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Effectiveness of pelvic rocking exercise on length and pain in delivery women: a Meta-Analysis

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ABSTRAK

Latar belakang: *Kecemasan terhadap proses persalinan yang memanjang dan nyeri mendorong ibu untuk dilakukannya operasi section caesarea (SC), yang menjadi salah satu indikasi peningkatan angka SC secara global. Pelvic Rocking Exercise (PRE) menggunakan birth ball memiliki beberapa manfaat dalam membantu ibu bersalin khususnya pada kala I. Gerakan dengan duduk di atas bola dan bergoyang-goyang memanfaatkan gravitasi dapat meningkatkan pelepasan endorphin yang menghasilkan rasa nyaman dan membantu kemajuan persalinan.*

Tujuan: *Menganalisis efektivitas PRE menggunakan birth ball terhadap lama persalinan dan penurunan nyeri pada ibu bersalin kala I.*

Metode: *A systematic review dan meta-analysis dengan melakukan strategi pencarian artikel menggunakan database elektronik sesuai metode PICO dengan mengeliminasi artikel sesuai kriteria inklusi yaitu artikel dengan jangka waktu tahun 2011 – 2021, berbahasa Indonesia atau Inggris, menggunakan metode RCT atau Quasy eksperimen, dan responden yang digunakan merupakan ibu hamil usia gestasi 30 minggu keatas.*

Hasil: *PRE menggunakan birthball didapatkan hasil secara statistik terbukti dapat memperpendek lama dan mengurangi nyeri persalinan daripada kelompok kontrol. Kelompok eksperimen memiliki pengaruh yang signifkan dalam penurunan lama persalinan dan nyeri setelah intervensi masing – masing -1.13 [95% CI:-1.57, -0.09] p<0,00001 dan -1.19 [95% CI:-1.48, -0.90] p<0,00001.*

Kesimpulan: *Terdapat pengaruh PRE menggunakan birth ball terhadap penurunan lama dan nyeri persalinan pada ibu bersalin kala I. Diharapkan penelitian ini dapat menjadi pilihan terapi komplementer dengan manfaat yang baik dan prosedur yang mudah bagi praktik kebidanan secara mandiri maupun kolaboratif dalam memberikan asuhan kebidanan yang komprehensif.*

KATA KUNCI *:* *pelvic rocking; nyeri; lama persalinan*

ABSTRACT

Background: *Anxiety about prolonged and painful labor processes encourages the mother to do a section cesarean (SC), which is becoming one of the indications SC incidents increase*

globally. Pelvic rocking exercise using a birth ball has several benefits in helping mothers give birth, especially in the first stage. The movement by sitting on the ball and rocking using gravity can increase the release of endorphins that provide comfort and enhance duration in labor.
Objectives: To analyze the effectiveness of the pelvic rocking exercise *using a birth ball on the duration of labor and reducing pain in the first stage of labor.*
Methods: A systematic review and meta-analysis *by conducting an article search strategy using an electronic database according to the PICO method by eliminating articles according to the inclusion criteria includes articles with a period of 2011 – 2021, in Indonesian or English, using the RCT or Quasy experimental method, and the respondents used are pregnant women with gestational age of 30 weeks and above..*
Results: *PRE using birth ball obtained statistically proven results to shorten the length and reduce labor pain than the control group. The experimental group had a significant effect in reducing labor duration and pain after intervention -1.13 [95% CI: -1.57, -0.09] p<0.00001 and -1.19 [95% CI: -1.48, -0.90] p <0.00001.*
Conclusions: *There is an effect of pelvic rocking exercise using a birth ball on decreasing length of labor and pain in the first stage phase. It is expected that this research can be a complementary therapy option with good benefits and easy procedures for independent and collaborative midwifery practice in providing comprehensive midwifery care.*
KEYWORD: *pelvic rocking; pain; length of labor*

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INTRODUCTION

The duration and pain of labor are physiological phenomena inherent in the childbirth process (1). Several studies have shown that the fear of prolonged labor and pain drives mothers to perform a cesarean section (SC), which is one indication of the increasing number of CS globally. The percentage of deliveries by the cesarean method in Indonesia increased from 7% in the SDKI 2007 to 17% in the SDKI 2017 (2). Although it has been reported that the mortality rate due to cesarean section is five times higher than vaginal delivery, suffering from severe pain and prolonged labor can influence a woman's decision about how to give birth in her next pregnancy (3) its rate has been rising. Nevertheless, it carries risk of complications resulting in morbidity and sometimes mortality. Therefore, cesarean sections done without medial indications, remains questionable.

Maternal mortality and morbidity after cesarean birth is nearly five times than vaginal births, especially the risks of haemorrhage, sepsis, thromboembolism and amniotic fluid embolism. In a subsequent pregnancy, cesarean section increases the risks of placenta previa and adherent placenta which may further result in higher risk of haemorrhage and peripartum hysterectomy. Technical difficulties due to adhesions increase the risk of injury to bladder and bowel. Though cesarean section can be life saving for a fetus in jeopardy, yet in countries with high cesarean rate increased neonatal mortality and morbidity is seen i.e., iatrogenic pre-term births and respiratory morbidity. Risk of rupture uterus and stillbirths in women with previous cesarean section also increase perinatal mortality. Neonatal adaptations is delayed in cesarean babies i.e. maintenance of body temperature, glycaemia and pulmonary

respiration. Development of neonatal immune system is also affected in babies born by cesarean section. Hence, cesarean section should be done only if medically indicated.

Research conducted by the Faculty of Public Health, University of Indonesia (FKM-UI) in 2012 revealed that 75% of maternal deaths were classified as direct deaths caused by five factors, namely bleeding, sepsis, high blood pressure in pregnancy, delayed or prolonged labor, complications of abortion. unsafe and other reasons. The incidence of prolonged labor is still high according to the Ministry of Health (Kemenkes) in 2014, old parturition mothers who were hospitalized in hospitals in Indonesia obtained a percentage proportion of 4.3%, namely 12,176 out of 281,050 deliveries.

Labor pain can cause stress which causes excessive release of stress hormones such as catecholamines and steroids. This hormone can cause smooth muscle tension and vasoconstriction of blood vessels resulting in decreased uterine contractions, decreased uteroplacental circulation, and reduced blood flow and oxygen to the uterus which makes pain impulses increase. The longer the delivery, the higher the concentration of catecholamines in the blood (3).

Midwives are encouraged to expand their role in promoting non-pharmacological management of labor duration and pain management. The goal is to provide additional options for comfort, pain reduction, and a less time-consuming delivery. Government efforts that can be the main alternative to overcome complaints that arise during childbirth are contained in the Decree of the Minister of Health of the Republic of Indonesia Number HK.01.07/MenKes/320/2020 concerning Midwifery Professional Standards in the area of clinical skill competence in midwifery practice, namely as profession midwives are required to provide services in midwifery care in particular in the first stage of labor non-pharmacological methods such as positioning, hydration, providing moral support, pain relief without medication, monitoring the progress of normal labor and the use of partographs and monitoring the process of descending the fetus through the pelvis during labor and delivery (4).

Perez (2001) in his book suggests that the use of the exercise method with a birth ball is physically beneficial during pregnancy and childbirth. Research in Taiwan showed that the group of women who did a pelvic rocking exercise using a birth ball experienced a shorter first stage of labor, lower analgesic use, and lower incidence of Sectio Caesaria Pelvic rocking exercises using a birth ball during labor prevent the mother in a supine position continuously. Practitioners who specialize in Obstetrics and Gynecology recommend that practicing pelvic rocking using a birth ball can be recommended as a significant modality to improve labor progress, manage pain, increase labor comfort and achieve a satisfying delivery experience. As the research conducted by Yeung (2019) in Hong Kong aim to evaluate the effectiveness, safety and harm of birth ball use by pregnant women in labour compared to common treatment group. The result for the intervention group proven have better pain relief, higher satisfaction with pain control, higher sense of control in labour and higher satisfaction with childbirth experience, when compared to subjects in control group. Although many studies have been conducted regarding pelvic rocking exercises, this technique is still rarely applied and is considered to be relatively new in Indonesia (6).

Considering it is not uncommon for cases of complications that arise during childbirth, especially those triggered by several factors, one of which is the length of the labor process and the presence of pain, and the emergence of various non-pharmacological treatments that have been carried out by various studies. Therefore, a literature review was conducted

on “Effectiveness of Pelvic Rocking Exercise using Birth Ball on the Length of Labor and Reduction of Pain in First Stage Maternity”. This study aims to analyze characteristic articles and effectiveness of intervention through systematic literature review and meta –analysis methods.

MATERIALS AND METHODS

The research design used in this study is a systematic review and meta-analysis using subgroup analysis with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocols (PRISMA-P) method.

The population of this research is articles obtained through searching a database of computerized international and national journals published from 2011 to 2021 such as MedLine, Google Scholar, Science Direct, PubMed, National Library, Garuda portal, Garuda Ristekbrin, Directory of Open Access Journals (DOAJ).), Crossref, Proquest, and research gate by typing selected keywords based on PICO and Medical Subject Headings (MeSH) pelvic rocking exercise and birth ball in reducing labor duration and pain in childbirth, pelvic rocking exercise for reducing prolonged labor and pain during childbirth. The inclusion criteria in the review article included using the subject of maternal age 30 weeks and above, English or Bahasa language, using the RCT or quasi-experimental research method, and showing positive results that were effective in reducing labor duration and pain.

The process of article elimination is assisted by the Mendeley application program to sort out duplication, not in full text, and not in Bahasa or English. Furthermore, the screening was carried out again based on the inclusion and exclusion criteria to obtain articles that match the research topic. After obtaining 23 eligible articles, then an assessment of the quality of the articles was carried out by conducting a critical study using the CASP (Critical Appraisal Skill Programme) instrument so that the final number of articles to be reviewed was 18 articles.

Analysis of articles using RevMan application (Review Manager) version 5.3 developed by Cochrane. The mean value was used as a determinant of the effect size in evaluating the decrease in duration and pain in first-stage mothers. Furthermore, the cross-study integration used a random effect model. The presentation of the data is shown by the forest plot tables and graphs. The calculation of heterogeneity used the I^2 index value and the significance value of $p<0.05$.

RESULTS AND DISCUSSION

RESULT

Figure 1 displays the PRISMA flow chart of the review process the initial search of databases after removing ineligible studies resulted in the eligible of 18 published studies were entered into the meta-analysis.

The results of the literature review on the characteristics of the article obtained that 33% of the articles were in the form of RCT research, while 67% were in the form of quasi research. Most of the participants used were pregnant women aged 23-28 years as many as 33%. The profiles of respondents who are research subjects in each article have an age range of 23 to 35 years which is classified as a healthy reproductive age range of 20 to 35 years.

Outcome measures

Eight studies reported the length of labor and fourteen studies provided data about pain in labor. The results of meta-analysis in light of the independent variables are as follows:

Length of labor

Figure 2 presents the RevMan analysis of the effectiveness of pelvic rocking exercise using birth ball on the length of labor in the first stage. The results of the analysis showed that there was an effect of pelvic rocking exercise on the duration of labor in the first stage compared to the control

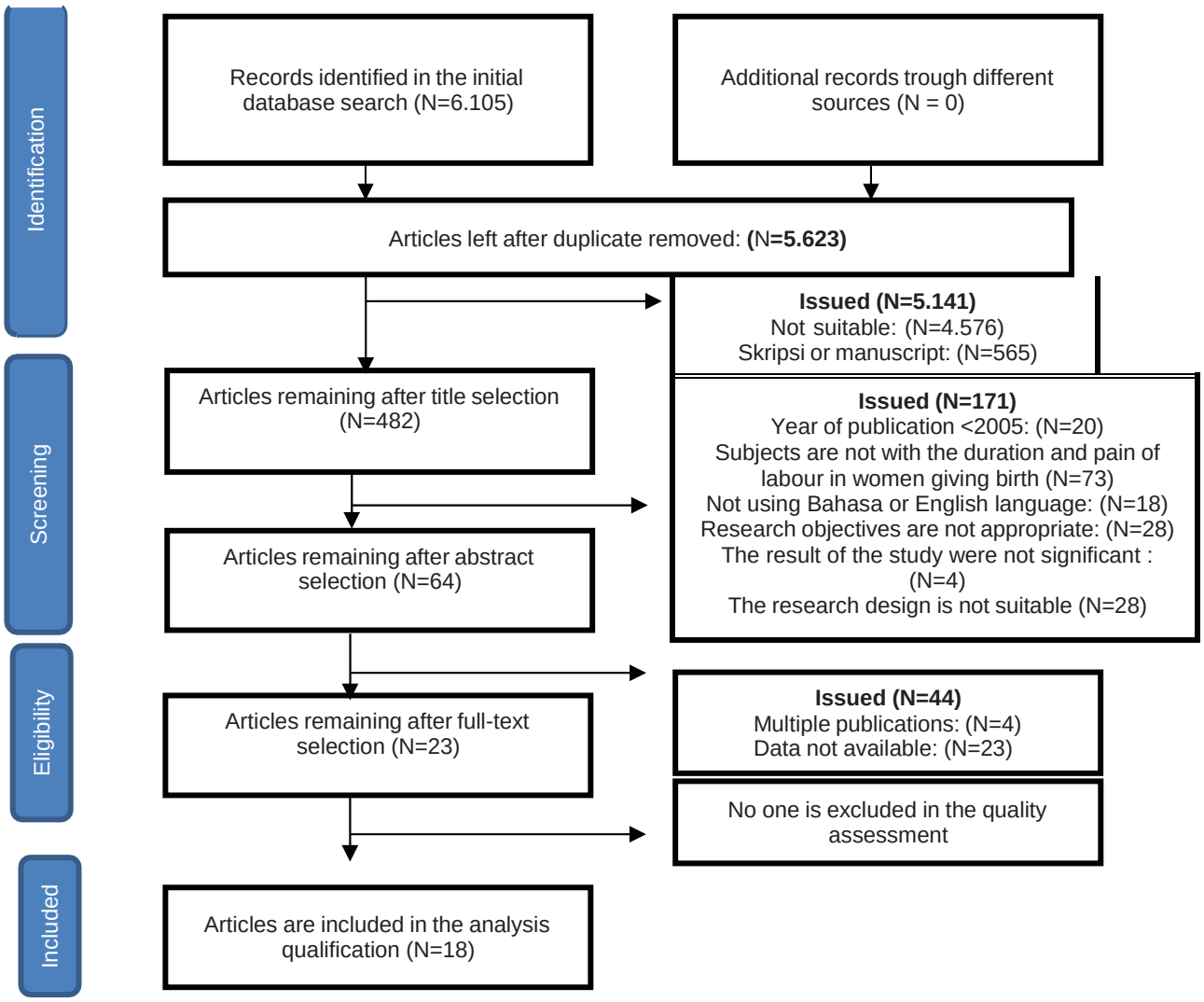

Figure 1. PRISMA flow chart of the review process

group with an effect size 1.13 [95% CI: -1.57, -0.09] p<0.00001. Analyses showed that in mixed studies group, the length of labor was significally shorter in pelvic rocking exercise group, compare to that in the control group (p<0,00001). As the research was conducted by Gau (2011) marked in minutes, the duration of the first stage of labor in the control group had a mean value of 485.4 (about 8 hours) while in the experimental group it had a mean value of 380 (about 6 hours). This study indicated that respondents in the experimental group had shorter first stage labour durations. Morover, subgroup analysis also showed that both gorup experiment are significant (p<0,00001). Heterogenity was achieved between RCTs and Quasys (I^2=81%).

Pain on labor

Figure 3 depicts the RevMan analysis of effectiveness pelvic rocking exercise using birth ball on the pain in the first stage of labor based on The results of the analysis showed that there was an effect of pelvic rocking exercise on pain in the first stage compared to the control group with an effect size of 1.19 [95% CI: -1.48, -0.90] p<0.00001. Overall, the pain on labor was statistically reduced in the intervention group compared with that in the control group (p<0,00001). Based on result of research was conducted by Shirazi (2019), marked pain scale indicator 1-10, the intervention group has a mean value of 9.1 while the control group has a mean value of 6.45. Pain scores in the experimental

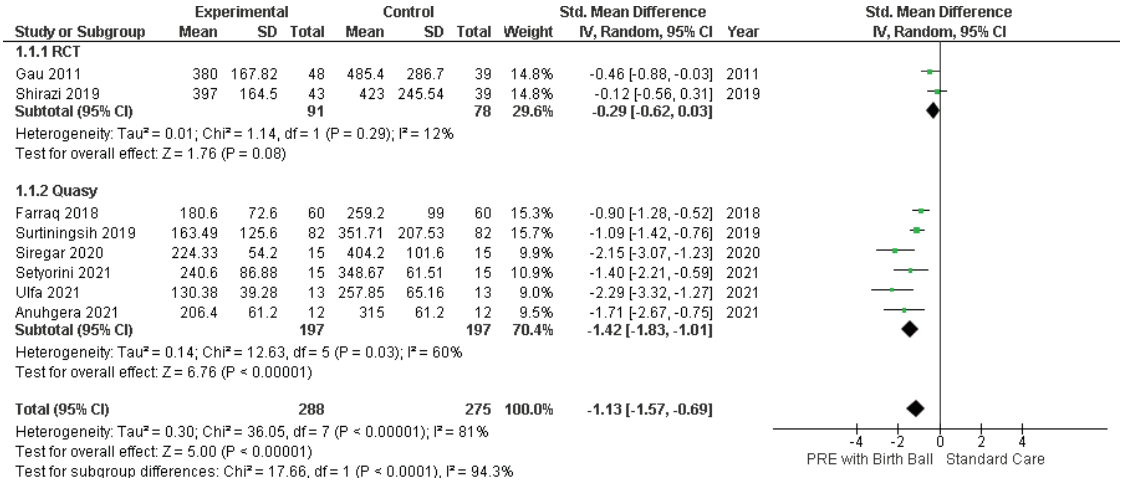

Figure 2. Forest plot of effectiveness pelvic rocking exercise using birth ball on length oflabor in the first stage

group decreased significantly after taking PRE than the control group. Morover, heterogenity was achieved between RCTs and Quasys (I^2=76%).

Analyses showed that in mixed studies group, the length of labor was significally shorter in pelvic rocking exercise group, compare to that in the control group (p<0,00001). Morover, subgroup analysis also showed that both gorup experiment are significant (p<0,00001). Heterogenity was achieved between RCTs and Quasys (I^2=76%).

DISCUSSION

According to findings in eighteen studies, The profile of respondents who are research subjects has an age range of 23 to 35 years which is classified as a healthy reproductive age range of 20 to 35 years. Leung et al. (2013) stated that age also greatly affects a woman in dealing with pregnancy and childbirth both physically and psychologically so someone with age <20 years may not be psychologically ready to face pregnancy or childbirth. Readiness to get pregnant is determined by 3 factors, namely: physical,

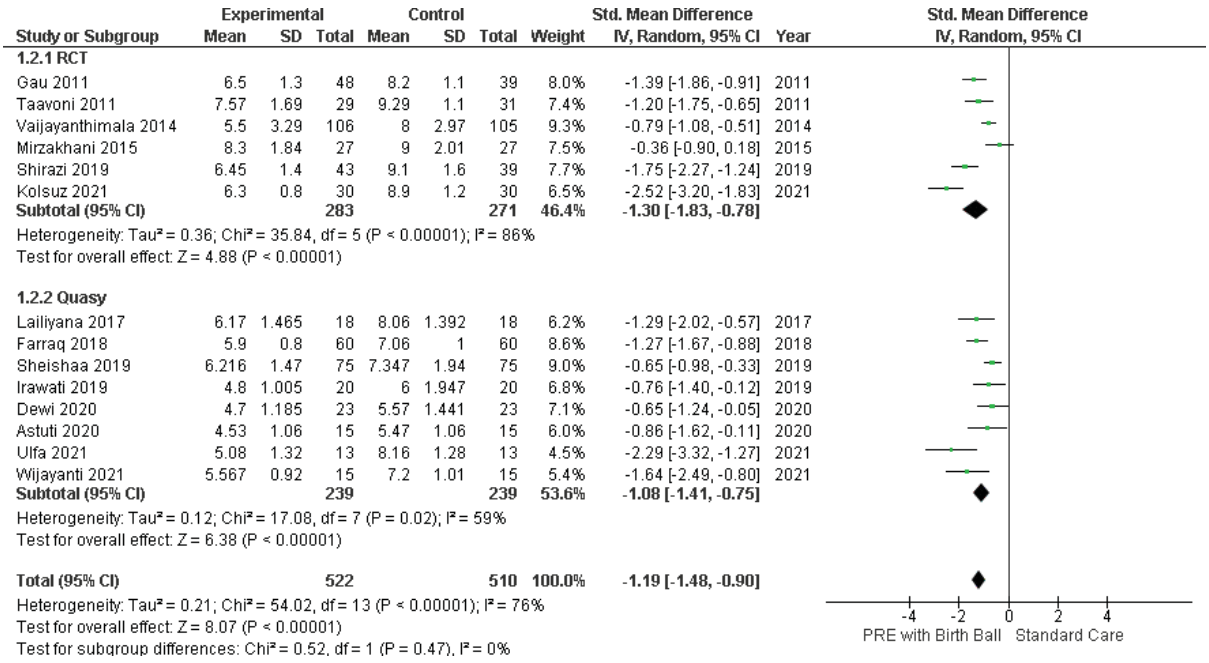

Figure 3. Forest plot of effectiveness pelvic rocking exercise using birth ball on pain in the first stage of labor.

mental, and economic readiness. In general, women are said to be ready to get pregnant if they are over 20 years old (7)psychological care, and facilitation of the labour process at a labour ward in a regional hospital. DESIGN: Case series with before-after comparisons. SETTING: Kwong Wah Hospital, Hong Kong. PARTICIPANTS: Chinese women admitted to the labour ward for spontaneous vaginal delivery between April and August 2012 were recruited. Physiotherapists taught birth ball exercises in groups or individually for 30 minutes. Labour pain intensity, back pain intensity, frequency of labour pain, stress and anxiety levels, and subjective pressure level over the lower abdomen were captured before and after birth ball exercises. Most of the parameters were measured using self-reported visual analogue scales. After the exercise session, physiotherapists measured the women's satisfaction level. Midwives recorded pethidine usage. RESULTS: A total of 203 pregnant women participated in this programme; 181 were in the latent phase group, whereas 22 were categorised into the no-labour-pain group. In both groups, there were statistically and clinically significant differences in back pain level, stress and anxiety levels, as well as pressure level over the lower abdomen before and after the exercise (P<0.05.

At the time of providing intervention, observation is needed to determine the duration of labor and the scale and description of the pain felt by the individual, the measurement of pain intensity is very subjective and individual because there is a possibility that pain in the same intensity is felt very differently in each person. The most widely used measuring instruments in several research articles are minutes to measure the length of labor and VAS (Visual Analog Scale) to measure pain scales. The measurement of the length of labor using minutes has become a time measurement scale that is included in the International Standard (SI) in the form of seconds (s) which has been converted. In addition, the measurement of pain with the most objective approach possible is to use the body's physiological response to pain itself and VAS is one of them. Visual Analog Scale (VAS) is a popular pain scale used in obstetrics and gynecology as well as in RCT research. The use of the VAS instrument is a benchmark that has a high sensitivity value to the effectiveness of an intervention (8).

The results of a systematic review and meta-analysis study with a 95% confidence level obtained a p-value of 0.00001 < 0.05 in both subgroup tests of variable analysis, which means that there is a significant effect between pelvic rocking and birth balls on the length of labor and pain in the maternity. The first stage of labor after the intervention. In line with the research conducted by Makvandi *et al.* (2019) regarding the effectiveness and evaluation of the use of intrapartum birth balls on labor pain, the results showed that the results of the analysis of several articles reported an outcome in the form of a decrease in pain after using a birth ball. The reduction in labor pain may also be associated with a reduction in the length of labor. The use of a birth ball allows the mother to give birth in an upright position and the freedom of movement during labor will help the force of gravity to accelerate the descent of the fetus, strengthen uterine contractions, and reduce the length of labor(9). From the 5 studies conducted in the research of Makvandi et al. (2019) in another article regarding the effectiveness of the birth ball on the length of labor, it was statistically significant for the results in the first stage (p = 0.048). However, the intervention did not show significant results in the length of labor in the second stage (p=0.128).

Research conducted by Grenvik *et al.* (2021) concluded from a literature review and a meta-analysis of 7 articles that the pelvic rocking exercise technique using a birth ball is an alternative choice in childbirth other than the

use of an epidural which is currently a trend. The use of birth balls indicates the right choice of non-pharmacological delivery methods that are effective and can significantly reduce pain in the first stage by reducing the risk of delivery by sectio cesarean (SC).

The theory put forward by Aprillia (2014) states that the more a mother feels relaxed and the more her mobility increases, the shorter the time needed to advance to complete opening. At the beginning of the labor process, the mother should not just lie in bed. Changing positions every half to two hours will greatly help the labor process. You can squat or use a birthing ball or beanbag chair to lean back and rock your pelvis. With the ball placed on the bed, the mother can stand and lean comfortably on the ball, pushing and swinging the pelvis for mobilization. With the ball on the floor or in bed, the mother can kneel and bend over with her weight on the ball, pushing the pelvis up and helping the baby to turn into the correct position (back of the head position) thereby allowing faster labor progress. The birth ball helps the mother to stay in a standing position and also opens the pelvis, encouraging the baby to move downwards. Changing positions during labor will change the shape and size of the pelvis which will help the baby's head move to an optimal position during the first stage of labor and help the baby to rotate (12). Different with mothers who only lie down during the first stage, the pressure of the head to the cervix will be more on the posterior cervix (cervix at 6 o'clock) so that in the end there are many cases of the anterior cervical lip which make the labor process longer and more painful (11).

The use of Birth Ball in pelvic rocking can strengthen the abdominal and waist muscles, reduce pressure on the waist, reduce pressure on the bladder, help the mother relax to reduce tension which has an impact on reducing labor pain felt by the mother. Patterned physical movements with pelvic rocking are also useful in increasing pelvic muscle strength by up to 30%, facilitating optimal perineal stretching, optimizing oxygen flow and blood circulation to the fetus and an effective position for fetal descent so that the fetus can descend easily and quickly during labor and delivery. labor pain will be short (13)cervical dilatation and fetal head descent/fifth among the study group. While the control group showed less progress with highly statically significant differences (<0.0001

Based on the discussion of previous studies and the results of analytical tests regarding the effectiveness of pelvic rocking with a birth ball on labor duration and pain reduction, a conclusion was found that intervention greatly affected labor duration and pain reduction. Where in the end, pelvic rocking with a birth ball helps mothers in labor to shorten the first stage with various advantages. Amount of 18 reference articles studied, the majority showed a positive correlation with the pelvic rocking method with a birth ball in which the average exercise duration was 10 to 30 minutes, carried out with various variations in the amount of exercise to obtain useful outputs including optimal first stage time and intensity. reduced pain. Mothers in labor have a comfortable and relaxed feeling in the face of labor because of the help of a birth ball. As research conducted by Taavoni *et al*. (2018) that the effect of exercise using a birth ball on 203 mothers with gestational age 37 to 41 weeks after several 7 exercises with a duration of 30 minutes resulted in a significant decrease in pain, anxiety, and increased comfort. The feelings experienced by mothers in labor are also very helpful psychologically for mothers in processing pain and creating a positive atmosphere for mothers so that the uterus can contract optimally. Pelvic rocking movements with birth balls performed by mothers in labor help mothers adapt to the pain and discomfort they experience.

Conservative treatment with complementary therapy is an option that can be considered to minimize the side effects of pharmacological

therapy. In the Regulation of Kementrian Kesehatan Republik Indonesia No. 1109 of 2007 article 3 states that complementary medicine is carried out as a continuous service effort starting from improving health (promotive), prevention (preventive), healing (curative), and or recovery (rehabilitative) carried out by health workers with high safety and effectiveness. These complementary therapies are positioning and relaxation (15). Same goes with the WHO program at the point of non-clinical educational interventions which mentions reducing duration and pain can involve therapists and midwives as well as in child training workshop recommendations, materials can be included in non-pharmacological methods of delivery, advantages and disadvantages of cesarean section and vaginal delivery, and indications and contraindications to non-pharmacological measures, among other topics (16).

Midwives in Indonesia have provided a variety of therapeutic modalities to reduce clinical manifestations that appear in labor, using non-pharmacological methods including warm compresses, cold compresses, hydrotherapy, counterpressure, knee compression, movement, positioning, relaxation and breathing exercises, back rubs or exercises. abdomen and bladder emptying . Complaints that are usually experienced by mothers who are about to give birth are general complaints that are considered normal, so the attention given by midwives to mothers who are about to give birth is not satisfactory (17). Research conducted by Simkin & Bolding (2017)PUBMED, the Cochrane Library, and AMED databases relating to the effectiveness of 13 non-pharmacologic methods used to relieve pain and reduce suffering in labor. Suffering, which is different from pain, is not an outcome that is usually measured after childbirth. We assumed that suffering is unlikely if indicators of satisfaction were positive after childbirth. Adequate evidence of benefit in reducing pain exists for continuous labor support, baths, intradermal water blocks, and maternal movement and positioning. Acupuncture, massage, transcutaneous electrical nerve stimulation, and hypnosis are promising, but they require further study. The effectiveness of childbirth education, relaxation and breathing, heat and cold, acupressure, hypnosis, aromatherapy, music, and audioanalgesia are either inadequately studied or findings are too variable to draw conclusions on effectiveness. All the methods studied had evidence of widespread satisfaction among a majority of users.(18) in his research explains that of the 13 methods used in non-pharmacological management in labor, the active birth method has satisfactory results in the labor process. Methods that can be carried out in active birth techniques are such as walking, tilting to the left, mobilization, husband assistance, yoga, warm cold compresses, birth balls that have been carried out by as one of the midwifery care in the labor process to assist prolonged labor (19).

A total of 10 studies that were analyzed and published in Indonesia regarding the effectiveness of pelvic rocking exercise with a birth ball on labor duration and pain reduction were shown to have a significant effect. As research conducted by Ulfa (2021) who conducted experiments on 26 mothers in labor when they entered the first stage of labor, comparing 13 respondents with conventional labor interventions and 13 with pelvic rocking exercise interventions with a birth ball with a total of 4 movements for 30 minutes resulting in a feeling of comfort and relaxation. This reduces the intensity of pain and increases the progress of uterine contractions.

The application of the pelvic rocking exercise method in Indonesia in particular has not yet received a standardized procedure officially issued by midwifery organizations. This causes variations in the procedures applied to various agencies.

CONCLUSION AND RECOMMENDATION

This study is proven that pelvic rocking exercise using birth ball effective in shorter length of labor and decrease pain level in women in the first stage of labor.

Considering the findings of the reviewed articles, it is essential to perform further high quality studies with different variables and more combination of interventions. It is expected that this research can be a complementary therapy option with good benefits and easy procedures for independent and collaborative midwifery practice in providing comprehensive midwifery care. It is necessary for policy maker especially for IBI (ikatan Bidan Indonesia) to consider this alternative method to become part of standard procedure in labor managements by associating with another care providers and presenting workshop and meeting about this method.

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