Biofeedback Exercise and its Relation to Pelvic Floor Muscle Strength: an Experiment at 3 Weeks and 6 Weeks Postpartum

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Abstract

Pelvic floor muscle weakness is closely related to the quality of life in women because this disorder can be caused by pregnancy and childbirth. Previous research has shown that pelvic muscle training can improve pelvic muscle health. This study aims to compare the strength of the pelvic floor muscles given biofeedback training at 3 weeks and 6 weeks postpartum. An experimental study was conducted on women who had vaginal delivery for the first time. The study was conducted at the post-partum clinic, a tertiary referral hospital in East Java, Indonesia. This study involved 40 people randomly with 20 people in each treatment. The women were given pelvic floor exercises with the biofeedback method starting at 3 weeks post vaginal delivery and at 6 weeks post vaginal delivery. Exercises in this study used the biofeedback method for 4 weeks in both groups. Pelvic floor muscle strength in this study was measured by Myomed 932 pressure biofeedback in units of hPa. Data were analyzed statistically. There was no significant difference ($p > 0.05$) between the two groups, both maximal contraction ($p = 0.283$) and delta ($p = 0.428$) before undergoing exercise. The pelvic floor muscle group started at the third week showed increased muscle strength after biofeedback after 4 weeks ($p < 0.05$). The pelvic floor group, starting the sixth week, showed improved pelvic floor muscle strength after 4 weeks of biofeedback training ($p < 0.05$). The mean change in maximum contraction strength in the third week exercise group compared to 6 weeks of exercise after the second 4 weeks of biofeedback training was not significant ($p = 0.881$). Likewise, the mean change in pelvic floor muscle delta in both groups at the end of the evaluation was not statistically significant ($p = 0.939$). Pelvic floor muscle strength in primiparous post-biofeedback exercise started at 3 weeks postpartum is as good as exercise started at 6 weeks postpartum.

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Introduction

The pelvic floor muscles have a very important role in the urinary and fecal control systems, as well as support for the pelvic organs. The pelvic floor is made up of a group of muscles and connective tissue that stretches as a sling across the pelvic floor; It consists of two layers, the superficial perineal muscles and the deep pelvic diaphragm, and provides support for the pelvic organs, bladder and spinal elements. Pelvic floor dysfunction and secondary stress incontinence have a negative impact on women, and as the population ages, more women will be affected and the costs of dealing with these problems will also increase[1].

Although pregnancy and childbirth are physiological processes, women cannot escape this risk because pelvic floor dysfunction or disorders of the pelvic floor muscles are closely related to pregnancy and childbirth[2]. One of the most common and inevitable complications of childbirth is its effect on the muscle structure of

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the pelvis. It has been reported that about 50% of pelvic organ prolapse (POP) occurs due to delivery and studies using MRI report that 20-26% of major injuries occur after vaginal delivery.

Vaginal delivery can cause weakness and weakness of the pubourethral and external urethral ligaments. POP has a negative effect on many aspects of women's quality of life (QOL), such as personal, psychological, social, economic, work, physical, and sexual life[3]. After vaginal delivery, not cesarean delivery, the cumulative incidence of pelvic organ prolapse, stress incontinence and an overactive bladder was associated with pelvic muscle strength, although these associations weakened when adjusting for genital hiatus and body mass index. Pelvic floor disorders (including urinary and anal incontinence and pelvic organ prolapse) associated with childbirth. Injury to the pelvic floor muscles during vaginal delivery, such as the levatorani muscle avulsion, is associated with weaker pelvic floor muscle strength[4].

Pelvic floor muscle training has benefits in the health of the pelvic floor muscles. This training is based on 3 main goals, namely strengthening the pelvic floor muscles, increasing the mechanisms that allow closure of the urethra, and inhibiting muscle reflex contraction.[5] Since weak pelvic floor muscle strength can be a modifiable risk factor for the development of pelvic floor disorders later in life, it is important to understand how pelvic floor muscle strength affects the course of pelvic floor disorders over time as well as appropriate pelvic floor muscle training[4]. There are several types of pelvic floor exercises that are known, ranging from tool-less exercises such as Kegel exercises to those that use additional modalities such as perineometer, vaginal cones, biofeedback and others[6,7]. Pelvic floor exercises are easy, effective and non-invasive tools that can be considered as therapy for patients with pelvic organ prolapse (POP), stress urinary incontinence (SUI) and overactive bladder (OAB)[8].

The findings indicated a significant difference between clinical variables (parity, neonatal birth weight, perineal tear rate, BMI) and increased pelvic floor muscles before and after performing Kegel exercises (INAJOG). Postpartum pelvic floor exercises increase blood flow to the pelvis and aid in wound healing. In addition, exercise can reduce the pressure of the epsiotomy suture, and help reduce perineal stiffness. This exercise also reduces discomfort due to vulvar edema, hemorrhoids, and anal fissure[6]. Biofeedback is defined as a training method that uses external sensors to provide an indication of the occurrence of bodily processes. Biofeedback devices are essentially pressure-based or surface EMG[7].

This study aims to determine the comparison of the strength of the pelvic floor muscles given the biofeedback method training at 3 weeks and 6 weeks after delivery, so that if it proves to be better, the benefits of pelvic floor muscle training can be felt more quickly. This study will provide benefits for research subjects to increase the strength of their pelvic floor muscles with proper pelvic floor muscle training, so as to prevent pelvic floor muscle dysfunction, knowing when is the best time to start postpartum pelvic floor muscle exercises and provide input on ODP exercise management. in postpartum care.

Materials and methods

This research is an experimental study, conducted pre-test and post-test. Women who gave birth for the first time were divided into 2 treatment groups, namely the pelvic floor exercise with the biofeedback method which was started at 3 weeks after vaginal delivery and the pelvic floor exercise with the biofeedback method which was started at 6 weeks after vaginal delivery. The study was conducted at the post-partum clinic, a tertiary referral hospital in East Java, Indonesia. This study involved 40 people with 20 people in each treatment.

The method of taking research subjects was carried out randomly at the first postpartum visit. Inclusion criteria for patients were primiparous patients after normal vaginal delivery at week 3 and week 6 after delivery, maternal age 18-35 years, body mass index (BMI) of normal mothers, giving birth to single term babies with body weight of 2500 - 3500 grams, can understand orders and answer questions well (cooperative and communicative) and are willing to follow and complete research (fill out informed consent). Patients who had signs of infection in birth canal wounds and present chronic disease, metabolic disease, neuromuscular disorders were not included in the study.

Pelvic floor muscle exercises are isometric strengthening exercises for the pelvic floor

muscles with the aim of restoring function and preventing pelvic organ decline and pelvic floor muscle weakness, in this study for the first time the subjects were taught at the Medical Rehabilitation Polyclinic therefore they could contract the pelvic floor muscles regularly. Exercises in this study used the biofeedback method for 4 weeks in both groups. Muscle strength is the maximum tension a muscle can produce as it contracts. Pelvic floor muscle strength in this study was measured by Myomed 932 pressure biofeedback in units of hPa. Three kinds of measurements were obtained, namely the minimum contraction force, maximum contraction and the length of maintaining the maximum contraction (in seconds). Maximum contraction pressure is defined as the maximum change in pressure above the resting base pressure during each contraction shown on the monitor. Myomed 932 Biofeedback is a complete unit that can be based on EMG-feedback or pressure-feedback. This study is an objective quantitative measurement method for measuring intravaginal pressure using a vaginal pressure probe that is inserted into the vagina. Data were analyzed statistically with SPSS. Statistical test using paired t-test to compare changes in primiparous pelvic floor muscle strength after 4 weeks of pelvic floor exercises in each of the 3 weeks primiparous group and after 6 weeks and unpaired t-test: knowing the mean ratio of pelvic floor muscle strength before and after being given pelvic floor muscle exercises for 4 weeks between the exercise group starting at 3 weeks and the exercise group starting 6 weeks postpartum.

Results

Of the 39 research subjects, the mean age of the mothers in the primiparous group who received pelvic floor muscle training from the third week was younger than the sixth week group, and based on statistical tests, it was found that a significant difference was p = 0.013 (p <0.05). For the characteristics of maternal education, the 3rd week pelvic floor muscle training group mostly has senior high school education / equivalent, namely 11 people (55.0%), while in the 6th week pelvic floor muscle training group who have high school and tertiary education, the number is the same. 9 people (47.4%), where the difference between the two groups was statistically significant p = 0.037 (p <0.05). The mean birth weight of babies in the pelvic floor muscle exercise group at week 6 was heavier than the week 3 group, but statistical tests showed no significant difference in the two groups (p = 0.245). This means that the weight of the newborns in the two groups is homogeneous. The mean body mass index (BMI) of mothers in both groups was also almost the same, including the normal BMI category with statistical tests showing no significant difference (p = 0.345). This means that the BMI of both groups is homogeneous.

After performing the pelvic floor muscle training with the biofeedback method for 4 weeks with each week of each subject doing ODP exercises with biofeedback, data were obtained in the form of values of maximum contraction strength, minimal contraction, and pelvic floor muscle endurance, then calculated the difference between maximal and minimal contraction (delta) which will be compared within each group and between the two groups.

Pelvic Floor Muscle Strength(hPa)	Before practice Mean ± SD	After 4 weeks of training Mean ± SD	P value
Exercise starts week 3			
Max	64,6 ± 25,2	127,1 ± 21,1	0,001
delta	34,3 ± 23,0	107,7 ± 21,4	0,001
Exercise starts week 6			
Max	72,5 ± 20,1	133,7 ± 20,6	0,001
delta	39,6 ± 18,1	113,6 ± 20,7	0,001

Table 1. Analysis of primiparous pelvic floor muscle strength after 4 weeks of biofeedback exercise in the exercise group starting at week 3 and week 6.
Note: Delta = Pelvic Floor Muscle strength maximum contraction – minimum.

The mean maximal pelvic floor muscle contraction in the exercise group starting week 6 before exercise (72.5 ± 20.1 hPa) was higher than the exercise group starting at week 3, as well as delta pelvic floor muscle strength in the week 6 exercise group (39, 6 ± 18.1 hPa) was also higher than the week 3 exercise group. To compare baseline pelvic floor muscle strength before exercise in both groups, an unpaired T test was used. It was found that there was no significant difference (p> 0.05) between the two groups, both maximal contraction (p = 0.283) and delta (p = 0.428) before undergoing exercise. This shows that in postpartum primiparous after 6 weeks, although the absolute value of maximal contraction and delta was higher than that of

week 3, statistically the difference was not significant. After measuring the initial strength of the pelvic floor muscles, the research subjects were given the correct teaching and pelvic floor muscle training using biofeedback. After understanding each subject, they were instructed to do regular exercise 3x practice sessions a day at home, as taught, and exercise with biofeedback at the Medical Rehabilitation clinic once a week. After 4 weeks of training, the subjects measured and evaluated the strength of their pelvic floor muscles.

Pelvic Floor Muscle Strength(hPa)	3rd week group mean ± SD	sixth week group mean ± SD	p-value
Before exercise			
Max 0	64,6 ± 25,2	72,5 ± 20,1	0,283
Delta 0	34,3 ± 23,0	39,6 ± 18,1	0,428
After exercise			
Maksimum 4	62,5 ± 25,4	61,2 ± 30,2	0,881
Delta 4	73,4 ± 23,2	73,9 ± 25,5	0,939

Table 2. Analysis of Primipara Pelvic Floor Muscle strength before and after being given biofeedback method exercises in the exercise group starting at week 3 and week 6 after delivery.
Note: Delta = Pelvic Floor Muscle strength maximum contraction – minimum.

In the 3rd week of exercise group after running the biofeedbak method exercise for 4 weeks, an evaluation was carried out. From the table above shows that in the week 3 exercise group, after running the exercise for 4 weeks, there was an increase in the maximal contraction value and the delta. The paired T statistical test showed a significant increase in pelvic floor muscle strength ($p < 0.05$) in both delta and maximal contraction. Week 6 exercise group, pelvic floor muscle strength (maximal and delta contraction) increased after undergoing biofeedback method training after 4 weeks. In paired T statistical test, there was a significant difference ($p < 0.05$). After 4 weeks of ODP training in both groups, then an evaluation was carried out, it turned out that statistical tests showed a significant increase in each group.

To assess the comparison of ODP strength between the two groups, due to normal data distribution, an unpaired T test was performed. When compared to the mean changes in the maximal ODP contraction strength in the third week exercise group compared to the sixth week exercise after both 4 weeks of biofeedback training, statistically the difference was not significant ($p = 0.881$). Likewise, the mean change in pelvic floor muscle delta in the two groups at the end of the evaluation was statistically not significant ($p = 0.939$). This means that 4 weeks of biofeedback training performed from week 3 and week 6 post delivery, resulting in an equally large increase in maximal contraction and delta strength of the pelvic floor muscles.

Discussion

Pelvic floor muscle strength after biofeedback exercise started at 3 weeks postpartum was as good as exercises started at 6 weeks postpartum. Pelvic floor muscle training biofeedback as a technique to improve pelvic floor muscle training. Biofeedback therapy (BF) is a technique in which physiological-activity (neuromuscular and autonomic activity) is monitored, amplified, and conveyed to the patient (feedback) as visual or acoustic signals[9]. One study suggests that first-time mothers should be encouraged to start pelvic floor exercises within the first 6 weeks after delivery. Women who are at risk of developing pelvic floor disease must be informed appropriately and potentially modifiable risk factors should be treated before delivery[10].

There are several different research results. A study aimed to assess the effectiveness of pelvic floor muscle training plus electromyographic biofeedback or pelvic floor muscle training alone for stress or mixed urinary incontinence in women. The results of that study indicated that for 24 months no evidence was found of an important difference in the severity of urinary incontinence between pelvic floor muscle training plus electromyographic biofeedback and the pelvic floor muscle training group alone. The routine use of electromyographic biofeedback with pelvic floor muscle training should not be recommended[11].

A systematic review reviewing this also shows that pelvic floor training with biofeedback offers no therapeutic benefit over alternative interventions (no training, pelvic floor training alone and vaginal electrical stimulation) for the treatment of female urinary stress incontinence[12]. These results differ from the results of the study by Maria Capelini et al which stated that the treatment of urinary stress incontinence with pelvic floor exercises associated with biofeedback was proven to be effective, with

maintenance of good results 3 months after treatment[13].

In this study, it was found that the value of the pelvic floor muscle strength before exercise tended to be low in both the 3 and 6 week postpartum groups. The mean maximal contraction at 3 weeks postpartum was 64.6 ± 25.2 hPa, whereas in the sixth week group it was 72.5 ± 20.1 hPa. The mean delta in the exercise group started at 3 weeks 34.3 ± 23.0 hPa and 34.3 ± 23.0 hPa in the exercise group starting at 6 weeks. Although statistically the unpaired T statistical value of the initial value of pelvic floor muscle strength in the two groups was not significant, the absolute value of the maximum contraception of the exercise group starting at 6 weeks was higher than the third week group. This may be due to the spontaneous postpartum resolution process that occurs as early as 6 weeks postpartum. In addition, the influence of hormones during pregnancy that was still obtained during the puerperium (exercise group starting at 3 weeks) such as relaxin, progesterone affected the relaxation of pelvic floor muscle tone so that the strength of the pelvic floor muscles at 3 weeks postpartum had the lowest value. Pregnancy and vaginal delivery are considered to be major risk factors for pelvic floor dysfunction. Prospective re-measurement of observational studies. Pelvic floor muscle strength is significantly reduced after vaginal delivery, both normal and instrumental, 6 to 12 weeks postpartum. Acute caesarean section in a much less reduction in muscle strength[14]. Despite this, other studies have shown that pregnancy and childbirth do not significantly reduce pelvic floor muscle strength. Perineometry and digital vaginal palpation used to assess pelvic floor muscle strength are well received by women[15].

Before getting exercise, each group had their initial pelvic floor muscle strength measured, in this study the mean maximum contraction in the 6 weeks postpartum group was higher (72.5 ± 20.1 hPa) than the 3 weeks postpartum group (64.6 + 25.2 hPa) although statistically this difference was not significant. This could mean that during the 6 weeks postpartum untrained ODP, the maximal contraction strength and delta ODP were slightly higher than the ODP strength 3 weeks postpartum. This is possible because of the physiological process of spontaneous resolution during the puerperium (6 weeks postpartum). In addition, the presence of the hormone progesterone, relaxin during the puerperium can affect the stretching of the supporting tissue and collagenolytic effects, resulting in weakness of the pelvic floor muscles[2,14].

Conclusions

Pelvic floor muscle strength in primiparous post-workout biofeedback method started at 3 weeks postpartum was as good as exercises started at 6 weeks postpartum. Recommendations that can be made are that it is necessary to carry out further research on the length of pelvic floor muscle training starting at 3 weeks postpartum to provide optimal ODP strength results and their effect on the prevalence of ODP weakness symptoms. should be recommended as a postpartum care management, pelvic floor muscle exercises starting at 3 weeks postpartum.

Declaration of Interest

The authors report no conflict of interest.

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