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Effect of Four-Square Breathing Exercises on After Pains, Initiation of Breastfeeding, and Satisfaction with Intervention among Postpartum Mothers

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Abstract
Background: Postnatal period is a joyous yet a challenging period for all mothers. After pain is one of the ailments which often goes unrecognized in this period. **Aim of the study:** this study aimed to evaluate the effect of four-square breathing exercises on after pains, initiation of breastfeeding and satisfaction with intervention among postpartum mothers. **Design:** A quasi-experimental research design. **Sample:** A convenient sample of 112 postpartum mothers**. Setting:** This study was carried out at the postpartum ward of El- Mansoura New General Hospital, El-Dakahleya Governorate, Egypt. **Tools:** Data was collected through three tools, basic data structured interview schedule, which included socio-demographic characteristics and reproductive history; Numerical Pain Rating Scale (NPRS), and Satisfaction Likert Scale. **Results:** This study reported initiation of breastfeeding within half an hour and one hour after delivery by 26.8% & 57.1% respectively of the study group, compared to 10.7% & 30.4% respectively of the control group. Intensity of after pains was also mild 1 & 2 days after intervention among 69.6% & 94.6% respectively of the former group, compared to 30.3% & 53.6% respectively of the latter group. In addition, most of the study group (96.4%) was completely satisfied with the intervention. **Conclusion:** This study concluded that four-square breathing exercises significantly reduced the intensity of after pains and enhanced early initiation of breastfeeding as well as achieved satisfaction of postpartum mothers with the intervention. **Recommendations:** Four square breathing exercises should be incorporated into the nursing intervention protocols of post-partum mothers.

Keywords: Four-Square Breathing Exercise, After Pains, Initiation of Breastfeeding, Satisfaction & Postpartum Mothers.

Introduction:
During postnatal period, woman's body experiences many physiological changes, especially in the uterus. After birth of the baby and delivery of placenta, the uterus continues contracting to enhance constriction of maternal blood vessels on uterine wall at placental site. These persistent mild contractions are termed as after-labor pains or after-pains, which create cramp like pain for a few days to 1 or 2 weeks after delivery. After-pain is usually spasmodic in nature and is felt in the lower abdomen as uterus contracts to return back to the pre-pregnancy size and place. However, initiation of breastfeeding leads to release of oxytocin from the posterior pituitary gland, which produces more uterine contractions. Therefore, after-pain may cause discomfort to the mother, especially multipara, thus, interferes with performing daily routine activity of caring for herself and her baby. It also may act as a trigger in neuro-hormonal stress response, which further leads to anxiety, insomnia, and fatigue in postnatal mothers. After-pains decrease in intensity and become mild by the 3rd postpartum day **(Panda et al., 2021 & Vasava et al., 2021)**

The International Mother Baby Childbirth Organization (IMBCO) introduce mother-baby care to emphasize the importance of recognizing that mothers and babies should be considered a unit during the immediate postpartum period (0–2 hours). It is important to avoid disrupting this close relationship and to encourage skin-to-skin contact between the baby and the mother (or partner if the mother is unable). The parent–baby bond, the first step in the baby's subsequent attachments, is formative to a child's sense of security and has long-lasting effects. Having early physical contact with the baby can also affirm parents' sense of accomplishment and promote their self-confidence as parents **(Hunt, 2020)**. However, women with skin-to-skin contact were more likely to breastfeed within one hour after delivery and continue breastfeeding for four months post- birth than women with standard contact **(Moore, 2016)**.

Pain has been documented as a major concern for women in the postpartum period. However, its management is a relatively neglected area of clinical research As a result, evidence to support interventions to alleviate it is sparse. Therefore, inadequate pain relief in the hours to months following childbirth can interfere with maternal-newborn bonding and feeding as well as increase the risk of postpartum complications by impeding mobility. It may also increase the risk of chronic pain that lasts beyond the postpartum period **(Fahey, 2017)**

Many studies done on after labor pain had assessed its nature and characteristics as well as non-pharmacological methods to minimize it. Non-pharmacological measures such as prone position, oil massage, Kegel's exercise, deep breathing exercise and application of Melissa Officinalis (Balm) have been found useful in reducing after-pains. Four-square breathing exercise, also known as box breathing, is relatively a new technique of breathing exercise that can help in reducing after-labor pain in postnatal women. It is very simple to learn and to practice as well as it can be practiced virtually anywhere and anytime **(Ramasamy & Suzan, 2014 & Scott, 2020)**

Intervention for pain and discomfort during labor and after delivery is a fact of modern obstetric care for laboring women, and it's a challenging topic for nurses establishing intervention protocols **(Karlström et al., 2015).** Nurses who care for women must learn to recognize postpartum pains and discomfort as a sensory and affective event, assess it, and intervene. These must be tailored to the specific demands and wants of each woman. The fundamental professional goal in the disciplines of obstetric nursing and midwifery has been to ensure a safe and optimal labor experience with little pain and discomfort. Women who had pleasant experiences throughout their labors and births described being well-cared for and supported by medical professionals. Women who had unfavorable feelings about childbirth described uncomfortable and disappointing contacts with hospital personnel **(Basyouni & Gohar, 2017)**. Nurses should never underestimate their potential to boost or lower a woman's self-esteem, sense of accomplishment, and general contentment with delivery in this context, and should try to assist all clients in their transition to parenting.

Significance of the study:

The postpartum period is a significant time for the mother, baby, husband, and family. It is a time of transition and adaptation as well as it is formative for everyone. Providing family-centered care to women, their husbands, and families during the postpartum period is an essential component of the care offered by all institutions, agencies, and programs **(Hunt, 2020)**. Effective postpartum pain management is an important aspect of obstetric nursing care for a mother to carry out her normal activities, bonding with and caring for her baby as well as it can interfere with establishing breastfeeding. Four square breathing exercises are a non-pharmacological pain reliever that has been shown to be beneficial in conditions other than after pains **(Basyouni & Gohar, 2017).** In the present study, the investigator used four-square breathing exercises. Therefore, this study was carried out to investigate the effect of four-square breathing exercise in reducing after pain to improve daily routine activities of postnatal mothers.

Aim of the study:

This study aimed to evaluate the effect of four-square breathing exercise on after pains, initiation of breastfeeding and satisfaction with intervention among postpartum mothers.

Study hypothesis:

H [1]: Postpartum mothers who perform four-square breathing exercise experience mild or no after pains than those who don't perform it.

H [2]: Postpartum mothers who perform four-square breathing exercise experience early initiation of breastfeeding than those who don't perform it.

H [3]: Postpartum mothers who perform four-square breathing exercise experience great satisfaction with this intervention

Operational definition:

Four-square breathing exercise is a relatively new technique of breathing exercise.

Materials and Method:

Study Design:

A quasi-experimental research design was used as an attempt to establish a cause-and-effect relationship between an independent and dependent variable, with no random assignment of participants.

Study Setting:

This study was conducted at the postpartum ward of Mansoura New General Hospital (MNGH), affiliated to the Ministry of Health and Population, El-Dakahleya Governorate, Egypt providing all types and level of care.

Study Subjects:

Purposive sample of 112 postpartum mothers was selected from the previously mentioned setting according to the following inclusion criteria:

- Free from any medical or obstetric risk factors and/or conditions
- Multiparous women who were between 20 and 35 years of age
- Do not receive any pharmacological pain relief substance.
- Delivered in the previous 24 hours, who had delivered full term, live single fetus (37 to 42 weeks

of gestation) without any congenital anomalies by normal vaginal delivery
- Didn't receive this exercise before
- Willing to participate in the study.
- At least read & write

The study subjects were assigned into 2 equal groups:
- The study group included 56 postnatal mothers, who performed four-square breathing exercise.
- The control group involved 56 postnatal mothers, who didn't perform four-square breathing exercise and received routine hospital care

Sample size was calculated by the following formula:
According to data from literature **(Vasava et al., 2021)** , concerning level of significance of 5%, and power of study of 80%, the sample size

$$n = \frac{\left[\left(Z_{\alpha/2} + Z_{\beta}\right)^2 \times \{2(SD)^2\}\right]}{(mean\ difference\ between\ the\ two\ groups)^2}$$

$Z_{\alpha/2}$: depends on 5% level of significance, which equals 1.96
Z_{β}: depends on 80% power, which equals 0.84
SD = Standard Deviation
$n= [(1.96 + 0.84)^2 \times \{2(3.2)^2\}]/ (1.7)^2 =55.6$
So, the required sample number per group is 56.

Tools of data collection:

Three tools were used by the researchers to collect the necessary data:

Tool one: Structured interview schedule, which was developed by the researchers, and entailed 2 parts:

Part I: Socio-demographic characteristics such as (age, educational level, & residence).

Part II: Initiation of breastfeeding include time of initiation (early or late breastfeeding).

Tool two: Numerical Pain Rating Scale (NPRS), which was developed by **(McCaffery, 1994).** and adapted by researchers to allow postpartum mothers to rate their level of after pains from 0 to 10 orally or by placing a mark on the line indicating it. It is classified into : 0 [no pain], 1-3 [mild pain], 4-6 [moderate pain] and 7-10 [severe pain].

Tool three: Satisfaction Likert Scale, which was developed by **(Friedel et al., 2014)** and adapted by the researchers to assess postpartum mother's satisfaction with four-square breathing exercise. It included 6 items: (1) women were comforted with using intervention; (2) it was a positive experience; (3) intervention was easy to use; (4) they would like to use this intervention in the future; (5) it has no side effects; (6) it was cost effective. A 3 points satisfaction Likert scale was used: satisfied (3) neither satisfied nor dissatisfied (2) and dissatisfied (1). The total score ranged between 6-18, where 14-18(completely satisfied), 6-< 10 (partially satisfied), and 10-<14(dissatisfied).

Field Work:

First phase (Preparatory phase):
- An ethical approval was obtained from Committee of Mansoura University, Faculty of Nursing before conducting the research.
- Official permission to collect data was obtained from the responsible authority of the study setting after explaining the purpose of the study.
- Tool one was developed by the researchers based on extensive review of recent and relevant literature, while tool two & three was adapted to suit Egyptian women
- The tools have been reviewed for content validity by a panel of 3 expert professors in the field of maternity nursing.
- Tools were checked for reliability for tool two and three by Cronbach's alpha test & it was reliable for tool two (0.81) and tool three (0.75).
- A Pilot study was applied on 12 postpartum mothers (excluded from the study subjects) for the feasibility of the study as well as to verify the clarity and applicability of the tools over time. After Pilot study, the tools have been overhauled, rebuilt and ready to use

Second phase (Implementation phase):
- Data were collected over a period of 7 months, starting from the beginning of May 2021 till the end of November 2021.
- Data of tool one was collected from postpartum mothers upon admission to the postpartum ward through an interview schedule which was conducted individually
- The study group received simple explanation by the researchers on how to perform four-square breathing exercise
- The researchers instructed postpartum mother of the study group to inhale to a count of four, holding air in lungs for a count of four, then exhale to a count of four, and holding lungs empty for a four-count.
- Postpartum mother was asked to repeat this exercise 5 cycles, at least 3 times per day on the 1st & the 2nd postpartum days [Figure 1].
- Postpartum mothers of the control group didn't perform four-square breathing exercise and received routine hospital care.

Third phase (Evaluation phase):
- The researchers measured after pains intensity for both groups during the 1st postpartum day at hospital before and after intervention, using tool two.
- They also measured after pains intensity for both groups during the 2nd postpartum day, through telephone call, using the same tool.

- The researchers measured satisfaction of the study group with intervention during the 2nd postpartum day, through telephone call, using tool three.
- Comparison between the two groups was done to identify the effect of four-square breathing exercise on after pains, initiation of breastfeeding, and satisfaction with intervention

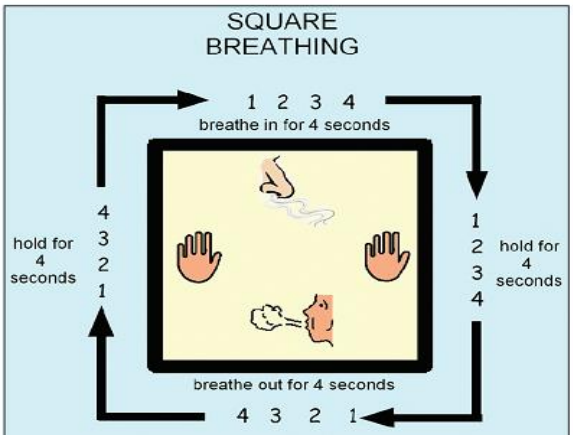

Figure (1): Square breathing technique

Statistical analysis:

- The collected data were categorized, coded, computerized, tabulated and analyzed using Statistical Package for Social Sciences (SPSS) version 23 program.
- Statistical measures were used such as cross tabulation to describe and summarize categorical variables of the two groups.
- A descriptive and analytical statistics were used such as percentages, mean & SD, whereas Chi-square-test, Fisher Exact-test and t-test were used to find out the difference in the results at < 0.05 (5%) level of significance.

Ethical Considerations:

- An approval from Ethical Research Committee, Faculty of Nursing, Mansoura University was obtained.
- Written informed consent was taken from each participant after explaining the aim of the study.
- Participants' privacy and right to withdraw at any time were kept.
- Confidentiality of their data was assured

Results:

Table (1): Distribution of postpartum mothers according to their socio - demographic characteristics

Socio - demographic characteristics	Study Group (n=56)		Control Group (n=56)		t-test (P) F / χ^2 (P)
	No	%	No	%	
Mean Age:	22.911 ± 2.665		23.018 ± 2.268		0.229 (0. 819)
Educational level:					
- Read & Write	9	16.1	10	17.9	1.819 (0.611)
- Basic	11	19.6	9	16.1	
- Secondary/its equivalent	27	48.2	32	57.1	
- University	9	19.1	5	08.9	
Residence					
- Rural	29	51.8	23	41.1	1.292 (0.256)
- Urban	27	48.2	33	58.9	

χ^2 *(P): Chi-Square Test & P for* χ^2 *Test* *F (P): Fisher Exact test &P for F Test* **: Significant at P ≤0.05*

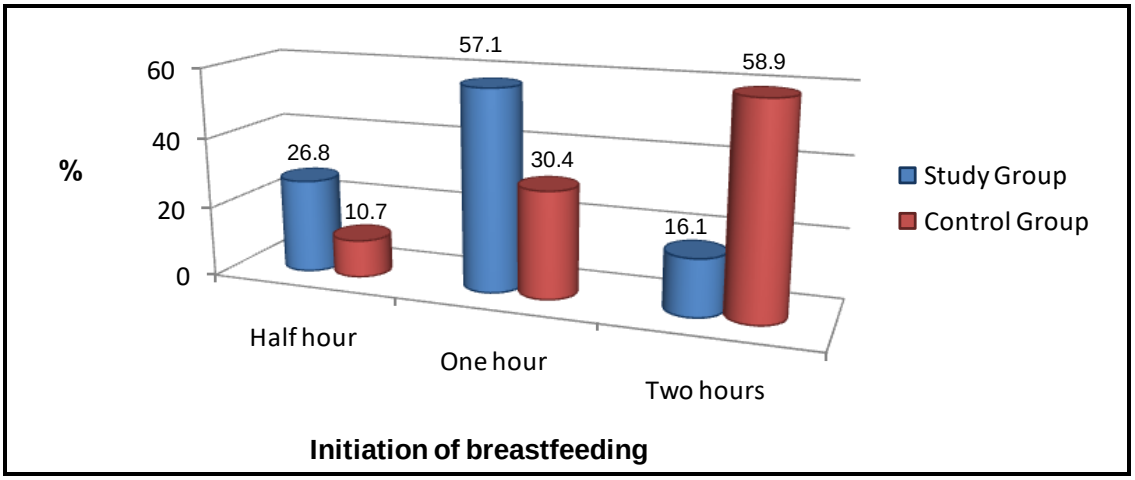

Figure (2): Percent distribution of postpartum mothers according to their initiation of breastfeeding

χ^2 =22.163 (P=<0.0001) **

Table (2): Number and percent distribution of postpartum mothers according to their intensity of after pains using NPRS

Intensity of after pains	Study Group (n=56)		Control Group (n=56)		F / χ^2 (P)
	No	%	No	%	
Before intervention:					
- Moderate (4-6)	27	48.2	25	44.6	0.144
- Severe (7-10)	29	51.8	31	55.4	(0.704)
Immediately after intervention:					
- Mild (1-3)	9	16.1	3	05.4	7.525
- Moderate (4-6)	38	67.8	33	58.9	(0.023)*
- Severe (7-10)	9	16.1	20	35.7	
1day after intervention:					
- Mild (1-3)	39	69.6	17	30.3	18.875
- Moderate (4-6)	16	28.6	31	55.4	(<0.0001)**
- Severe (7-10)	1	01.8	8	14.3	
2days after intervention:					
- Mild (1-3)	53	94.6	30	53.6	24.707
- Moderate (4-6)	3	05.4	24	42.8	(<0.0001)**
- Severe (7-10)	0	00.0	2	03.6	

χ^2 (P): Chi-Square Test &P for χ^2 Test *F (P): Fisher Exact test &P for F Test*
: Significant at P ≤0.05* *: Highly Significant at P ≤0.05*

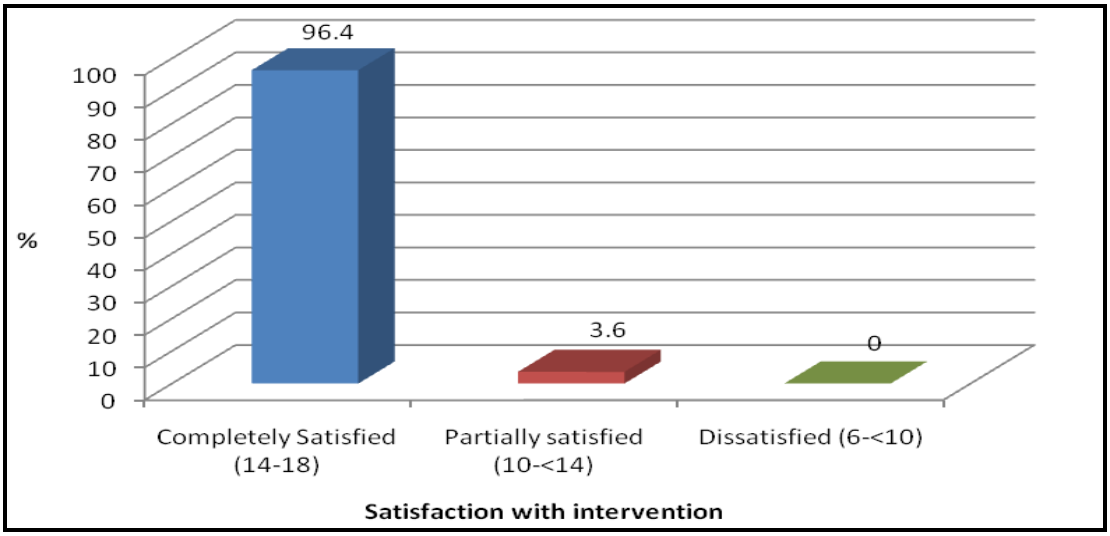

Figure (3): Percent distribution of the study group according to their satisfaction with intervention using satisfaction Likert-scale

Table (1): Displays distribution of postpartum mothers according to their socio - demographic characteristics. **Mean age** was 22.911 ± 2.665 years & 23.018 ± 2.268 years for the study and the control groups respectively. **Educational level** also showed that around one-half and more (48.2% & 57.1%) of the two groups respectively had secondary level or its equivalent. In addition, **residence** clarified that almost one-half and more (48.2% & 58.9%) of the study and the control groups respectively were urban residents. However, the two groups' socio-demographic characteristics were almost similar, where no statistically significant differences were found between them.

Figure (2): Demonstrates the percent distribution of postpartum mothers according to initiation of breastfeeding. Breastfeeding was early initiated within half an hour after delivery by 26.8% of the study group, compared to 10.7% of the control group. It was also initiated one hour after delivery by 57.1% of the former group, compared to 30.4% of the latter group. On the other hand, breastfeeding was late initiated by 58.9% of the control group two hours after delivery, compared to 16.1% of study

group. However, a highly statistically significant difference was found between the two groups, where P=<0.0001.

Table (2): Manifests the number and percent distribution of postpartum mothers according to their intensity of after pains using **Numerical Pain Rating Scale (NPRS)**. No statistically significant difference was found between the two groups before intervention. However, a statistically significant difference was observed between them immediately after intervention (P=0.023), where intensity of after pains was severe among 16.1% of the study group, compared to 35.7% of the control group. Highly statistically significant differences were also noticed between the two groups 1 & 2 days after intervention (P=<0.0001), where intensity of after pains was mild among 69.6% & 94.6% respectively of the former group, compared to 30.3% & 53.6% respectively of the latter group.

Figure (3): Shows the percent distribution of the study group according to their satisfaction with intervention using satisfaction Likert-scale. Fortunately, most of the study group (96.4%) reported that they were completely satisfied.

Discussion:

Numerous changes occur in different aspects of women's lives in the postpartum period, where women adjust with problems and take advantage of this opportunity. Therefore, accurate knowledge of their experiences and feelings is necessary to help them benefit from this period **(Asadi et al., 2021)**. After pain is one of postpartum problems that may cause some discomfort, which can interfere with a woman's ability to care for herself and her baby **(Anna Klepchukova, 2022)** . It can be managed by pharmacological method such as analgesics or non-pharmacological measures such as relaxation and breathing techniques as well as early ambulation, evacuation of the bladder and early initiation of breastfeeding **(Wisner, 2022)** . Few studies have included use of breathing exercise in pain management after labor **(Dengsangluri & Salunkhe, 2015; Yuksel et al., 2017)**

After pain has been documented as a major concern for women in the postpartum period, its management. As a result, evidence to support interventions to alleviate the discomforts associated with after pains is sparse. Therefore, this study was conducted to evaluate the effect of four-square breathing exercise on after pains, initiation of breastfeeding and satisfaction with intervention among postpartum mothers.

The results of present study revealed that four-square breathing exercise significantly enhances early initiation of breastfeeding and reduces the intensity of after pains (Figure 2 & Table II). This may be interpreted as this exercise can reduces physical stress symptoms in the body by decreasing the stress hormone (Cortisol); positively affects emotions and mental well-being by reducing anxiety, depression, and stress; as well as increases mental clarity, energy, releases endorphins, which are the feel-good hormones and a natural pain killer created by the body itself. It also diverts, a focus away from the pain as it reduced pain perception, helps postpartum women cope with stress; alleviates insomnia; controls hyperventilation; and eases worry. In addition, this exercise lowers blood pressure, which can help postpartum women relax and be in a good mood. Moreover, slow deep breathing can influence pain perception throughout cardiovascular changes. As such, respiration may be considered a behavioral interface to change autonomic discharge patterns and central mechanisms known to modulate pain. All these can lower the intensity of after labor pains and motivate postpartum women to initiate breastfeeding early **(Contributers & 2021; Jafari et al., 2017; Jewell, 2021 & Stinson, 2018)**

The current finding partly corresponds with a study conducted in Egypt, where it was reported that practicing breathing exercise was effective in reduction of the mean score of after pains among postpartum women **(Basyouni & Gohar, 2017)**. It also relatively conforms to a study performed in Gujarat, India, where it was concluded that although after-labor pain reduces naturally overtime, four-square breathing exercise can help in reducing this pain further. On the other hand, the present finding is incongruent with this Indian study, which reported no difference between the experimental and the control groups in terms of time of initiating breastfeeding **(Vasava et al., 2021)**. The difference between the finding of this study and the current one may be due to different sample size and different culture.

The result of the present study also revealed satisfaction with four-square breathing exercise among most of the study group (96.4%), who reported that they were comfortable with using this exercise as it was a positive experience, easy to use and has no side effects. In addition , four square breathing exercise helps to remove the toxins from the body so promoting better blood flow with fresh oxygen which help to improves sleep, emotions of well-being , clams down anxiety and alleviates pain, as well as increases physical strength so it enhance women's satisfaction **(Nestor, 2020).** In addition, the study group reported that they would like to use this exercise in the future (Figure 3). Actually, four-square breathing exercise is a very simple and even familiar type of pain management exercise. It is also

very simple to learn and to practice as well as it can be practiced virtually anywhere and anytime (Scott, 2020). The current finding relatively accords with a study accomplished in Beirut, Lebanon, where it was observed that around 85% of the patients were satisfied with their pain management (Tawil et al., 2018).

Conclusion:

Based on the findings of the present study, it can be concluded that four-square breathing exercise significantly reduced intensity of after pains and enhanced early initiation of breast feeding as well as achieved satisfaction of postpartum mothers with the intervention. So, the study aim and hypothesis were achieved within the framework of the present study.

Recommendations:

Based on the findings of the present study, the following recommendations are suggested:

In-service training programs should be carried out for postpartum health care providers to increase their awareness about the positive effects of 4-square breathing exercises in the management of after-labor pains and enhance early initiation of breastfeeding as well as satisfaction

- Four square breathing exercises is a practice that is inexpensive, effective, and easy to apply during the hospitalization period. Therefore, it should be incorporated in the nursing intervention protocols of post-partum mothers.
- The curriculum of basic nursing / midwifery education as well as continuing education should entail the four-square breathing exercises for management of afterpains
- Patient's education about Four square breathing exercises should be implemented with all post-partum women to help relieve pain
- A baseline information leaflet about the importance and the way of performing 4-square breathing exercises to manage after-labor pain, should be designed, and distributed to all postpartum women.
- Future trials should aim to include larger sample sizes and different settings to justify the causal association between the 4-square breathing exercises and after-labor pains.
- Further study should be performed to evaluate the effect of using 4-square breathing exercises for the management of pain following cesarean section delivery.

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Conflict of Interest Disclosure

Researchers declared that there is no conflict of interest in the research.

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