Concurrent administration of oxytocin with Foley catheter versus misoprostol for induction of labor: A systematic review

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Abstract

Objectives: Around one- third of pregnancies require labor induction due to issues such as post-term pregnancy, stillbirth, and medical complications. This systematic review aimed to evaluate the effect of concurrent administration of Foley catheter plus oxytocin vs. misoprostol on labor induction.

Methods: The search was conducted in April 2019. The following databases were searched: PubMed, SCOPUS, Cochrane Central Register of controlled trials and Web of Science. Primary outcomes included mode of delivery and cesarean section rate. Secondary outcomes were the mean time of induction to delivery and delivery in less than 12 hours from induction. Data were analyzed using RevMan. For binary outcomes, the odds ratio with 95% confidence intervals (CI), and for continuous outcomes, the mean difference (MD) with 95% CI was measured.

Results: Four studies were included in this review. The cesarean section and vaginal delivery rate in Foley + oxytocin was not significantly different from misoprostol (OR = 0.95; 95 % CI: 0.70, 1.30) and (OR = 0.92; 95 % CI: 0.66, 1.29) respectively. Foley + oxytocin decreased the mean time of induction to delivery compared to misoprostol (MD = 0.60; 95 % CI: 0.03, 1.16), and increased delivery in less than 12 hours from induction (OR = 2.08; 95 % CI: 1.43, 3.02).

Conclusion: Although the rate of cesarean and vaginal delivery was not significant in two groups of Foley catheter + oxytocin and misoprostol, the mean time of induction to delivery reduced and delivery in less than 12 hours from induction increased in the Foley +oxytocin.

Background

Labor induction or labor inducing defines as stimulation of uterine contraction before the onset of labor (1). Labor induction is indicated in the following condition: post term pregnancy, intrauterine fetal growth retardation, preeclampsia or eclampsia, premature rupture of membranes, fetal death, some cases of twin pregnancy, pregnancy induced with medical problems such as diabetes and high blood pressure (2). Labor induction has dramatically increased in the United States, from 9.6% in 1990 to 23.2% in 2011 (3).

Labor induction can be done by non-pharmacological or pharmacological methods (4). Non-pharmacological methods are including Foley balloon catheter (5), amniotomy, acupuncture, sexual intercourse (6), hypnosis (7) and breast stimulation (8).

Medications such as oxytocin, prostaglandins, nitric oxide, misoprostol and mifepristone have been used for labor induction for many years (9–10). Foley catheter introduced as a non -pharmacological method that could significantly improve Bishop Score and reduced the length of labor (5).

A study by Acharya et al (2017), showed that using oxytocin (infusion) could significantly induce labor in less time compared to misoprostol suppository (11). Also oxytocin could significantly increase the rate of normal vaginal delivery compared to misoprostol in post-term pregnancies.

Misoprostol in form of oral and vaginal routes could significantly improve the labor induction and resulted in a fewer cesarean section compared to placebo and oxytocin (12).

Some clinicians used pharmacological and non-pharmacological methods concurrently. Levin et al (2016) (13), found that concurrent use of misoprostol and Foley catheter, oxytocin and Foley resulted in a better induction of labor as well as lower duration of induction. Considering cervical ripening is an important issue in labor induction. There is no universal agreement on the definition of prepared or unprepared cervix. Some clinicians consider Bishop Score < 6 while others define cervical Bishop score of < 3 as unfavorable cervix (14). The role of labor induction in the rate of cesarean is important and failure in induction, may lead to higher rate of cesarean Sect. (15).

There is lack of evidence about the effectiveness of concurrent use of oxytocin plus Foley catheter in comparison to misoprostol. Therefore, we aimed at identifying such effect, in an attempt to suggest a clinical guide to reduce cesarean section.

Methods

Types of studies

We have included only randomized clinical trials (RCTs). The protocol of this study was registered in PROSPERO (Ref No: CRD42019133611). This systematic review was prepared according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

Types of participants

Women at any age with a singleton full term pregnancy who delivered by induction of labor were included in the study.

Types of interventions

All double-blind, randomized, matched placebo-controlled trials were considered for inclusion in this review.

Double blind was defined as blinding of participants, personnel and outcome assessors.

Exclusion criteria:

- Unblended trials or single-blinded
- HT and placebo packaging not identical
- Participants not randomized
- Studies that did not measure a primary outcome

Trials included in the study were those comparing use of oxytocin in combination with Foley catheter placement for induction of labor compared to misoprostol. We had no restriction regarding route of administration, dose, frequency and duration of treatment or language.

Types of outcomes

Primary outcomes: Primary outcomes were; mode of delivery, cesarean section rate.

Secondary outcomes

Secondary outcomes were; mean time of induction to delivery and delivery in less than 12 hours from induction.

Adverse events

Adverse events included hyper stimulation, chorioamnionitis, neonatal admission to neonatal intensive care unit (NICU), and neonatal sepsis.

Collection and review data

We have followed the Cochrane Collaboration reviewed methods for collection and analysis of summary data (16).

The search was conducted on April 2019. The following databases were searched: PubMed, SCOPUS, Cochrane Central register of controlled trials (Issue 4 of 12, April 2019) and Web of Science. We also have searched the references of the relevant articles to detect any study that was not retrieved from our primary search. No limitations were set regarding year of publication, language, or route and dose of the medications. The Search terms included: Misoprostol, Foley catheter, oxytocin and induction of labor (See Supplemental Material No. 1).

Search results from the databases were imported to Endnote X7 (Thompson Reuter, CA, USA) and the duplicates were removed. Two review authors (MAA and SF) independently examined all titles and abstracts according to the inclusion criteria. Any discrepancy was resolved by discussion or consideration of the third person (PA). Using a predesigned data extraction form, two review authors (MAA and SF) independently extracted the data. Any discrepancy was resolved by discussion. One review author (MAA) entered the data into Review Manager 5.3. A second author checked the data (SF).

When there was any data missing in included studies, we tried to contact the authors to get relevant missing data. In case the data were not provided, we applied an intention-to-treat analysis. We always analyzed the number of women randomized if given and for positive events we assumed that the positive event did not occur.

Risk of bias assessment

We assessed the following risk of bias domains for each trial: random sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data, selective outcome reporting, and other biases (17). Two review authors (MAA and SF) estimated the risk of bias in each included study. Any disagreement was resolved by discussion. Authors rated each study in the specified domain as a low, medium or high risk of bias.

Measures of treatment effect

For binary outcomes, such as cesarean section rate, we calculated the OR and 95%CI. For continuous outcomes, such as mean time to delivery, we calculated the mean difference (MD) with 95% CI. The unit of analysis was the participant. The analysis was per women randomized. An intention-to-treat analysis was performed, as far as possible.

Random effects models were considered appropriate as there were many differences between trials (e.g. participant inclusion criteria, treatment types and dosages) that may potentially influence the size of the treatment effect, although the heterogeneity associated with fixed effects models was always assessed. Fixed effects results were only reported when a random effects analysis could not be performed due to negative "between study" variance for analyses using the inverse variance weighting method.

The mean difference between baseline and end of study results for women randomized to the placebo group was estimated for mean time difference to induction analyzed as continuous variables.

We assessed the methodological and clinical characteristics of the included studies in to see if they were similar enough for meta-analysis to be clinically meaningful. Heterogeneity was tested by using the I^2 statistics, where a measurement greater than 50% was taken to indicate substantial heterogeneity (17).

We conducted subgroup analyses if sufficient data was available to determine the separate evidence within the subgroups such as primigravida versus multigravida.

For all substantial heterogeneity we might have detected, we explored possible explanations in sensitivity analyses and we have taken all substantial heterogeneity into account in our interpretation of the results.

Sensitivity analyses were done for primary and secondary outcomes to determine whether the conclusions are robust to arbitrary decisions made regarding the eligibility and analysis. Our analyses considered of whether the review conclusions would have differed if eligibility were restricted to studies without high risk of bias, if alternative imputation strategies had been implemented or if the summary effect measure was relative risk rather than odds ratio.

Results

Literature search

A flow diagram of the included and excluded studies is shown in Fig 1. The database searches identified 432 records. After removing the duplicates (n = 137), two reviewers (MM and SF) screened the titles and abstracts for potentially relevant studies (n = 295) independently. Seven full-text RCTs were assessed for eligibility that three of full-text articles excluded due to: one reported non- concurrent administration of oxytocin and Foley catheter, one had a wrong study design and other was clinical trial registered on clinictrials.gov with no published full text yet. So, four studies were included in the meta-analysis.

Characteristics of studies

The trails included a total of 430 women in the group of Foley catheter plus oxytocin, and 433 in the misoprostol group that published between 1999 and 2016. The characteristics of the studies included in the meta-analysis are shown in table 1. From the four included studies three were conducted in the USA, (13, 18- 19), one in Nigeria (20). In general, the included participants had singleton pregnancies with an unfavorable cervix, intact membranes, and with the fetus in cephalic presentation in the third trimester of pregnancy. Three studies recruited primi- and multigravida women (13, 18-19). One study enrolled only multigravida women (20) and one enrolled only primigravida women (18). Only in two studies the main outcomes were reported separately by primi and multigravidas (13, 19).

Risk of bias in included studies

We assessed the risk of bias of the included trials according to the Cochrane evidence quality assessment tool that is shown in Figure 2. The random sequence and allocation concealment were reasonable in most trials (100% and 60%, respectively). The lack of blinding in most of the study trials was likely to be the main source of bias; only one trial reported an adequate description of blinding of the study subjects (13). Selective reporting was reasonable (60%) but incomplete outcome data was considered a high risk of bias in most of the included trials.

Effects of interventions

Cesarean section rate

1. Foley plus oxytocin vs. Misoprostol

As indicated in Fig 3, there were 430 participants in Foley plus oxytocin groups and 433 in misoprostol groups. The overall cesarean section rate in Foley plus oxytocin group was not significantly different from misoprostol groups (OR: 091, 95% CI: 0.71-1.18). Subgroup analysis of primiparous and multiparous women didn't show any differences in the rate of cesarean section in both groups (OR = 1.00; 95 % CI: 0.63, 1.60, in primiparous vs. OR = 0.68; 95 % CI: 0.33, 1.42 in multiparous).

2. Foley+ oxytocin vs. Foley + vaginal Misoprostol

Only one study compared the cesarean rate between Foley + oxytocin versus Foley + vaginal misoprostol (13). The result regarding the cesarean rate was not significant between two groups (OR = 1.14; 95 % CI:

0.66, 1.98). However, in the subgroup analysis of multiparous women vs. primiparous, there was an increased rate of cesarean section in Foley + oxytocin group in multiparous women.

3. Foley + oxytocin versus oral misoprostol

In one study cesarean section rate was assessed between Foley + oxytocin group versus oral misoprostol. The overall cesarean section rate was not significantly different between the two groups (OR = 0.99; 95 % CI: 0.51, 1.91) (19).

Vaginal delivery rate

Figure 4 represents the meta-analysis of vaginal delivery rate in two groups. In total, 554 women were included in the meta- analysis, 280 participants in Foley plus oxytocin groups and 274 in the misoprostol groups. There were no significant different between two groups (OR = 1.03; 95 % CI: 0.71, 1.50). Subgroup analysis of primiparous and multiparous women didn't show any differences in the rate of vaginal delivery in both groups (OR = 0.98; 95 % CI: [0.62, 1.55] in nulliparous vs. OR = 1.18; 95 % CI: [0.59, 2.37] in multiparous).

One study assessed the vaginal delivery rate between Foley + oxytocin versus oral misoprostol group. The overall vaginal delivery rate in Foley plus oxytocin group was not significantly different from oral misoprostol groups (OR = 1.01; 95 % CI: 0.52, 1.96) (19).

Mean time of induction to delivery

Three studies (n= 554 women) were included in the meta- analysis of mean time of induction to delivery in two groups (Fig 5). Foley plus oxytocin decreased the mean time of induction to delivery compared to misoprostol (MD = 0.60; 95 % CI: 0.03, 1.16). Also, subgroup analysis showed significant differences between primigravida vs. multigravidas (MD = -6.74; 95 % CI: -9.20, -4.28, vs. MD = 0.88; 95 % CI: 0.31, 1.46). One study has compared mean time from insertion of catheter to delivery between Foley + oxytocin versus Foley +vaginal Misoprostol. The overall mean time in Foley + oxytocin group was not significantly different from Foley + vaginal misoprostol group (MD = 1.08; 95 % CI: -0.78, 2.95) (13).

Delivery in less than 12 hours from induction

As indicated in Fig 6, there were 67 participants in Foley plus oxytocin group and 39 participants in misoprostol group. Delivery in less than 12 hours from induction in Foley plus oxytocin group was significantly more than that in the misoprostol groups (OR = 2.08; 95 % CI: 1.43, 3.02). Subgroup analysis of primiparous women showed significant decrease in the time of delivery in Foley + oxytocin group (OR = 2.21; 95 % CI: 1.18, 4.15) (13,18).

Levin and et al (13), compared delivery within 12 hours between Foley + oxytocin versus Foley +vaginal misoprostol. The overall mean time in Foley + oxytocin group was not significantly different from Foley + vaginal misoprostol group (OR = 0.85; 95 % CI: [0.51, 1.41], P =0.53).

Adverse events

Two studies with 418 participants reported admission in NICU rate (13, 18). There were no significant differences between Foley plus oxytocin and misoprostol groups (OR = 0.72; 95 % CI: 0.0.41, 1.24) (Fig 7).

Neonatal sepsis

Two studies (involving 428 women) were included in the meta- analysis of neonatal sepsis (13,18). There were no significant differences between Foley plus oxytocin and misoprostol groups (OR = 0.64; 95 % CI: 0.24, 1.75).

Hyper-stimulation or terbutaline use

Two studies (involving 418 women) were included in the meta-analysis for assessment hyper-stimulation or terbutaline use (13,18). There were no significant differences on the rate of hyper-stimulation or terbutaline use between Foley plus oxytocin and misoprostol groups (OR = 0. 069; 95 % CI: 0.38, 1.25).

Others adverse outcomes

There was only one study that assessed the rate of chorioamnionitis and endometritis between Foley plus oxytocin and misoprostol groups (13). The result of analysis showed significantly higher rate of chorioamnionitis in misoprostol group compared to Foley plus oxytocin (OR = 2.35; 95 % CI: 1.02, 5.39). However, there was no significant differences between two groups in the rate of endometritis (OR = 1.37; 95 % CI: 0.67, 2.82).

Discussion

This systematic review was conducted to assess the effect of Foley catheter plus oxytocin vs. misoprostol for induction of labor. Our results indicated that the rate of cesarean section and vaginal delivery was not different between two groups of administration Foley catheter plus oxytocin with misoprostol.

Insertion of Foley catheter (filled with 30mL or more normal saline) is a mechanical method for labor induction in which, cervix is dilated via increase in uterine receptors and progressive response to oxytocin and prostaglandin (21). Some studies showed that with recruiting women with Bishop Score 3 to 6, there is no significant difference between labor induction and expectant management of labor regarding cesarean section rate and adverse events in mothers and babies (15). The Bishop Score in time of labor induction is an important issue. Misoprostol is recommended for labor induction by the World Health Organization (22), International Federation of Gynecology and Obstetrics (23), and the Society of Obstetricians and Gynecologists of Canada (24). Studies showed that using oral misoprostol is preferable to vaginal suppository for labor induction (12). In the current systematic review, all included studies recruited women with term pregnancy and Bishop Score 3-6 and used oral or vaginal misoprostol for labor induction.

Our results regarding mean time from induction to delivery revealed that Foley + oxytocin could significantly decrease the mean time from induction to delivery. This effect was more obvious in multigravida vs. primigravida women. Studies in which they used misoprostol vs. Foley catheter revealed that misoprostol in labor induction resulted with a better outomes in terms of normal vaginal delivery rate (25).

Results of this systematic review showed that concurrent use of Foley + oxytocin could significantly increase delivery less than 12 hours from induction compared to misoprostol. Other studies also revealed that using Foley catheter is safe as spontaneous labor. The Foley mechanism for ripening cervix defined as direct mechanical pressure on cervix and cervical dilation as a result and also the local secretion of prostaglandins (26). Studies showed that the level of prostaglandin in women who used Foley catheter for cervical ripening, increased and this increase has continued with the level of higher cervical dilation (27).

Strengths and limitations of the study

Although there are many studies that evaluated the effect of oxytocin vs. misoprostol or vs. Foley catheter for labor induction, the information regarding comparison of Foley catheter plus oxytocin vs. misoprostol for induction of labor is scarce. This is a first systematic review that evaluated the impact of concurrent use of Foley catheter and oxytocin vs. misoprostol in primi and multipara women. The other strengths of this study are; we used the Cochrane methodology for assessing the risk of bias, use of systematic method for search of studies and use of RevMan for analyzing data.

Conclusions

This systematic review showed that although the rate of cesarean section and vaginal delivery was not different between two groups of concurrent use of Foley catheter plus oxytocin and misoprostol, but the mean time from induction to delivery and delivery less than 12 hours from induction in Foley plus oxytocin was significantly better than that in the misoprostol alone. Concurrent use of Foley plus oxytocin in term pregnancies which need labor induction is recommended.

Abbreviations

CI
Confidence Interval
MD
Mean Difference
RCT
Randomised Controlled Trial
PRISMA
Preferred Reporting Items for Systematic Reviews and Meta-Analyses

NICU
neonatal intensive care unit

Declarations

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Availability of data and materials

Data sharing is not applicable for this study. There is no datasets were used for this study.

Authors' contributions

Conceptualization: MAA, PA, SF, SJ

Search and screening: MAA

Analyses and interpretation: MAA, PA and SJ

Writing and finalizing the manuscript: FS, PA and SJ.

All authors read and approved the final version of the study.

Ethics approval and consent to participate

N/A

Consent for publication

N/A

Competing interests: Parvin Abedi and Shayesteh Jahanfar are both associate editors of BMC Pregnancy and Childbirth and other than this; the authors declare that they have no competing interests.

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Table

Table 1: Characteristics of included studies

nce	**Culver, 2004**
ds	Parallel design -Two arms -Phase III -Country: USA, North Carolina Women's Hospital (Chapel Hill, NC) and WakeMed Hospital (Raleigh, NC). -Unit of randomization: participant - Analysis unit: participant
ipants	-Enrolled: 173 pts -Randomized: 1) Foley + oxytocin: 89 pts 2) Misoprostol alone: 84 - All patients were nulliparous. **Inclusion criteria:** Nulliparity, gestational age >28 weeks, a Bishop score<6, and intact membranes. **Exclusion criteria:** (1) a previous delivery past 20 weeks, (2) multiple gestation, (3) non-cephalic presentation, (4) previous uterine surgery, (5) non-reassuring fetal heart rate (FHR) tracing, (6) more than eight spontaneous contractions in the hour preceding randomization, (7) latex allergy, or (8) any contraindication to vaginal delivery.
entions	1. **Foley catheter + Oxytocin:** 18F Foley catheter with 30-mL balloon was placed through the cervical canal. The balloon was then inflated in the lower uterine segment with 30 mL of sterile water and the Foley catheter taped under gentle traction to the patient's inner thigh. Intravenous oxytocin was then started at 2 mU/min and increased 1 to 2 mU/min every 15 to 30 minutes to a maximum of 20 mU/min. Maximum oxytocin doses could exceed 20 mU/min by physician order. 2. **Intravaginal Misoprostol:** misoprostol 25 mg intra-vaginally every 4 hours up to a maximum of six doses. Tablets (100 mg) were cut into fourths by the nurse and one fourth tablet was placed into the posterior fornix by the physician. Subsequent doses were withheld if the patient was having three or more contractions in 10 minutes or non-reassuring FHR tracing. Oxytocin augmentation was withheld until 4 hours after placement of the last misoprostol dose. If oxytocin was used, the protocol listed above was followed.
mes	- **Primary**: CS rate -**Secondary**: indications for cesarean delivery, time from induction to delivery, abnormalities of labor such as tachysystole, hyper stimulation, abnormal FHR tracings; intrapartum and postpartum fevers and use of antibiotics; estimated blood loss; and blood transfusions, Apgar scores, neonatal resuscitation requirements, admission to the neonatal intensive care unit, meconium aspiration, hyperbilirubinemia, sepsis (culture proven or clinically suspected),death.
nce	**Levine, 2016**
ds	-Parallel design -Four arm -Phase III -Country: USA, University of Pennsylvania. the Hospital of the University of Pennsylvania -Unit of randomization: participant -Analysis unit: participant
ipants	Enrolled: 491 pts **-Randomization:** 1) Foley alone: 123 pts, 2) Misoprostol alone: 120 pts, 3) Foley + misoprostol: 123 pts, 4) Foley + oxytocin: 125 pts **-Nulliparous**: N (%):1) misoprostol alone :70 (58.3), 2) Misoprostol + Foley: 73 (59.4,) 3) Foley alone: 73 (59.4), 4) Foley + oxytocin: 74 (59.2) **Inclusion Criteria:** at least 18 years of age with a full term (≥37 weeks), singleton gestation in cephalic presentation. Both nulliparous and multiparous women were included. Women were required to have intact membranes, a Bishop score of ≤6 and cervical dilation ≤2cm to be eligible

	Exclusion Criteria: there was a contraindication to a vaginal delivery or to misoprostol, fetal demise, or major fetal anomaly. Non-English speaking women, women with HIV, and women with medical conditions requiring an
entions	**1. Foley + oxytocin:** 18F Foley catheter with 30cc balloon inflated with 60 cc sterile water and deflated and removed after 12 hrs. if not spontiously dropped. Oxytocin was initiated concurrently at the start of induction. Oxytocin protocol: 2 mill units/minute of oxytocin increasing by 2 mill units every 15 minutes until regular uterine contractions occur. Forty mill units of oxytocin is considered the maximum dose with no limit as to the length of time a participant can remain at 40 milliunits. 2. **Intravaginal Misoprostolalone**: 25 micrograms of misoprostol per vagina every 3 hours, repeated up to five additional times for a maximum of 24 hours, Oxytocin was initiated if there was a contraindication to another misoprostol dose or if additional cervical ripening was not indicated. 3) **Foley catheter** as in intervention (Foley alone group) and oxytocin was initiated when the catheter either dropped spontiously or removed after 12 hrs. by the care giver 4) **Foley + intravaginal misoprostol** as described above for each one of the interventions.
mes	**-Primary:** time to delivery (hours) **-Secondary**: Cesarean delivery rate, time to delivery censored for cesarean section, time to active labor (defined as dilatation ≥5cm), delivery within 12 hours, delivery within 24 hours, and maternal length of stay (defined as length of time from admission for induction to discharge postpartum, days) and indication for cesarean delivery, 3rd/4th degree perineal laceration, blood transfusion, endometritis, wound separation–infection (defined by the need for additional wound closure or the need for antibiotics), venous thromboembolism, hysterectomy, intensive care unit admission, or death. Other maternal secondary outcomes analyzed were chorioamnionitis (defined by the presence of maternal fever ≥100·4°F in the presence of maternal or fetal tachycardia or fundal tenderness), use of terbutaline, intrauterine pressure catheter, amnioinfusion, or analgesia use. neonatal morbidity outcome was pre-specified to include ≥1 of the following prior to neonatal discharge: severe respiratory distress syndrome (defined as intubation and mechanical ventilation for a minimum of 12 hours), culture proven–presumed neonatal sepsis, neonatal blood transfusion, hypoxic ischemic encephalopathy, intraventricular hemorrhage grade 3 or 4, necrotizing enterocolitis, or receipt of head cooling. Other neonatal outcomes analyzed were neonatal intensive care unit (NICU) admission, NICU admission >48 hours, and neonatal length of stay (days).
nce	**Garba, 2016**
ds	-Parallel design -Two arm -Phase III -Country: Nigeria: Aminu Kano Teaching Hospital, From February 01 to May 30, 2015 -Unit of randomization: participant -Analysis unit: participant
ipants	-Number enrolled: 136 pts -Randomized: 1) Foley + oxytocine:66 pts. 2) misoprostol alone: 70 -Primigravida: N (%): All patients were Multigravida **Inclusion criteria:**postdate singleton pregnant multigravida **Exclusion criteria:**not mentioned
entions	**1.** Foley + oxytocin: the details did not mentioned

	2. Intravaginal misoprostol alone: the details did not mentioned
mes	-***Primary outcomes:***Mean induction to delivery time -***Secondary outcomes:****CS rate, Failed induction rate, Failure to progress rate, The APGAR scores, maternal vital signs, estimated blood loss*
nce	***Abramovici, 1999***
ds	-RCT - two arms -Phase III Country: USA, Division of Maternal-Fetal Medicine, Department of Obstetrics and Gynecology, University of Tennessee. -Unit of randomization: participant -Analysis unit: participant
ipants	-Enrolled: 197 pts -Randomized: 1) Foley +oxytocin: 99 pts, 2) Oral misoprostol alone: 98 pts -Primigravida: N (%): 1) Oxytocin + Foley: 57 pts, 2) misoprostol: 58 pts **Inclusion criteria**:Women at term (37 weeks' gestation) with a singleton live fetus in cephalic presentation, had intact membranes, had a Bishop score of 5 or less, and were not in labor (<3 uterine contractions in 10 minutes). **Exclusion criteria:** any of the following: a no reassuring fetal heart rate tracing, multifetal gestation, previous cesarean delivery or previous uterine surgery, ruptured membranes, placenta Previa, active genital herpes, maternal asthma, sickle cell disease, or known hypersensitivity to prostaglandins.
entions	1. Foley + oxytocin: Foley + oxytocin: In patients without any cervical dilation, a Foley catheter was inserted into the cervix under direct visualization. A speculum was placed into the vagina, and the cervix was cleaned with an antiseptic solution. A 16F balloon-tipped Foley catheter (C.R. Bard, Inc., Covington, Ga) was passed through the cervix beyond the internal os and was inflated with 30 mL of sterile sodium chloride solution. The catheter was taped under gentle traction to the inner aspect of the patient's thigh. The balloon was deflated, and the device was removed after 12 hours if it had not been spontaneously expelled, Oxytocin: Intravenous oxytocin was started at 1 mU/min and increased by 2 mU/min at 30-minute intervals until adequate uterine activity was maintained (3 contractions in 10 minutes). The maximum dose of oxytocin allowed was 36 mU/min. **2. oral Misoprostol alone:** 50- microgram tablet orally every 4 hours over a 24-hour period up to a maximum dose of 300 mg.
nes	**1. Primary:** delivery within 24 hours from the start of induction **2. Secondary**: induction-to-delivery time, time to active labor, incidence of cesarean delivery, indications for cesarean delivery, uterine hyper stimulation, and neonatal outcome eg meconium, NICU admiration, Apgar score at 1min and 5 min, Maternal SEs eg, chorioamnionitis

Figures

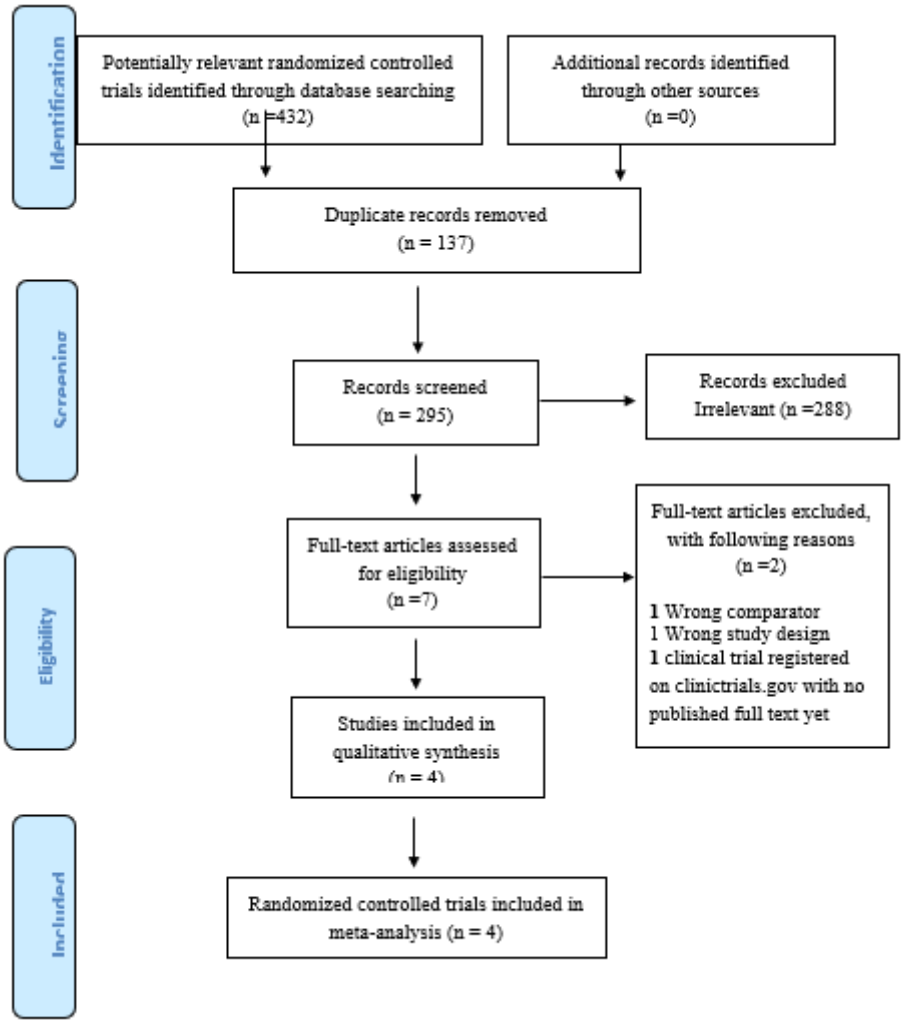

Figure 1

PRISMA Chart

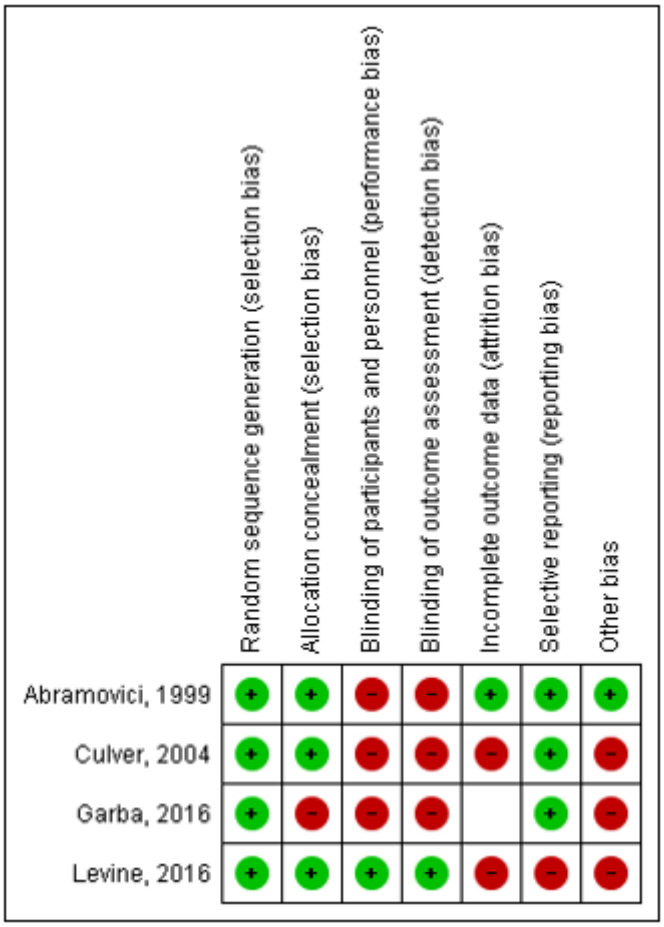

Figure 2

Risk of bias summary: review authors' judgments about each risk of bias item for each included study

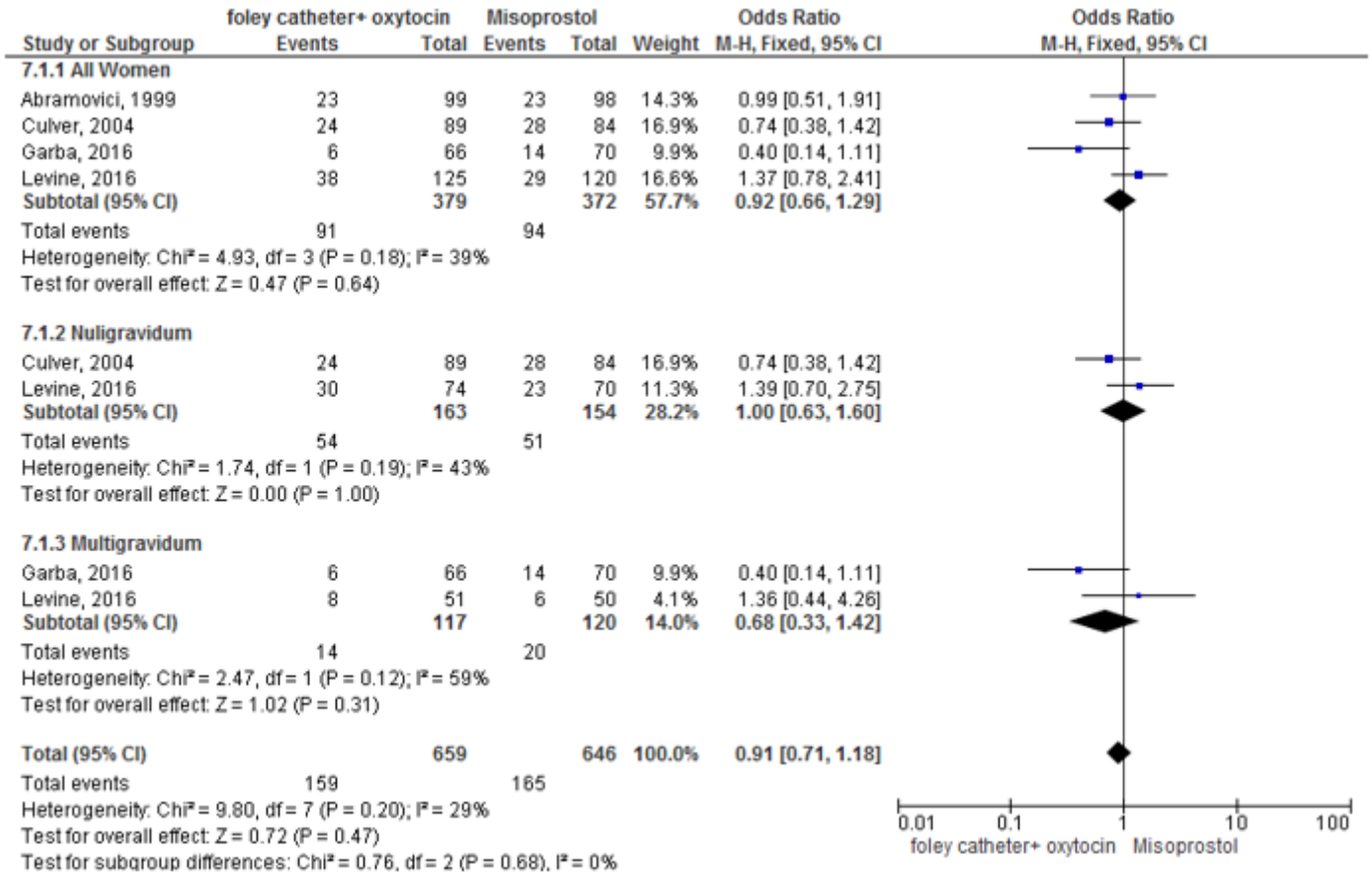

Figure 3

Forest plot of the cesarean section rate in Foley catheter plus oxytocin vs. misoprostol groups using fixed effect

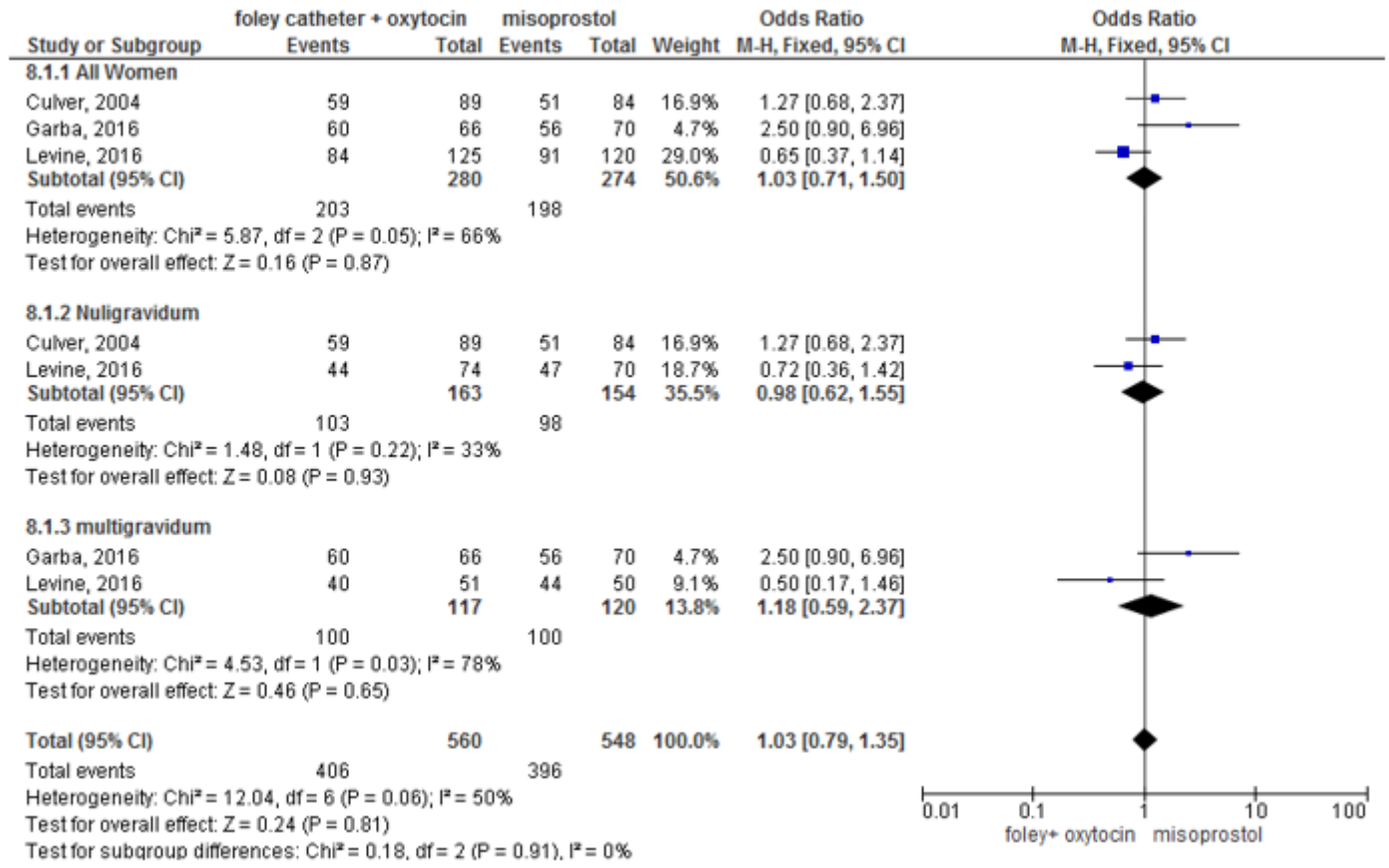

Figure 4

Forest plot of vaginal delivery rate in Foley catheter plus oxytocin vs. misoprostol groups using fixed effect

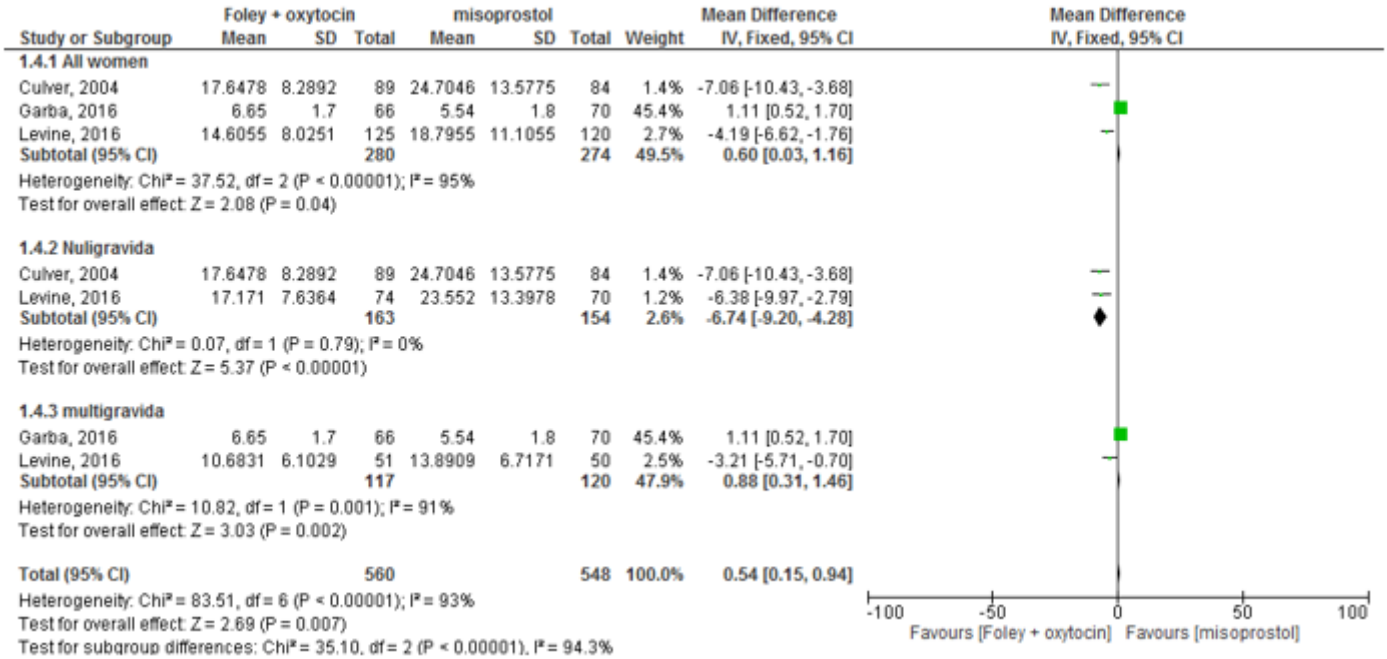

Figure 5

Forest plot of mean time to delivery in Foley catheter plus oxytocin and misoprostol groups using fixed effect

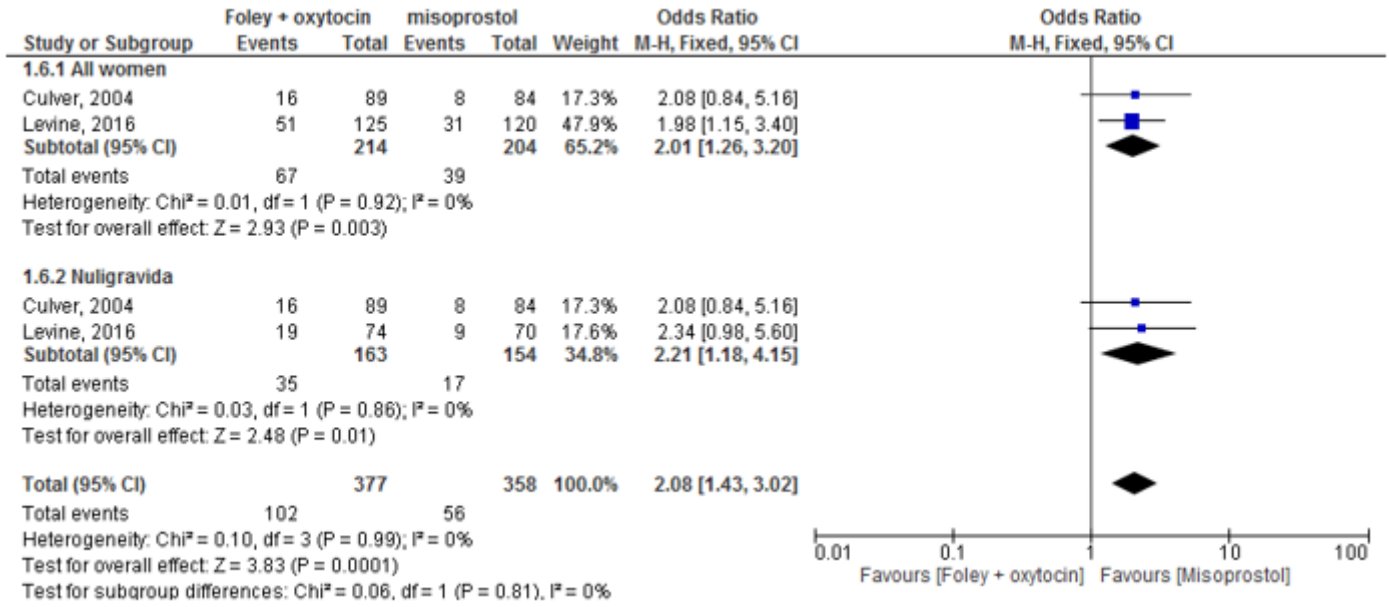

Figure 6

Forest plot of delivery less than 12 hours in Foley catheter plus oxytocin vs. misoprostol using fixed effect

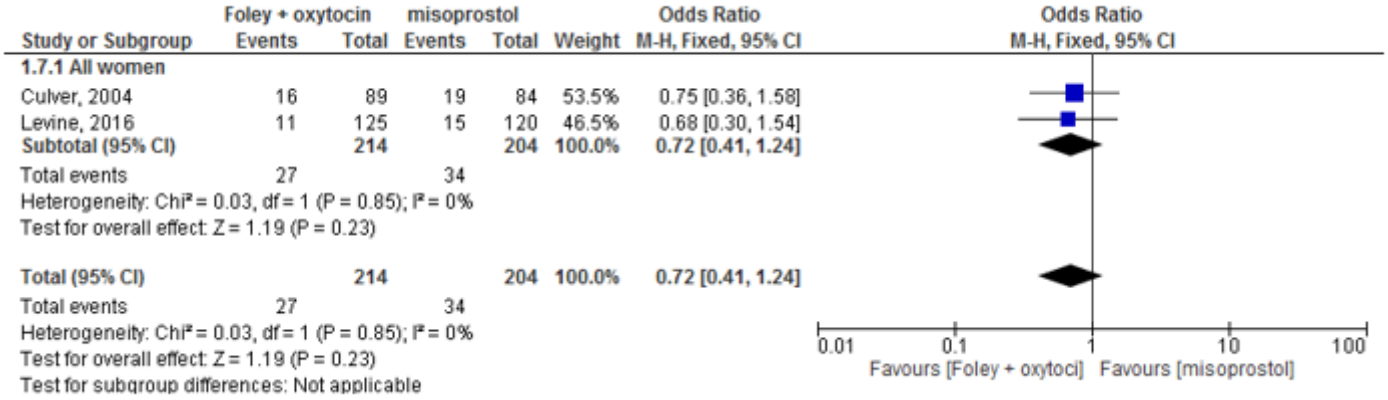

Figure 7

Forest plot of admission to NICU in Foley catheter plus oxytocin and misoprostol using fixed effect

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Supplementalmaterial1Searchstrategies.docx