

# The Effectivity of Birth Ball Exercise on Labor: a Systematic Literature Review

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**Abstract**— A midwife service area is pregnancy and normal childbirth. One of multipurpose childbirth tools which is easily available for women is birth ball. The tool is useful to shorten childbirth duration, make the childbirth more efficient, help mother feel more comfortable, and help in the descents of fetal head. Scientific literatures about the use of birth ball for childbirth are considered rare. The purpose of this study is to conclude and examine literatures that are connected to the effectiveness of birth ball exercise on labor. The data were articles published within 2008-2018 from Pubmed and Cochrane Library and were selected by using literature elimination strategies. Of the initial 374 articles that were verified, this study analyzed 5 articles which met the inclusion criteria. Birth ball exercise was effective to reduce pain during childbirth. The duration and interval of uterus contraction was longer. There are statistically significant differences between birth ball exercise that was done in class compared to those done at home in childbirth duration phase I and II. The use of birth ball resulted higher the efficacy in the active phase of childbirth. It shows that the efficacy has an impact for about 30-40% at delivery. Women practicing birth ball exercise used fewer epidural anesthesia and fewer Caeser operation. Birth ball exercise was effective to reduce pain during childbirth in latent and active phase, the duration and contraction interval on uterus were longer, having effect to childbirth duration phase I and II, mother efficacy in childbirth is higher, less using epidural anesthesia and caesarean sections.

**Keywords:** *birth ball, birthing, exercise, childbirth, labor pain, duration*

## I. INTRODUCTION

According to SDG 2030, the target for the three goals which guarantee a healthy life and promotes well-being for all people of all ages, one of which is to reduce MMR to below 70 per 100,000 KH [1]. AKI increased sharply in 2012 (from 228 in 2007 to 359 in 2012). Errors in sampling are often exhaled as a trigger for high MMR [2].

In short, the government has tried to improve maternal health, but the MMR remained above 200 [3]. For five years 74% of live births prior to the survey in health care facilities, 90% of live births are helped by health workers.

17% of deliveries by cesarean section, prolonged labor is

the most reported complication (41%) by women 15-49 years of age at birth five years before survey [4].

In general, labor can be done naturally without medical intervention. Cost effectiveness of normal childbirth compared to cesarean section in many countries needs less anesthesia, has short inpatient time and lower rates of infection and bleeding [5]. Fetal heart rate blood flows from mother to fetus can be rotated by the supine position of the mother. Additionally, the levels of stress hormone in the mother and uterine contractions are reduced [20]. The descent of fetal head can be supported in an upright position which is advantageous because it increases and supports the widening of the pelvis [21] [22]. However, this study is generally limited to a relatively small sample size and wide variation in the number of studies [23]. In the latent phase it is very necessary to change into positions which are popular from the non-pharmacological techniques [24].

Midwives are health workers who always accompany and support women in the delivery process, being independent and collaborative in their roles which depend on the level of expenditure [11] [12]. Education and approval must be the focus of midwives' competence in assisting childbirth [13]. Pain during labor is related to many factors which are unique and physiological [6] [7]. For women who do not feel excessive fear, pain during childbirth can be received according to their capabilities [8]. Pain management at the time of labor is the main goal of midwifery practice [9]. Perception of pain can be determined by several things, namely the environment, social, local culture, family support, experience, and relationships with midwives [10]. Other than being able to be done in general, pharmacologists also do it with non-pharmacologists [14] [15] [16] [17]. The pharmacological methods aim to eliminate labor pain physically, but non-pharmacological methods do not involve psychological / emotional and spiritual aspects [18] [19].

The most versatile and easily available delivery support tool for women is birth ball which is useful for shortening the duration of labor, making labor more efficient, helping the mother feel more comfortable, and helping the decent of fetal head [25] [26]. Some of the benefits of birth ball exercise during labor are reducing anxiety and pain, reducing the use painkillers, speeding up the recovery process and the reduction of the lowest part of the fetus, the head, thereby increasing satisfaction and assistance

from women in terms of their psychological needs [27] [28].

Apart from the proliferation of complementary therapies related to midwifery practice, there are very few publications can be considered as evidence on complementary therapies used during labor [29]. The availability of scientific literature about birth ball exercise used during labor is rare. However, health professionals and researchers are interested in this practice despite the lack of consensus on its use [30]. Based on the above explanation, this study aimed to assess scientific findings and explore the effectiveness of birth ball exercise on labor.

II. METHOD

The literature search strategy was done following these steps, 1) making framework as a basis for determining the criteria of inclusion, 2) composing keyword which is designed and focused on framework

TABLE 1. SEARCHING METHOD

Search String	AND	AND
birth ball	Parturitions	"Labor pain"
Birthball	Birth	"Pain management"
"birth ball"	Births	"labor pain management"
birthing ball	Childbirth	"Labour pain"
Birthingball	Childbirths	"duration of labor"
"birthing ball"	Labor	"uterine contraction"
gymball	Labour	"self efficacy"
"Swiss ball"		"epidural anesthesia"
Exercise		"Caesarean birth"
"birth ball exercise"		

Inserting keyword into searching engine of Pubmed database by regulating set screening using filter of full text, 10 years, and human. As well as Cochrane library by regulating the filtering in the home page by the custom range which is 1 January 2008 - 31 December 2018 and select trials. 4) taking notes in details about the development lifecycle of the outcome of the findings of a database. 5) saving home page database to Zotero. 6) storing the data in the strainer or other similar devices 7) taking notes on the finding of number of articles . The process of filtration will be outlined in the Prisma Flow Diagram.

Critical appraisal in literature had been eliminated from inclusion criteria. The quality of the study was measured by JBLI (The Joanna Briggs Institue) Critical Appraisal Checklist).

III. RESULTS

The data obtained from the literature search were five journal articles which consisted of two articles from Iran, one articles from Taiwan, one articles from Hong Kong, and one article from Canada. Those selected articles were indexed Q1 (n=3), Q2 (n=1), Q3 (n=1) according to the American journal of public. All articles used quantitative research methods.

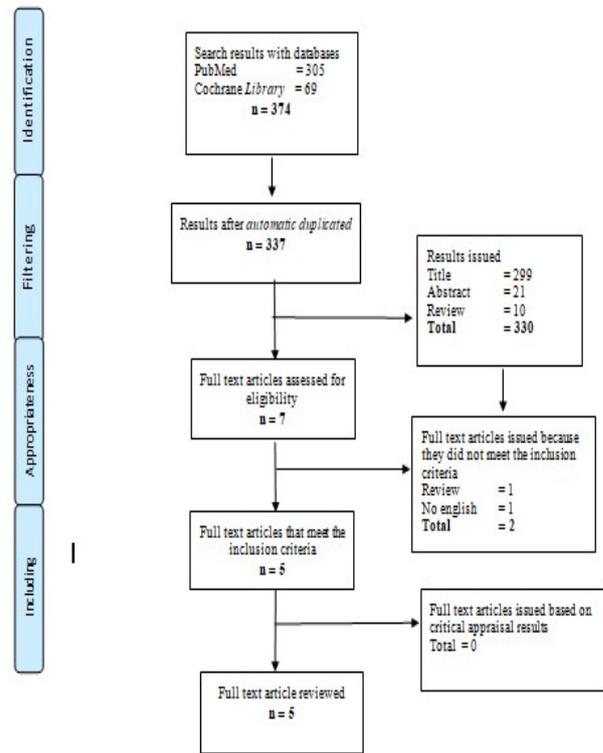


FIG1. PRISMA FLOW CHART

A. The effectiveness of birth ball exercises during labor

Experimental group was found more effective and statistically significant in reducing pain in active childbirth phase than the control group by using VAS (Visually Analogue Scale) and the PPI (Present Pain Intensity Scale), but it is not statistically significant by using VRS (Verbal Response Scale) [31]. It was also statistically significant that the experimental group was more effective in reducing pain childbirth than the control group [32]. In another research, Birth ball exercise were also done for 30 minutes in the childbirth group [33]. The subject of the research is divided into two group, they were experimental group which experienced pain during childbirth latent phase at the interval of 15-20 minutes and dilatation of the cervical 0-4 of cm and the control group with no pain delivery by the score of VASs (Visual Analogue Scales) 0 but secreted mucous blood.

The average level of pain during the delivery in this experimental group had changed from 5,3; SD 2,6 on pretest , became 4,3; SD 2,5 on posttest (p<0,001) while in the case of the control group was not analyzed .The level of a back kind of thing with groups the course of this experiment average the surface had changed from on pretest 4,3; SD 3,1, on post-test become 3,2; SD 2,9; with p<0,001 while in case of the control the level of average the surface had changed from 1,9; SD 2,1 on pretest become 1,5; SD 1,8 on post test drives with (p=0,027).

**TABLE II. DATA EXTRACTION WITH PICO APPROACH**

Citation/Author /Year/ Level /State/Journal	Desain/ Metode	Population (Sample/ setting)	Intervention	Compare /Control	Data analysis	Follow Up	Outcome (Finding)
Effects of birth ball exercise on pain and self-efficacy during childbirth : a randomised controlled trial in Taiwan/ Gau, M. Chang, C. Tian, S. Lin, K/ 2011/ Q1/ Taiwan/ Midwifery	RCT	Randomisation, 48 participants to experiment group and dan 38 to control group to finish the research.	During the childbirth given birth ball exercise and supported tio choose position posisi and comfortable move.	Standar service and midwife service from midwife staf in the hospital in all pregnancy aspect and childbirth.	Kolmogorov-Smirnov. Mann-Whitney U-test dan X2 test	The research take meeting a time every two weeks with the subject and their partner during prenatal observation.	birth ball exercise increase in that is statistically significant i efficacy their lives and reduce pain during childbirth.
Effect of birth ball usage on pain in the active phase of labor : a randomized controlled trial/Taavoni, S. Abdolalian, S. Haghani, H. Neysani, L/2011/Q2/Iran/Journal of Midwifery & Women's Health by The American College of Nurse-Midwives	RCT	Randomisasi got table random number with the number of sample each group was 30 sample.	Birth ball exercise	In control group, the participant got intensive service during childbirth. P childbirth in Iran, every women usually forbidden to walk or free movement.	T-test in SPSS version 14. Demografi characteristic analyzed with T test an chi Square test. P<0,05 there was significant.	Professional attending exercise session to give support women in order to be able of preserving the balance of the ball	There are significant differences between pain score to the Birth ball exercise group after 30 minutes (P=0,001), 60 minutes (P= 0,001) if compared with pain score from control group. There are no significant differences in duration or interval of uterus contraction between two group. Even this research did not showing significant differences in childbirth active phase duration among the groups.
Efficacy of birth ball exercise on labour pain management/ Leung, RWC. Li, JFP. Leung, MKM. Fung, BKY. Fung, LCW. Tai, SM. Sing, C. Leung WC/ 2013/ Q3/ Hong Kong/ Hong Kong Med J	Case series with before-after comparisons	Participation in this program was mother in the time of childbirth cared in hospital Kwong Wah from April till August 2012 and fulfill the criteria of of inclusion. As many as 203 sample used in this research.	Birth ball exercise in the group of pain childbirth in interval 5-20 minutes and dilatation servic 0-4 cm.	Birth ball exercise in the group of no pain childbirth with the score VASs 0.	independen T-test to compare stres and anxiety, pressure lower abdominal and the level of a back. Dependent t-test to analyze change the score VAS before and after birth ball exercise in pain childbirth.	Pregnant women given a choice to continue or stop all the time and offers other pain methods including medicine. The midwife always induce to commit birth ball exercise and strengthened guidance suggesting that the four movement has been taught had to do. Physiotherapy ensure muscular contraction that right to maximize the effect of any movement birth ball	In the two groups , there are clinic differences and significant statistics in the level of pain back, the stress and anxiety, as well as the pressure on lower abdominal before and after exercise (P<0,05). In latent phase group, significant decline in pain childbirth and frequency of delivery indicated, the use of decreasing 6,4 % compared to 2last years.
Birth ball or heat therapy? A randomized controlled trial to compare the effectiveness of birth ball usage with sacrum perineal heat therapy in labor pain management/ Taavoni, S. Sheikhan, F. Abdolalian, S. Ghavi, F/ 2016/ Q1/ Iran/ Complementary Therapies in Clinical Practice	RCT	As many as 90 mother primipara who fulfill the inclusion criteria of general hospital great islamic the university of medical science by the distribution of 30 samples each groups of randomisasi results. Protocol research has approved and permit ethical obtained from ethics committee Iran University of Medical Science, Teheran, Iran.	Exsperiment group (I) Heat therapy. Group exsperiment (II) Birth ball exercise	In contro group participant get intensive care during childbirth. Childbirth in Iran, women usually forbidden walked atau free movement.	Karakteristik demography characteristic analyzed with uji-t and chi-square. Score P reduce from 0,05 Considered significant.	On the group heat therapy subjects were asked to inform researchers to change towels when it gets cold. On the group birth ball exercise accompanied by professional to maintaining equilibrium during exercise lasted.	The average score pain perception in the heat therapy less than the control group in 60 and 90 minutes after intervention (P<0,05). In addition there are significant differences between scores on pain in the third time childbirth ball after investigated than to the control group. There are no significant differences between duration phase active childbirth in 3 groups
Outcomes of exercise training following the use of a birthing ball during pregnancy and delivery/ Fournier, D. Feeny, G. Mathieu, ME/ 2017/ Q1/ Kanada/ Journal of Strength and Conditioning Association	Quasi experimental	A sample of pregnant women who meet the criteria of inclusion and participate in 1-28 class and supervised exercise during pregnancy by the ballon forme offered in setting non clinical with the option to settle birth ball exercise carried out at home with supervision The total number is 30.	Birth ball exercise held in Montreal, Canada and surrounding areas between February 2013 and April 2014.	There is no	The relationship between duration birth ball exercise during pregnancy with duration when i and ii delivery by the Spearman after test normality Shapiro wilk .Wheat Whitney u test to relations the independent variable (time birth ball exercise during pregnancy in class , in a house) with dependent variable ( duration when i , ii and stages of joint childbirth )	Any subject participate in session, weekly prenatal class exercise for at least 1 class and maximum 28 class supervised by a specialist sports trained. Participants included and tested throughout the year.	30 those who gave birth naturally involved in this research. The birth exercise ball average 22,3 hours ( primary = 16,6 ) hours .The birth ball exercise greater that significantly associated with shorter duration of childbirth ( r = -0,408; p = 0,031 ) delivery and the specific ( the active phase 1 dilatation / ) ( r = -0,372; p = 0,043 ) (expenditure and the 2 ( r = -0,415 = 0,028 ).

The frequency of childbirth pain level (the time interval between the any part) kind of thing with groups the course of this experiment rata-rata the surface had changed from on pretest 16,1; primary school 32,4 on post-test became 11,6; SD 30,8; ( $p < 0,001$ ) while in the case of the control group was not analyzed. The level of subjective pressure for lower abdomen on the group experiment average changed from pretest 4,3; SD 2,5 on post-test be 5,5; SD 2,3; ( $p < 0,001$ ) while in the control group level average changed from 3,8; 2,1 SD in pretest be 4,8; SD 2,0 on posttest ( $p = 0,008$ ).

According to the results of the research, the ball exercise done by the experimental group was statistically significant in reducing labor pain compared to the control group. The experimental group given birth ball exercise found it as more effective in reducing labor pain compared to a group given heat therapy intervention but it was statistically insignificant [34].

*B. The effectiveness of birth ball exercise on uterus contraction.*

The research article revealed the duration of uterine contractions of the experimental group 48,94 second, SD 12,64 meanwhile the duration of the control group was 46,40 second, SD 14,23 with  $p = 0,863$ . Intervals between uterine contractions in the experiment group was 159,11 second, SD 39,10 while the interval in the control group was 158,38 second, SD 40,78 with  $p = 537$ . However, differences in the duration and intervals between uterine contractions in the birth in experiment and control group were not statistically significant (32).

*C. The Effectiveness of birth ball exercise on childbirth duration.*

The effectiveness of birth ball exercise towards childbirth duration according to the research showed that childbirth duration phase I and II in the experiment group was shorter than control group's but the difference was not statistically significant (31). According to the research, the active phase duration of childbirth in the experiment group was longer than the control group's but the difference was not statistically significant (32). Furthermore, according to other research, the measurement results of active phase duration, with intervention using heat therapy was 1,95 hours; SD 0,01; childbirth ball exercise 1,78 hours; SD 0,58, in the control group in the score; 1,6 hours, SD 0,98.

Therefore, the active phase duration of childbirth in the ball exercise group was longer than the control group but faster than the heat therapy intervention group, but it was not statistically significant [34]. According to a study, the increase of participation in birth ball exercise in class made the duration of childbirth faster than birth ball exercise controlled at home. There was no relation between birth ball exercise time and side effects of childbirth parameter [35].

*D. The Effectiveness of birth ball exercise for self-efficacy.*

According to a study, the self-efficacy of the experimental group using ball exercise was higher than the control group. It was statistically significant in the first measurement but was insignificant where the efficacy of the control group was higher. In testing and proving the efficacy using Sobel statistical tests, the result of experimental group was 30-40% and control groups was 32.4% With VAS and PPI 40.88 30.7% and P value  $< 0.001$  [31].

*E. Effectiveness of birth ball exercise on the use of epidural anesthesia.*

The research that has been done showed the experimental group used less epidural anesthetic compared to the control group but they were not statistically tested [31]. Reported from the research result, there was no statistically significant difference in the use of petidin inter communal ( $p = 0,380$ ) [33].

*F. Effectiveness of birth ball exercise on caesarean birth.*

A research reported that the experimental group underwent fewer caesarean section compared to control group but it was neither statistically significant nor tested [31].

#### IV. DISCUSSION

Birth ball exercise starts from the 30-32 weeks of pregnancy. Each exercise session takes 20 minutes and is carried out up to three times over six weeks, equipped with media containing a video duration of 19 minutes and a booklet of 26 pages (based on the results of the review and recommendations by two prenatal educators and certified deliveries, two body specialist and one physical therapist) and birth ball exercise during labor (Exercise, comfortable positions and movements must be supported every hour) and follow-up provided a statistically proven improvement with a significant result in pain during labor [31]. From the results of studies in the experimental group as evidenced by statistically significant tests about 30 minutes of ball exercise in the latent phase can reduce back pain and lower abdomen, reduce labor pain in the latent phase and hypertension [33]. The sample of a mother with cervical opening up to 4 centimeters and using birth ball exercises, that it can be removed from the four studies mentioned above, the level of labor care can be obtained by birth ball exercises [32] [34].

From the results of the study it was proven that increased comfort, relaxation and reduced anxiety, comfortable feeling of labor and a positive experience during labor can be obtained by doing birth ball exercises during labor [33] [36]. Upright back position during the initial process of labor, can be sitting or standing, give a little relaxing feeling during labor, especially in the lower back when opening the cervix was up to six centimeters [32] [138]. Birth ball exercise given by physiotherapists and midwives, with comfortable exercise facilities and away

from factors that cause increased stress in mothers, is a tool that can help the head rejuvenation to the pelvic floor, support and assistance can help and be adjusted according to maternal desires in overcoming pain. Birth ball exercise is a part of the treatment that includes not only physical but also psychological, emotional as well as spiritual [33].

The results of the study from the birth exercise group with the heat therapy trial group was statistically different in scores of delivery, it was related to the difficulty in the sample where from the results of other studies proved the focus on certain things and pain research results. Health education about birth ball exercise should be given to pregnant women because it is a complementary method that uses little cost and is easily practiced. From some studies it can be concluded that birth ball exercise during labor, starting from the latent and active phases can reduce the pain during labor and midwives can collaborate with obstetricians and gynecologists for the safety management during labor using birth ball exercise [34]. The duration and interval of uterine contractions during delivery were longer in the experimental group of birth exercise compared to controls which was statistically insignificant [35]. Birth ball exercise in a class monitored by midwives and physiotherapy was higher than participation of pregnant women and the duration of delivery was faster than that of birth balls performed at home by pregnant women [34]. Birth ball exercise during the active phase of labor was faster compared to heat therapy but from statistical tests insignificant results are obtained [32].

One of facilities and infrastructure that support maternity is the Birth ball exercise program [31]. The quality of health services by midwives and policy holders can support from the perspective of service clients [39]. From the results of the study it was proven that birth ball exercise during pregnancy can increase progress in labor because it provides a comfortable position for mothers, which is an upright position [31] [40]. the duration of labor was shorter in sitting position compared to the supine position. Further research involving other factors that affect labor is needed so that the effect can be understood more broadly and deeply [31] [32]. Birth ball exercises performed in the class of pregnant women are more efficient than those done at home because only little or limited movement can be done. Implementing the exercise can improve active lifestyle of pregnant women [35] [41] [42].

Pregnant women are recommended to do uncomplicated physical activities 30 minutes per day [34]. From the results of the study, birth ball exercise can improve self-efficacy in maternal from 30% to 40%. Childbirth care felt by maternal can be done by maternal self-efficacy [31]. Good collaboration between muscle performance, sensory and central changes in the body of pregnant women can be improved by birth ball exercise during the third trimester [31] [44]. It is also useful for mobilizing sacroiliac arteries and

lumbrosacral furlas, avoiding lower back difficulties by maintaining the back and abdomen and improving posture in good condition, increasing hopes for labor (31)(45)(46)(47). Birth ball exercise makes mothers more actively involved in choosing the position of labor, reducing the sense of security during childbirth because the mother can control herself with confidence. This is in accordance with a research conducted on 85 samples of maternity mothers from China, and increase labor [31] [48]. High confidence can control pain during childbirth around 30 to 40% [49].

From the results of a study on the use of anchoring drugs between exercise using a birth ball with no control, there was no statistically significant test result [33]. This was different from the results of other studies: the birth ball exercise group used fewer anesthetics and had fewer cesarean sections compared to controls, but the truth of the results of the study is not in accordance with statistics. Research samples that emerge from high sample drop-out rates and confounding variables that do not communicate but are not important because the sample characteristics are not statistically different [31] [50] [51].

#### V. CONCLUSION

Based on literature assessment, it can be concluded that birth ball exercise was statistically significant in effectively reducing the pressure during labor in the latent and active phase. The duration and interval of uterine contractions is longer and is not statistically significant. Statistically, the self-efficacy is higher during the active phase of labor and pain during labor can be caused by the low self-efficacy around 30 to 40%. The use of epidural anesthesia is less but not statistically significant. Less caesarean section done after using birth ball is not supported statistically.

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