_1).

	Group	N	Mean	Std. Deviation	Std. Error Mean
Post_1	A	7	4.29	.488	.184
	B	7	2.57	.535	.202

Table 6. Independent samples test (Post_1).

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	*Sig.*	*t*	*df*	*Sig. (2-tailed)*	*Mean Difference*	*Std. Error Difference*	*95% Confidence Interval of the Difference*	
									Lower	*Upper*
Post_1	Equal variances assumed	.941	.351	6.267	12	.000	1.714	.274	1.118	2.310
	Equal variances not assumed			6.267	11.902	.000	1.714	.274	1.118	2.311

For **Post_1 Scores**, following the intervention, Group A's mean increased to 4.29, while Group B's mean was 2.57. An independent t-test found a significant difference in post-intervention scores (t=6.267, p<0.001). **Levene's Test** (F=0.941, p=0.351) again showed equal variances, allowing for the assumption of equal variances. The 95% confidence interval for the mean difference (1.118 to 2.310) did not include zero, suggesting a substantial effect of the intervention on Group A compared to Group B (Tables 5 and 6). Within **Group A**, a paired t-test compared Pre_1 and Post_1 scores, showing a significant increase from a mean of 2.14 to 4.29 (t=–5.303, p=0.002). The mean difference of –2.143, with a 95% confidence interval from –3.132 to –1.154, indicates a significant positive effect of the intervention. With a p-value well below 0.05, we reject the null hypothesis and conclude that pelvic floor exercises led to significant improvement in Group A's muscle strength (Tables 7 and 8). In **Group B**, a paired t-test revealed no significant change between Pre_1 (mean =2.29) and Post_1 (mean =2.57) scores (t=–1.000, p=0.356). The mean difference of –0.286, with a 95% confidence interval from –0.985 to 0.413, includes zero, indicating that the intervention did not have a significant impact on Group B (Tables 9 and 10). Consequently, there was no statistically significant improvement in Group B's scores post-intervention. Overall, the intervention had a notable impact on Group A, whereas Group B exhibited no significant changes.

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Table 7. Paired samples statistics (Group A).

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre_1	2.14	7	.690	.261
	Post_1	4.29	7	.488	.184

Table 8. Paired differences samples test (Group A).

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	*Std. Deviation*	*Std. Error Mean*	*95% Confidence Interval of the Difference*				
					Lower	Upper			
Pair 1	Pre_1–Post_1	–2.143	1.069	.404	–3.132	–1.154	–5.303	6	.002

Table 9. Paired samples statistics (Group B).

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre_1	2.29	7	.756	.286
	Post_1	2.57	7	.535	.202

Table 10. Paired differences samples test (Group B).

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	*Std. Deviation*	*Std. Error Mean*	*95% Confidence Interval of the Difference*				
					Lower	*Upper*			
Pair 1	Pre_1 Post_1	–.286	.756	.286	–.985	.413	–1.000	6	.356

DISCUSSION

The objective of this study underscores the effectiveness of pelvic floor muscle (PFM) strengthening exercises, specifically Kegel exercises, in improving PFM strength among primigravida women during the antenatal period. 14 subjects were included in this study. Demographic data and all other essential data including consent forms were taken on the first day before the intervention. In this study, average age of group A was 22.14 years with a standard deviation of 1.952 years and average age of group B was 25 years with a standard deviation of 3.162 years. The outcome variable manual muscle testing (MMT) for checking pelvic floor muscle were being used on first day of assessment (20–24WG) and final assessment was taken on (32–36 WG) in all subjects, and pre- and post-intervention data were statistically analyzed (Table 6). Independent-test was conducted to check the significant difference between pre- and post-intervention PFMs. An independent t-test was performed to compare the post-intervention scores, revealing a significant difference between the two groups ($t=6.267$, $p<0.001$). indicating that PFMEs significantly improved pelvic floor muscle strength in Group A. This result aligns with previous research, which has consistently shown that regular pelvic floor exercises improve muscle strength and endurance, helping to mitigate pregnancy-related pelvic floor dysfunctions such as urinary incontinence, fecal incontinence, and pelvic organ prolapse of the pelvic floor muscles provides insight into why strengthening exercises may benefit pregnant women [7, 8]. Possible mechanism behind the improvement of PFMs may be because after the exercise the PFMs fibers gets hypertrophic which leads to increase in muscle strength and also lead to neuromuscular adaptation. Another possible mechanism behind the increase in muscle strength may be because of recruitment of type 1 muscle fiber during the pelvic floor muscle exercise training which lead the muscle to get resistant to fatigue which may contribute in the strengthening of the PFMs. This study revealed that pelvic floor muscle exercises (PFMEs) during pregnancy significantly improved pelvic floor strength in the experimental group compared to the control group. The findings highlight the significance of including PFMT in antenatal care, as it could improve maternal health outcomes by lowering the risk of urinary incontinence and pelvic organ prolapse during and after pregnancy. However, limitations

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such as a small sample size, a short study duration, and reliance on subjective measures highlight the need for further research with larger cohorts and longer follow-up periods [19, 20].

CONCLUSION

This study concludes that pelvic floor muscle strengthening exercises performed during pregnancy are an effective intervention for improving PFM strength. Thereby, the alternative hypothesis is accepted which proves that PFM exercises are effective. Additional research with a larger sample size could offer stronger evidence to support these findings.

Ethics Statement

As our study includes human subjects, ethical clearance was obtained from the Institutional Ethical Committee of Jorhat Medical College and Hospital.

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