Comparison Between the Effect of Electromagnetic Stimulation Chair with or Without Birth Ball on Pelvic Floor Muscle Dysfunction

Marwa Salah Abd elgawad Abd elhady
B. Sc. N., Faculty of Nursing, Alexandria University

Shadia Ahmed Taha Yassin, Emeritus Professor
Obstetric & Gynecologic Nursing department, Faculty of Nursing, Alexandria University

Niven Rizk Mohammed, Professor
Obstetric & Gynecologic Nursing department, Faculty of Nursing, Alexandria University

Abstract

Background: *Pelvic floor muscle dysfunction (PFMD) is gynecologic health problem caused by damage, weakness and degeneration of pelvic floor, it is clinically identified through testing various parameters of the pelvic floor including pelvic floor muscle weakness, lack of muscle coordination, excessive muscle tension, and unregulated sensory-motor processing. Consequently, pelvic floor muscle training is considered the first treatment proposed for pelvic floor muscle dysfunction and it is widely recommended due to its effectiveness as well as non-invasive method. Quasi- experimental research design was utilized in this study.* ***The aim:*** *this study aimed to compare the effect of electromagnetic stimulation chair with or without birth ball on pelvic floor muscle dysfunction.* ***Settings:*** *The study was conducted at pelvic floor rehabilitation clinic (private clinic).* ***Subjects:*** *A convenient sample of 40 out of 80 women was selected from the previously mentioned setting.* ***Tools:*** *Three tools were used for data collection.* ***The first tool*** *was basic data structured interview to identify women's-demographic data, reproductive history and medical &surgical history.* ***The second tool*** *was Pelvic Floor Interview Schedule.* ***The third tool*** *was Pelvic floor muscles strength test (Manometric assisted biofeedback) MBF:* ***Results:*** *Findings of the present study revealed that there is no any a statistically significant difference in relation to their age. On measuring the pelvic floor muscles strength in the present study, it was noticed that there is no statistically significant difference between the study group (1) and study group (2) at pre intervention (p=0.208). After six weeks and three months from intervention, it was showed a highly statistically significant difference between the two study groups where (p=0.003, p=0.001).* ***Conclusion:*** *The study concluded that, women who practiced active training of pelvic floor muscles by using birth ball with electromagnetic stimulation chair exhibited less signs and symptoms of pelvic floor muscle dysfunction, increased muscle strength and low recurrence rate compared to women who received passive training by using electromagnetic stimulation chair alone with a statistically significant difference over a period of six weeks and three months after the implementation of the exercise program.* ***Recommendations:*** *In service training program should be carried out for nurses to upgrade their knowledge regarding the importance of pelvic floor muscle training (kegel's exercise) during pregnancy, postpartum and during each developmental phase of women's life span.*

Keywords: Pelvic floor muscle dysfunction, electromagnetic stimulation chair, birth ball.

Introduction

Pregnancy, childbirth and overall changes that occur during maternity cycle are considered one of the major risk factors for occurrence of pelvic floor muscles dysfunction. Where intra-abdominal pressure generated by the growing uterus, as well as the mechanical strain imposed by the delivery process and

improper management during post-partum period may cause partial degeneration and injury to the pelvic floor muscle, adjacent connective tissue and finally leading to weakness in pelvic floor muscle and dysfunction. **(Xiaowen et al., 2019).**

PFMD mainly includes a wide variety of clinical problems such as pelvic organ prolapses, fecal incontinence, urinary incontinence, overactive bladder as well as sexual dysfunction. (**Keizer et al., 2019)** Also, it is considered asignificant women's health problem in both developed and developing countries. Where one in every four women suffers from pelvic floor disorders in developed countries. Although there are not enough studies about the prevalence of PFD in developing countries but it is suspected to be higher in developing countries than the developed ones. (**Dheresa et al., 2019)**

PFMD is considered a financial burden on the health care system and disrupts women's quality of life. So that, there are several Strategies that can be applied to decrease PFMD, these strategies mainly focus on lifestyle modifications, medications and manipulation such as Pessary as well as Physical therapy such as pelvic floor muscle training (PFMT). **(Bonzkurt et al., 2014)**

PFMT is also considered the first treatment proposed for pelvic floor muscle dysfunction and it is widely recommended due to its effectiveness as well as non-invasive method with non-intrusive manner and fewer side effects and this is also known as **(Kegel exercises)**. **(Kobayashi et al, 2021.)**

As a result, recently in response to solve these problems (PFMD) Electromagnetic stimulation chair (EMSC) has been introduced as type of passive kegel exercises in addition to active training by using birth ball. **(Weber-Rajek et al, 2020)**

Aims of the Study

This study aims to Compare the effect of electromagnetic stimulation chair with or without birth ball on pelvic floor muscle dysfunction.

Research Hypotheses

- Women who practice active training of pelvic floor muscles by using birth ball with electromagnetic stimulation chair exhibit less signs and symptoms of pelvic floor muscle dysfunction and increased muscle strength than women who receive passive training by using electromagnetic stimulation chair alone.
- Women who practice active training of pelvic floor muscles by using birth ball with electromagnetic stimulation chair exhibit low recurrence of signs and symptoms of pelvic floor muscle dysfunction than women who receive passive training by using electromagnetic stimulation chair alone.

Materials and Method

Materials

Design: quasi- experimental research design was utilized in this study.

Settings: The study was conducted at pelvic floor rehabilitation clinic (private clinic).

Subjects: A convenient sample of 40 women was selected from the previously mentioned setting.

Tools: Three tools were used to collect data of the study:

Tool (I): Basic data interview schedule:

This tool was developed by the researcher and included 3 parts: **Part one:** Socio- demographic characteristics such as age, level of education, occupation etc. **Part two:** Reproductive history such as: gravidity & parity, mode of delivery etc. **Part three:** Past history (Medical and Surgical history)

Tool (II): Pelvic Floor Interview Schedule:

- It was adopted from Pelvic Floor Questionnaire (PFQ) of **Mattson** and used to identify improvement of PFMD symptoms which have been affected by bladder, bowel, or vaginal symptoms., It included 4 sections: Bladder section contained 14 questions with total score (42), Bowel section contained12 questions

with total score (36), Prolapse section contained 5 questions with total score (15) and Sexual function section contained 6 questions with total score (19). **(Mattson et al., 2017)**

-For each of the four sections, each question was scored according to a four-point scale (0-3) where 0 (Not at all),1 (somewhat),2(moderately),3(greatly). the total score for each section was compared before and after intervention to find out any change (effect).

Tool (III): Pelvic floor muscles strength test (Manometric assisted biofeedback) MBF:

Manometric assisted biofeedback (MBF): It is non-invasive, easily applied and well tolerated method which was used by the examiner to measure pelvic floor muscle strength. The patient was positioned in the lithotomy position. The tip of the vaginal or anal pressure sensor was lubricated with sterile gel to be easily inserted about three to four cm from the introitus with one cm remains outside where its sensitive area was crossed muscle sheet of PFMs. Then vaginal or anal pressure was set to zero to start measurement and asked patient to squeeze (contract) forcibly to perform three maximum PFMS contractions holding each for ten seconds if possible with one minute rest interval .The average of three peak values of vaginal squeeze pressure was taken to make up the baseline pretreatment value for each patient .**(Herderschee, Hay-Smith, Herbison, Roovers, Heineman, 2011)**

Method

- Approval was obtained from the Ethical Research Committee. An official letter from the Faculty of Nursing, University of Alexandria was submitted to the responsible authorities of the previously mentioned setting to carry out the study.
- fter reviewing the recent relevant literature, tool (I) was developed by the researcher.
- ools II & III were adopted and tool II was translated into Arabic language and the necessary modifications were done.
- ools were tested for content validity and applicability by jury of (5) experts in the field of obstetric and gynecologic nursing. Their suggestions and recommendations were taken into consideration.
- The reliability of the tools was tested using internal consistency test (Cronbach α) and the results were highly reliable. (r= 0.95).
- A pilot study was carried out on 4 women to ensure the clarity and applicability of the tools, identify obstacles and problems that may be encountered as well as to estimate the time needed for data collection. Accordingly, the necessary modifications were made. Women participating in the pilot study were excluded from the study sample.
- The program started from 20/4/2021 until 27/9/2021.
- The study was conducted through the following phases:

I. Assessment phase:

- The 40 women who fulfilled the inclusion criteria at the private clinic were selected and then assigned into two study groups (20 participants in each group).
- The researcher conducted individual interviews with the subjects of the study to collect basic data using (tool 1) and assess pelvic floor muscle condition using (tool II &tool III).
- They were given an appropriate explanation about the purpose of the study; the explanation was done using power point presentation at the clinic for small group (5-10) women each time.

II. Implementation phase:

- The study group was divided randomly into four subgroups according to

the schedule of subjects and each group included approximately 10 subjects.

- For the two study groups, the training was implemented in 12 sessions, it was scheduled as: one session /week (30 minutes for each session).

- After orienting the first study group to the clinical training environment and the available resources. A clinical section on precautions, steps and technique of pelvic floor muscle training (PFME) by using birth ball were demonstrated by the researcher. While the second study group received only the passive training of pelvic floor muscle by using electromagnetic stimulation chair after receiving appropriate instructions from the researcher.

- There are some instructions specific to electromagnetic stimulation chair were considered as follows:

Before procedure:

- The researcher was knowledgeable about the therapeutic use of electrical stimulation and being thorough and competent in performing initial and ongoing patient examinations and assessments in collaboration with other health care providers.

During procedure:

- Researcher instructed woman to be fully clothed during session and put her in proper position (sitting position in the center of chair); woman removed any metal materials and jewellery. The researcher told her that she may feel intense but comfortable muscle contraction and instructed her to report any felling of discomfort during procedure, continuous monitoring and reassurance of the woman was done.

III. Evaluation phase: included 2 follow up: Short term follow up was conducted after 6 weeks and long term follow up was conducted after three months of the implementation of exercise program (training) and the subjects were assessed using assessment questionnaire as subjective tool (tool II) and pelvic floor muscles strength test (Tool III) (Manometric assisted biofeedback), the two scores were compared in order to identify long term effect and recurrence rate.

Ethical considerations:

For each recruited subject a written informed consent was obtained after explanation of research purpose, the subject's privacy was considered and respected. Confidentiality of the subject's data was assured and respected at all phases, right to voluntary participation and withdrawal of the study subjects at any time was respected.

Statistical Analysis

Collected data were categorized, coded, computerized, tabulated and analyzed using statistical package for social science (SPSS) version 25 and presented in descriptive and association forms. The necessary tables were then prepared.

Results

Table (1): shows that less than two- thirds (60%) of the study group1 (birth ball with chair group) compared to slightly more than two- fifth (45%) of the study group2 (chair only group) had a weak pelvic floor muscle contraction before the intervention with no statistically significant difference between them (p=0.208). but After six weeks from the intervention, more than half (55%) of the study group (1) had strong contraction compared to only (20%) of the study group (2) had strong pelvic floor muscle contraction. The differences were statistically significant between both groups (p=0.003). While, three months after intervention, more than half (55%) of the study group (1) had strong contraction compared to none (0.0%) of the study group (2). The differences between groups was statistically highly significant (p<0.001).

Table (2): explores that there is no statistically significant differences between both study groups in relation to their age, level of education, occupation and family income where, P=(0.773, 1.000, 0.744, 0.237, respectively)

Table (3): demonstrates that before and after six weeks of intervention, there is no statistically significant difference between both study groups (1&2), where (p= (0.644, 0.205, respectively). While after three months of intervention, the differences were statistically significant between both study groups in relation to pelvic floor muscle strength, where (p=0.026).

Table (4): reveals no statistically significant relation was found between the studied subject's pelvic floor muscle strength and their age (years). Where (p=0.901, 0.333).

Discussion

Pelvic floor dysfunction (PFD) is considered an important public health concern because of its high prevalence, deleterious effects on pregnancy and its outcomes, quality of life as well as impacts on the health care system as a whole. PFD includes broad range of problems such as: urinary incontinence, fecal incontinence, pelvic pain, weakness in the muscles of the core stability and the prolapse of pelvic organs. **(Kim et al ., 2020; Alves et al ., 2015)**

Consequently, Treatment of pelvic floor muscle disorders (PFD) should involve Structured and well-organized pelvic floor muscle training regimen (PFMT) which is considered the first non-invasive treatment proposed for pelvic floor muscle dysfunction. This type of training is also known as **Kegel exercises**. There are different modalities can be used for performing pelvic floor muscle training (kegel exercise) such as birth ball (as active training) and electromagnetic stimulation chair (as passive training). **(Woodley et al, 2020; Sobhgol et al ., 2020)**

In relation to the study subject's pelvic floor muscles strength after six weeks and three months from intervention, it was showed a highly statistically significant difference between the two study groups. This could be attributed to two reasons. ***Firstly***, communicating the high expectations to the study groups for improvement before program implementation that motivate them to adhere to researcher instructions regarding exercise program ***Secondly,*** the valuable information that are given about types, benefits and advantages, precautions, steps and technique of application throughout the training sessions as well as the use of different educational materials such as photos about PFM training by using birth ball.

In relation to the effect of electromagnetic stimulation chair on pelvic floor muscle dysfunction:

The results of the present study are consistent with the findings of **Silantyeva et al., (2021),** who had conducted a study entitled " A comparative study on the Effects of high-intensity focused electromagnetic technology and electro stimulation for the treatment of pelvic floor muscles and urinary incontinence in Parous Women". This study revealed that HIFEM therapy (electromagnetic stimulation chair) was more effective method for treatment of weak pelvic floor muscle based on the evaluation by both subjective (questionnaires) and objective methods (manometric assisted biofeedback) and also it produced more profound improvement in PFMs with reduction of urinary incontinence severity and finally, leads to positive impact on the quality of life .

In addition to, **Lukanovic et al., (2021),** who had conducted study titled " Effectiveness of magnetic stimulation in the treatment of urinary incontinence: A Systematic Review ", this study reported that magnetic stimulation chair is a successful non-invasive conservative method for treating UI, where UI improved after treatment with magnetic stimulation (MS) and The international consultation incontinence questionnaire short-form (ICIQ-UI SF) score improved regardless of the type of UI. However, the greatest decrease in post-treatment assessment ICIQ-UI SF scores was

seen in patients with stress urinary incontinence.

In relation to the effect of active pelvic floor muscle training by using birth ball (Gym ball) on pelvic floor muscle strength:

The results of the present study are congruent with the findings of other studies, **Martinho et al., (2016).** Who had conducted study titled "The effects of training by virtual reality or gym ball on pelvic floor muscle strength in postmenopausal women: a randomized controlled trial", this study showed that PFMT by using gym ball (birth ball) lead to increase in the "maximum strength" parameter, which could refer to the power and ability to perform fast contractions.

The same findings are supported by the findings of **Mirzakhani et al., (2015).** Who had conducted study investigated ''Effect of performing birth ball exercises during pregnancy on mode of delivery in primiparous women", this study showed that performing birth ball exercises for 4-6 weeks at the end of pregnancy could increase pelvic floor muscle strength and the rate of vaginal delivery? Therefore, birth ball exercise could be applied as a non-pharmacological, inexpensive method for strengthening pelvic floor muscles and reducing the incidence of PFD and cesarean section rate.

Comparison between the effect of electromagnetic stimulation chair with or without birth ball (PFMT) on pelvic floor muscle dysfunction:

The results of the current study are to some extent in harmony with the results of **Mikuš et al., (2021),** who had conducted study titled "Comparison of efficacy of extracorporeal magnetic innervation and Kegel exercises for stress urinary incontinence in adult women", they concluded that PFMT(active Kegel exercise) is associated mostly with improvement in symptoms and its short-term cure rate is up to 80% based on 8-week high-intensity home-based regimen in order to sufficiently increase strength, endurance and coordination of pelvic floor muscle activity and to achieve an optimal overall patient treatment response. While in clinical practice, electromagnetic stimulation (EMS) attract attention chiefly because of its high acceptance and tolerability rates among patients, non-invasiveness, improved quality of life (QoL) scores and minimal adverse effects. But it is unclear whether one of these routinely used treatment modalities is superior to another in terms of improvement of clinical outcomes or cost-effectiveness.

The present study results showed that there wasn't a statistically significant relation between the studied subject's pelvic floor muscle strength and their age (years) in both study groups. The present study results are congruent with the results of previously mentioned study that had conducted by **Sartori et al. (2021)** who evaluated "Reliability of pelvic floor muscle strength assessment in healthy continent women",, it showed that there was no statistically significant difference in PFM strength in the different age groups .

Conclusion

Based on the results of the current study, it can be concluded that, women who practiced active training of pelvic floor muscles by using birth ball with electromagnetic stimulation chair exhibited less signs and symptoms of pelvic floor muscle dysfunction, increased muscle strength and low recurrence rate compared to women who received passive training by using electromagnetic stimulation chair alone with a statistically significant difference over a period of six weeks and three months after the implementation of the exercise program. Therefore, the research hypotheses are fulfilled.

Recommendations

In line with the findings of the study, the following recommendations are made:

- In service training program should be carried out for nurses who are working

in antenatal clinics to upgrade their knowledge regarding the importance of pelvic floor muscle training (Kegel exercise) during pregnancy.

- Enforce good postpartum care with more emphasis on an importance of pelvic floor muscles exercise for prevention of pelvic floor muscle dysfunction.

Table (1): Distribution of the study subjects according to their pelvic floor muscles strength at pre, 6 week and 3months after intervention

Pelvic floor muscles strength	Pre-intervention				6 weeks after the intervention				3 months after intervention			
	Birth ball + chair (n = 20)		Chair only (n = 20)		Birth ball + chair (n = 20)		Chair only (n = 20)		Birth ball + chair (n = 20)		Chair only (n = 20)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
No contraction	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Weak contraction	12	60.0	9	45.0	1	5.0	3	15.0	2	10.0	7	35.0
Moderate contraction	8	40.0	11	55.0	8	40.0	13	65.0	7	35.0	13	65.0
Strong contraction	0	0.0	0	0.0	11	55.0	4	20.0	11	55.0	0	0.0
Min – Max.	41.0 – 75.0		43.0 – 77.0		60.0 – 123.0		52.0 – 84.0		58.0 – 119.0		47.0 – 79.0	
Mean ± SD.	57.95 ± 10.17		62.20 ± 10.82		87.45 ± 18.96		71.90 ± 10.03		85.05 ± 18.57		64.55 ± 9.69	
Median	59.0		66.50		85.50		76.50		84.0		68.50	
t (p)	1.280 (0.208)				3.243* (0.003*)				4.377* (<0.001*)			

Table (2): distribution of the study subjects according to their socio-demographic characteristics (n=40)

Socio- demographic data	Study1 (EMSC+ birth ball) (n = 20)		Study2 (EMSC only) (n = 20)		Test of Sig.	P
	No.	%	No.	%		
Age (years)						
20–<25	1	5.0	0	0.0	χ^2=	MCp=
25–<30	5	25.0	3	15.0	1.793	0.773
30–<35	7	35.0	9	45.0		
≥35	7	35.0	8	40.0		
Min – Max.	23.0 – 41.0		29.0 – 47.0			
Mean ± SD.	32.30 ± 4.77		35.65 ± 6.43		t= 1.872	0.069
Median	32.50		33.50			
Level of Education						
Illiterate / read and write	0	0.0	0	0.0		
Primary and preparatory	2	10.0	3	15.0		
Secondary education	10	50.0	10	50.0	χ^2= 0.374	MCp= 1.000
University education	8	40.0	7	35.0		
Post university education	0	0.0	0	0.0		
Occupation						
House wife	12	60.0	13	65.0	χ^2=	0.744
Work	**8**	**40.0**	**7**	**35.0**	0.107	
Type of work						
Employee	8	100.0	7	100.0		
Worker	0	0.0	0	0.0	–	–
Others	0	0.0	0	0.0		
Family income/month						
Enough	20	100.0	17	85.0		
Not enough	0	0.0	2	10.0	χ^2= 2.801	MCp= 0.237
More than enough	0	0.0	1	5.0		

Table (3): Distribution of the study subjects according to their pelvic floor muscles strength at pre, 6 week and 3months after intervention. (using tool II)

Pelvic floor questionnaire	Pre-intervention		6 weeks after the intervention		3 months after intervention	
	Birth ball + chair (n = 20)	Chair only (n = 20)	Birth ball + chair (n = 20)	Chair only (n = 20)	Birth ball + chair (n = 20)	Chair only (n = 20)
Min – Max.	10.0 – 30.0	10.0 – 33.0	3.0 – 24.0	5.0 – 25.0	3.0 – 25.0	8.0 – 30.0
Mean ± SD.	20.20 ± 7.59	21.35 ± 8.03	12.20 ± 7.10	15.10 ± 7.14	13.35 ± 7.27	18.70 ± 7.38
Median	21.0	22.50	11.0	16.0	12.0	19.50
t (p)	0.465 (0.644)		1.288 (0.205)		2.309* (0.026*)	

Table (4): distribution of the study subjects according to the relation between pelvic floor muscle strength and their age. (pre-intervention)

Age (years)	Pelvic floor muscle strength							
	Study1 (EMSC+ birth ball) (n = 20)				Study2 (EMSC only) (n = 20)			
	Weak contraction (n = 12)		Moderate contraction (n = 8)		Weak contraction (n = 9)		Moderate contraction (n = 11)	
	No.	%	No.	%	No.	%	No.	%
20–<25	0	0.0	1	12.5	0	0.0	0	0.0
25–<30	3	25.0	2	25.0	0	0.0	3	27.3
30–<35	5	41.7	2	25.0	5	55.6	4	36.4
≥35	4	33.3	3	37.5	4	44.4	4	36.4
χ^2(MCp)	1.945 (0.901)				2.631(0.333)			

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