

The comparison between sitting and lithotomy position during the second stage of labor on maternal and fetal outcomes Systematic Review

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Abstract: The position at delivery is divided into supine, which includes lithotomy, and upright position such as sitting. Maternal positions during the second stage of labor can affect maternal and fetal outcomes. Aim: This review was conducted to compare sitting and lithotomy position during the second stage of labor related to maternal and fetal outcomes. Method: Searching for related articles performed in three databases (CINAHL, MEDLINE, and Pub Med) between 2015 to 2020. Out of all searched literature, eight studies retrieved (3 randomized controlled trials, 2 cohort studies, 1 cross-sectional study, 1 descriptive and retrospective study, and 1 Mixed method) to be included with a total of 129 399 laboring women. Results: The literature review indicates emerging categorized into five themes: duration of the second stage, mode of delivery, maternal labor pain, fetal outcomes, and the most common them was perineal tears and performing of episiotomy. Conclusion: Most of the articles demonstrate the positive effect of sitting position during the second stage of labor compared to lithotomy position on maternal and fetal outcomes.

Keywords: sitting position, lithotomy position, maternal delivery outcomes, fetal delivery outcomes, second stage of labor, childbirth.

1. INTRODUCTION

The maternal positions during the second stage of labor have potential benefits in promoting maternal and fetal outcomes [1]. It is divided into a supine, semi-recumbent, lithotomy, lateral and upright position, i.e. standing, sitting, squatting, and kneeling. [2]. Today the lithotomy position is the most common position used during delivery [4]. Lithotomy position it makes care easier for the health care provider [5]. It can lead to a need for risky and invasive interventions, including augmentation, use of assisted delivery, or a Cesarean Section. Afterward, the fetal could suffer from low Apgar scores, and increased the need for critical care. [1] [6]. Birthing in the lithotomy position has numerous risks and disadvantages for the maternal and her fetus [7].

The benefits of sitting position, including the use of gravity to aid the fetal descent, and decrease the weight of the maternal uterus on the inferior vena cava therefore the oxygenation of the fetal, regular uterine contractions, reduced need for augmentation, shortness of the second stage, and increased pelvic diameter, reduce the need for instrumental deliveries. Psychological advantages include reduced pain experience, and increased maternal feeling of control, and satisfaction. [2, 8] [9]. In the sitting position, the increased diameter of the pelvis correlates most directly with preventing

perineal tears [10]. The lithotomy position has been identified as a risk factor for severe perineal tears including third and fourth-degree tears [1]. Routine use of the lithotomy position should be stopped [2].

1.1 Rationale of the study:

Expecting maternal to adopt one particular position during the second stage of labor, can be justified if there is good evidence that it has important advantages for the health of either the mother or the fetus. A comprehensive understanding of the delivery position of maternal and fetal outcomes is needed to solidify the current evidence base for best practices. Maternal delivery position its an effective way to decrease maternal and fetal morbidity and mortality, and improve maternal and fetal quality of life. Furthermore, the implications of this study can help inform nursing care practices while caring for women experiencing labor and birth.

1.2 Aim:

The given review aimed to compare sitting and lithotomy position during the second stage of labor related to maternal and fetal outcomes.

2. METHODS

2.1 PICOT Question:

PICOT	CONTENT	PICOT QUESTION
P	Laboring women	“Laboring women who adopt the sitting position comparable to the lithotomy position as measured by maternal and fetal outcomes?”
I	Laboring women who adopt the sitting position in the second stage of labor	
C	Laboring women who adopt the lithotomy position in the second stage of labor	
O	Maternal and fetal outcomes	
T	Second stage of labor	
Type	Intervention PICOT question	

2.2 Search Strategies

This review was systematic in its approach and was guided by Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines. A review of the literature was conducted using different databases including the Database of Cumulative Index of Nursing and Allied Health Literature "CINHAL," Database of the National Library of Medicine "Pub MED," Database of Medical Literature Analysis and Retrieval System Online "Medline". The review focused on studies that had met the same inclusion and exclusion criteria based on the developed PICOT question. The inclusion criteria for this review entailed: full-text articles of weighted research quality, published between 2015 to 2020, in English language, which studies the relationship between the above mentioned maternal delivery position on maternal and fetal outcomes. While the exclusion criteria encompassed studies examining multiple pregnancies, preterm labor, breech presentation, intrauterine fetal death, fetal congenital anomalies, maternal persisting psychological disease. The initial studies identified were of both qualitative and quantitative design and all met at least one of the inclusion criteria.

2.3 Articles Selection and Screening Process

The electronic search was completed on March 14, 2020. Search terms included an upright position in the second stage, sitting position, lithotomy position, maternal delivery outcomes, fetal delivery outcomes, maternal and fetal childbirth complications.

The researcher then reviewed each article using the inclusion criteria, also the included articles with a study sample included women of all ages, nulliparous, and parous women, with a gestational age of 37–42 weeks, a singleton viable fetus, and with cephalic presentation, spontaneous onset of labor or induction of labor. Articles were excluded if their primary focus was not on maternal and fetal delivery outcomes and maternal delivery positions (sitting and lithotomy). The final number of articles included in the review was eight.

2.4 Quality assessment

For appraising the studies included in this systematic review, the author has used the critical appraisal tool designed by Hawker and colleagues (Hawker, Payne, Kerr, Hardey, & Powell, 2002) to systematically appraise the quality of the studies included in this paper. The Hawker and colleagues appraisal tool consists of nine items, to evaluate the abstract and title, Introduction and aim, Method and data, Sampling, Data analysis, Ethics and bias, Results, and usefulness, Implications, and generalizability. The four-point Likert scale: (1) Very poor (2) Poor (3) Fair (4) Good was used to measure the quality of all the included studies. The score of the overall studies' quality could be estimated by adding up the nine items. The poor-quality study is represented by a score ranging from (9 – 18), fair quality scores, study ranging from (18 – 27), while good quality study ranging from (28 – 36). The results of this quality assessment were that seven articles have a rate of good quality. However, only one study has the rate of fair-quality study and that because the description of the ethical issues, that the researchers have encountered, was inadequate.

3. FINDING AND RESULT

This review presents the results in order of a description of the characteristics of included studies, followed by a critical appraisal process, and finally the presentation of extracting themes. A broad range of studies focusing on different delivery positions was identified as a part of the literature search. Each study included was reviewed individually by comparing each paper's aims and/or objectives, study design, data collection and analysis methods, main findings, and implications for practice.

The study design of the included studies can be divided into four quantitative types which are RCT, cohort, cross-sectional, descriptive, and one sequential explanatory mixed methods. The majority of studies are RCT (n= 3), followed by a cohort study (n=2). Five articles had a relatively large sample (between 2992, up to 113279 women) and 3 articles had samples of less than 200 women. Of the eight studies, most of them were conducted in Europe (n = 4), then, Africa (n= 2), with a minority of included studies published in Asia (n= 1), and South America (n= 1).

Table I: Themes and sub themes

Themes	Name	Author name/ Publish year
3.1	Maternal delivery position and the occurrence of perineal injury /performing episiotomy	<ul style="list-style-type: none"> - Elvander et al., 2015 - Prosser et al., 2018 - Diorgu & Steen, 2018 - da Rosa dos Reis et al., 2015 - Edqvist et al., 2017 - Epidural and Position Trial Collaborative Group, 2017 - Edqvist et al., 2016 - Rezaie et al., 2020
3.2	Maternal delivery position and second stage duration	<ul style="list-style-type: none"> - Elvander et al., 2015 - Edqvist et al., 2017 - Epidural and Position Trial Collaborative Group, 2017
3.3	Maternal delivery position and mode of delivery	<ul style="list-style-type: none"> - Prosser et al., 2018 - Epidural and Position Trial Collaborative Group, 2017
3.4	Maternal delivery position and fetal outcomes	<ul style="list-style-type: none"> - Epidural and Position Trial Collaborative Group, 2017 - da Rosa dos Reis et al., 2015 - Edqvist et al., 2017 - Rezaie et al., 2020
3.5	Maternal delivery position and labor Pain	<ul style="list-style-type: none"> - Rezaie et al., 2020 - da Rosa dos Reis et al., 2015

A total of five themes emerged from the literature relating specifically to the association between maternal sitting and lithotomy position during the second stage of labor and maternal and fetal outcomes, they are: perineal tear or performing an episiotomy, duration of the second stage, mode of delivery, fetal outcomes and maternal labor pain.

3.1 Them1: The relationship between maternal delivery position and the occurrence of perineal injury /performing episiotomy

Most mothers undergoing vaginal birth sustain some degree of perineal tears [11]. The maternal position during the second stage of labor may help to reduce the incidence of spontaneous perineal tears. Perineal tears are a source of pain and discomfort for mothers, they may experience difficulty with breastfeeding due to unable to find a comfortable position. [13].

A cohort study in Sweden by Elivander and his colleague carried out, among 113 279 women, to investigate the association between maternal birth position and occurrence of severe perineal tears in spontaneous vaginal delivery, included nine deferent delivery positions (sitting and lithotomy), the result shows the lithotomy position has an increased risk of severe perineal tears, while sitting position, has a protective effect in nulliparous [4].

Furthermore, a cross-sectional study in Australia by Prosser and his colleague to examine the role of modifiable and non-modifiable factors in normal vaginal delivery among 5840 women, the result shows 53.2% of the total sample size deliver vaginally without an episiotomy, and the probability of not having an episiotomy, the woman should deliver in a non-supine position [14].

Likewise, in Sweden a cohort study among 597 women, included three different intervention groups, sitting as one of the flexible sacrum positions, compared with the standard care, which includes lithotomy. The percentage of the second-degree tear in the intervention group was lower than the standard care group. In addition, the episiotomies prevalence was low in both groups, while the prevalence of severe perineal tears did not differ significantly between the groups [8].

In Nigeria, a sequential explanatory mixed-methods, to explore the prevalence rate of different birthing positions and the views of the mothers and midwives regarding the birthing position and perineal tears. The result identified that most women are instructed to give birth on lithotomy position, and that correlated to the high rate of episiotomy performing. The qualitative findings revealed that the maternal birthing positions were decided and chosen by the attended midwives [15].

Although in Brazil a quantitative descriptive and retrospective study, among 189 women, with five different delivery positions includes sitting and lithotomy, it found that more than 88% of the delivery was in the lithotomy or sitting position. Over 50% of women maintained perineal integrity or minor perineal tears; episiotomies were performed in 15.5% of the sample size. Comparing the upright position with the lithotomy position, it is important to highlight reducing the rates of performing an episiotomy [16].

On the other hand, a randomized control trial in the United Kingdom among 3093 women, to evaluate whether women during the second stage of labor in upright position (sitting) increased the chance of spontaneous vaginal birth, compared with laying down. The result shows a statistically significant difference between the groups regarding the incidence of perineal tears. The incidence of performing episiotomy increased in the upright group compared with the laying down group. Also, the incidence of severe perineal tears was higher in the upright group compared with the laying down group [17].

However, a cohort study with eight different birth positions to describe the prevalence of perineal tears among 2992 women. The study was done in four Nordic countries: Norway, Sweden, Denmark, and Iceland, it found that there are no associations found between maternal position and perineal tears, 0.7% was the prevalence of spontaneous perineal tear of the total study sample, and the only risk factors were primiparity and birth weight > 4000 g [18].

Likewise, a randomized control trial among 96 women in Iran, with three positions (squatting, lithotomy, and sitting) 32 women each. The result shows the perineal status (in terms of tears and episiotomy) after delivery was not significantly different among the three groups ($p>0.05$) [19].

3.2 Them 2: The relationship between maternal delivery position and second stage duration

The second stage of labor is defined as beginning with the cervix completely dilated (10 cm) and ends with the expulsion of the fetus. The prolonged second stage leads to increases in the risk of maternal and fetal complications, like postpartum hemorrhage, the need for operative birth, and the risk of severe perineal injury, low Apgar score, and asphyxia. There are types of maternal positions that may decrease in the second-stage duration. Sitting position may enhance the second stage progress, therefore minimizing the risk of these complications [1].

In Sweden a prospective cohort study with an experimental design among 597 women, included three different intervention groups, sitting as one of the flexible sacrum positions, compared with the standard care which includes lithotomy. Time is calculated between the beginning of the second stage to the time of the delivery. The result shows the duration of the second stage was significantly shorter for the women in the sitting position, However, the majority of the women deliver within two hours in both groups [8].

Likewise, a cohort study carried out, between nine different delivery positions, including sitting and lithotomy positions among 113 279 women from Sweden, women in the lithotomy position were characterized by longer second stages, and higher rates of augmentation by oxytocin infusion [4].

However, a randomized control trial in the United Kingdom done among 3093 women, with two main delivery position: upright groups (sitting), and layings down group, it found a statistically significant difference at the 1% level in the laying down group with a shorter duration of the second stage of labor (median difference of 7 minutes) [17].

3.3 Them 3: The relationship between maternal delivery position and mode of delivery

Maternal position in the second stage of labor can affect the mode of delivery. The sitting position has many physiological mechanisms specified in promoting labor progress, therefore the spontaneous vaginal delivery. First, the effects of gravity, maternal pushing in the same direction as gravity. Second, regular and strong uterine contractions. Third, it increases the size of the pelvic diameter, thereby enabling the progress of labor. On the other hand, the maternal weight is supported by her back in the lithotomy position, which requires women to push against gravity. Furthermore, uterine contractions are regular but less effective [20, 21].

A cross-section study among 5840 in Australia, to investigate factors promoting or inhibiting normal birth. The result shows 53.7% had an unassisted vaginal birth. To increase the probability of normal birthing women should give birth in a non-supine position. The probability of a normal birth was reduced for nulliparous women, older age, with high BMI, or later gestational age [14].

On the other hand, in the United Kingdom a randomized control trial among 3093 women, it found a clear statistically significant difference between the groups regarding the incidence of spontaneous vaginal birth, with 35.2% of women deliver spontaneously in the upright group (sitting position) compared with 41.1% in the laying down group. This represents the chance of spontaneous vaginal birth in the laying down group by an increase of 5.9% [17].

3.4 Them 4: The relationship between maternal delivery position and fetal outcomes

To prevent fetal complications, maternal positions like lithotomy should be avoided, which compromised the intra-abdominal vessels; therefore, minimize the flow into the placenta and decline uteroplacental perfusion and cause fetal heart rate abnormalities. On the other hand, a sitting position may improve fetal outcomes due to the avoidance of the intra-abdominal vessel compression, especially the inferior vena cava [20].

In the United Kingdom, a randomized control trial was done among 3093 nulliparous. The sample was divided into an upright (sitting position) as an intervention and laying_down as a control. The study's secondary outcome measure included infant Apgar score. The result shows only a few newborns with a low Apgar score at five minutes, only two newborns in the upright group, while three newborns in the laying down group. Approximately 12% of newborns need resuscitation at birth. Placental arterial blood gas shows the incidence of metabolic acidosis among 6 newborns in upright, while 17 newborns in laying down group [17].

Similarly, da Rosa dos Reis and his colleague in Brazil through quantitative, descriptive, and retrospective study reported among 189 women, more than 88% of the total sample size give birth in the lithotomy or sitting position. The vast majority of newborns 87.7% had an Apgar score of more than seven in the first minute of life, and 96.7% had more than seven in the fifth minute [16].

On the other hand, a prospective cohort study among 597 women done in Sweden, included three different intervention groups, sitting as one of the flexible sacrum positions, compared with the standard care which includes lithotomy., the result related to newborn Apgar scores show no difference and there was no newborn had less than five APGAR score at 5 minutes of life [8].

However, in Iran, A randomized control trial among 96 women, with three positions (squatting, lithotomy, and sitting) 32 women each. The result has shown that the average Apgar score in the first minute of life in the sitting group was 8.56 ± 1.39 , and the lithotomy group was 8.69 ± 0.59 . The mean Apgar score in the fifth minute of life in the sitting group was 9.81 ± 0.54 , and the lithotomy group was 9.84 ± 0.51 . The mean Apgar score in the 1st and 5th minutes was not significantly different among the three groups ($p > 0.05$) [19].

3.5 Them5: The relationship between maternal delivery position and labor Pain

One of the important components of maternal care in labor is pain relief. In the second stage of labor, pain is transferred by the stimulation of L1–L10 nerve, and S2–S4 nerves. There are many methods to relieve labor pain; it can be categorized into pharmacological and non-pharmacological methods. One of the non-pharmacological methods include maternal position, it affects the dimensions of her pelvis. Changes in maternal position lead to changes in the pelvis spatial shape and cause better alignment of the fetus axis with the labor canal. That results in less pain felt [19].

A randomized control trial among 96 women in Iran, to study the effects of various birth positions in the second stage of labor on pain reduction among three positions (squatting, lithotomy, and sitting) 32 women each. The result shown in the mean pain severity latent phase of the second stage of labor was significantly less in sitting position (5.33), while in lithotomy position was (2.27). Pain severity in the active phase of the second stage of labor was 7.59 and 7.41 in sitting and lithotomy positions, respectively [19].

Likewise, a quantitative, descriptive, and retrospective study, with 189 women in Brazil, the study includes the lithotomy and sitting position with three other delivery positions. The result shows the use of non-invasive and non-pharmacological pain relief and freedom of position during labor, 90.5% (171) of the cases. Also, it was found that most of the delivery positions are in semi-seated or lithotomy. There was a reduction of pain and maternal fatigue in upright positions compared to the lithotomy position [16].

4. CONCLUSION

The findings have intended to highlight the background of this review paper, by comparing two maternal delivery positions and maternal and fetal outcomes. Eight studies have met the review inclusion criteria and their outcomes were divided into five themes to answer the PICOT question.

Eight studies had concerns related to the maternal delivery position and perineal tears or performing an episiotomy. In these studies, it was found that maternal lithotomy position during the second stage of labor may predispose to severe perineal tears or one of the risk factors of an episiotomy, while the sitting position is not [4, 14, 15]. While only two studies found the upright position is the risk of severe perineal tears and episiotomy [16, 17]. However, one study mention there is no association [18].

Moreover, two studies had concerns related to maternal delivery position and duration of the second stage. In these studies, it was found that maternal lithotomy position during the second stage of labor might predispose to prolong the second stage, while the sitting position is not [4, 8]. Where only one study found there the sitting position associated with a longer second stage of labor [17].

Furthermore, there are two studies concerns about the maternal delivery position and mode of delivery. One study found women had a higher probability of normal birth if they gave birth in a non-supine position [14]. While the other study found an increase of 5.9% in the chance of spontaneous vaginal birth in the laying down position [17].

In addition, four studies were concerned about the maternal delivery position and fetal outcome. It found two studies reported the vast majority of newborns had a good Apgar score in the first minute and the fifth minute [17] [16]. While two studies found no difference related to the APGAR score between the groups [8] [19].

Finally, there are two studies concern about the maternal delivery position and labor pain. It found that reduction in pain severity and fatigue of the second stage of labor, in sitting position compared to the lithotomy position [16, 19].

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In addition, this review paper has some contradictory findings in the studies regarding the relationship between maternal delivery position and maternal-fetal outcomes. There is a need for more studies to confirm this relationship.

In conclusion, evidence supports women giving birth in the sitting position to reduce perineal injury or performing an episiotomy, decrease the duration of the second stage, minimize the incidence of instrumental and operative births, and improve fetal outcomes.

5. LIMITATIONS

However, the major limitation of this literature review is the availability of the studies themselves. Limited studies are specifying sitting and lithotomy position. The number of studies that were exclusive to the previously mentioned delivery positions was few; there were only eight studies articles. Furthermore, the studies included in this review are from a wide range of countries, which have differences in the health care delivery system that may affect the delivery outcomes. In addition, some studies have a small sample size that was limiting the number of comparisons that could have been made in order to get accurate results.

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APPENDIX - A



PRISMA 2009 Flow Diagram

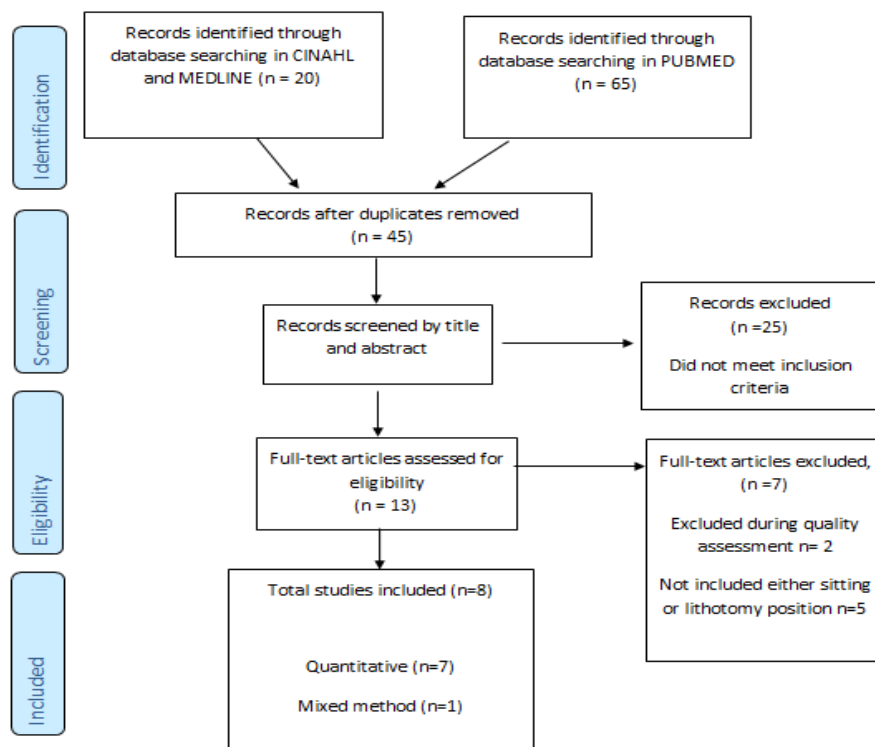


Figure I

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

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