Induction of labour for improving birth outcomes for women at or beyond term (Review)

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ABSTRACT

Background
As a pregnancy continues beyond term the risks of babies dying inside the womb or in the immediate newborn period increase. Whether a policy of labour induction at a predetermined gestational age can reduce this increased risk is the subject of this review.

Objectives
To evaluate the benefits and harms of a policy of labour induction at term or post-term compared to awaiting spontaneous labour or later induction of labour.

Search strategy
We searched the Cochrane Pregnancy and Childbirth Group's Trials Register (June 2006).

Selection criteria
Randomized controlled trials conducted in women at or beyond term. The eligible trials were those comparing a policy of labour induction to a policy of awaiting spontaneous onset of labour. Trials comparing cervical ripening methods, membrane stripping/sweeping or nipple stimulation without any commitment to delivery within a certain time were excluded.

Data collection and analysis
Two review authors independently evaluated potentially eligible trials and extracted data. Outcomes are analysed in two main categories: gestational age and cervix status.

Main results
We included 19 trials reporting on 7984 women. A policy of labour induction at 41 completed weeks or beyond was associated with fewer (all-cause) perinatal deaths (1/2986 versus 9/2953; relative risk (RR) 0.30; 95% confidence interval (CI) 0.09 to 0.99). The risk difference is 0.00 (95% CI 0.01 to 0.00). If deaths due to congenital abnormality are excluded, no deaths remain in the labour induction group and seven deaths remain in the no-induction group. There was no evidence of a statistically significant difference in the risk of caesarean section (RR 0.92; 95% CI 0.76 to 1.12; RR 0.97; 95% CI 0.72 to 1.31) for women induced at 41 and 42 completed weeks respectively. Women induced at 37 to 40 completed weeks were more likely to have a caesarean section with expectant management than those in the labour induction group (RR 0.58; 95% CI 0.34 to 0.99). There were fewer babies with meconium aspiration syndrome (41+: RR 0.29; 95% CI 0.12 to 0.68, four trials, 1325 women; 42+: RR 0.66; 95% CI 0.24 to 1.81, two trials, 388 women).

Authors' conclusions
A policy of labour induction after 41 completed weeks or later compared to awaiting spontaneous labour either indefinitely or at least one week is associated with fewer perinatal deaths. However, the absolute risk is extremely small. Women should be appropriately counselled on both the relative and absolute risks.

PLAIN LANGUAGE SUMMARY

Induction of labour in normal pregnancies at or beyond term

A normal pregnancy lasts about 40 weeks from the start of the woman's last menstrual period, but anything from 37 to 42 weeks is considered within the normal range. Births before 37 weeks are considered premature because these babies often have breathing difficulties and other problems as some of their organs will not yet be fully matured, e.g. their livers. Births after 42 weeks seem to carry a slightly increased risk for the baby, and this review sought to find out if induction of labour at a prespecified time could reduce this increased risk or not. There are currently no tests that can tell if a baby would be better to be left in the womb or be induced and born, so arbitrary time limits have been suggested. The review of trials found 19 studies involving almost 8000 women given induction of labour at various times from 38 weeks to over 42 weeks' gestation; some were quite old trials and the quality was variable. The review grouped the trials by induction at (1) 37 to 40 weeks; (2) 41 completed weeks; and (3) 42 completed weeks, compared with waiting to a later date. There were fewer baby deaths when a labour induction policy was implemented after 41 completed weeks or later. However, such deaths were rare with either policy. Women's experiences and opinions about these choices have not been adequately evaluated.

BACKGROUND

A pregnant women is 'at term' when her pregnancy duration reaches 37 weeks. For 5% to 10% of women, their pregnancies continue beyond 294 days (42 completed weeks) and are described as being 'post-term' or 'postdate' (Olesen 2003). Both the mother and the infant are at increased risk of adverse events when the pregnancy continues beyond term. Hilder 1998 reported the risk of fetal or infant loss per 1000 ongoing pregnancies beyond term. After 41 weeks, neonatal and postneonatal death risk increased significantly. Olesen et al conducted a cross-sectional study of birth registry data between 1978 to 1993 in Denmark (Olesen 2003) showing similar results, that is, significant increase in perinatal death and morbidities. The majority of post-term births occurred at 42 weeks (87%) while less than 1% of women gave birth at 44 weeks or later. The overall risk of perinatal death was 0.4% in the post-term group and 0.3% in the term group in the Olesen et al study. These findings are important in that, even in a setting where early booking allows accurate assessment of gestational age and antenatal services are accessible for most women, post-term pregnancy constitutes a high-risk situation, especially for the baby.

The obstetric problems associated with post-term pregnancy include induction of labour with an unfavourable cervix, caesarean section, prolonged labour, postpartum haemorrhage and traumatic birth. It is likely that some of these unwanted outcomes result from intervening when the uterus and cervix are not ready for labour.

Early pregnancy ultrasound is associated with a reduced incidence of post-term pregnancy possibly by avoiding misclassification (Neilson 1998). Induction of labour is widely practised to try and prevent the problems mentioned above and improve the health outcome for women and their infants. Unfortunately, labour induction may itself cause problems especially when the cervix is not favourable. Furthermore, the ideal timing for induction of labour is not clear. In the past there was a tendency to await spontaneous labour until 42 completed weeks. However, the earlier version of this review, last revised in 1999, suggested that induction of labour at or from 41 weeks reduced perinatal mortality without increasing caesarean section and other adverse outcomes (Crowley 2004). Other authors have concluded that labour induction at 41 weeks or more is associated with a reduced caesarean section rate and no difference in perinatal mortality (Sanchez-Ramos 2003). Earlier studies have also looked at interventions before the post-term stage is reached.

The gestational age and cervix being (un)favourable may affect the success of the induction of labour and the resulting caesarean section rates. When the cervix is favourable (usually a Bishop score of six or more), induction is often carried out by oxytocin and artificial rupture of amniotic membranes. If the cervix is not favourable then usually a prostaglandin gel or tablet is placed in the vagina or cervix to ripen the cervix, initiate the uterine contractions and labour. Many protocols are used with varying repeat intervals and transition to oxytocin and amniotomy depending on the onset of uterine contractions and progress of cervical dilatation. Recently, the use of oral (Alfirevic 2001) and vaginal (Hofmeyr 2003) misoprostol for labour induction have been reviewed. A low-dose vaginal misoprostol regimen seems to be as effective as other induction agents while orally, a slightly higher dose of misoprostol may be used.

The earlier versions of this review included interventions such as early pregnancy ultrasound that may have an effect on the outcome of pregnancies for women at or beyond term. In this update, we evaluate labour induction at or beyond term compared with expectant management which may include various intensities of monitoring.

OBJECTIVES

The hypothesis tested in this review is that a policy of labour induction at or beyond term compared with a policy of awaiting

spontaneous labour indefinitely (until a later gestational age or until a maternal or fetal indication for induction of labour is identified) improves pregnancy outcomes for the infant and the mother.

CRITERIA FOR CONSIDERING STUDIES FOR THIS REVIEW

Types of studies

Randomized controlled trials were eligible for inclusion in the review. Quasi-random allocation schemes such as alternation, case record numbers or open random-number lists were not eligible.

Types of participants

Pregnant women at or beyond term were the participants in the trials eligible for this review. Since a risk factor at this stage of pregnancy would normally require an intervention, only trials including women at low risk for complications were eligible. We accepted the trialists' definition of 'low risk'. The trials of induction of labour in women with prelabour rupture of membranes at or beyond term were not considered in this review (Dare 2006), although some women participating in the eligible trials may have ruptured membranes.

Types of intervention

The experimental intervention evaluated in this review is a policy of labour induction at a predetermined gestational age. This policy is compared with 'expectant management' until an indication for birth arises. The trial protocols differ according to:
(1) gestational age;
(2) actual method of labour induction (prostaglandins, misoprostol, +/- oxytocin), protocol used (dosage of any drugs, timing, frequency of use and mode of administration);
(3) expectant management protocols (intensity of fetal well-being assessment and fetal monitoring techniques used).

Types of outcome measures

The primary outcome of this review was perinatal mortality, defined as intrauterine deaths plus newborn deaths in the first week of life. Other important outcomes included the following.

For the infant/child

- Perinatal mortality (stillbirth, newborn deaths within first week)
- Birth asphyxia (as defined by trialists)
- Admission to neonatal intensive care unit
- Neonatal convulsions
- Neonatal encephalopathy
- Use of anticonvulsants
- Meconium aspiration syndrome
- Pneumonia
- Apgar score less than seven at five minutes
- Neurodevelopment at childhood follow up

For the mother

- Mode of birth (caesarean section, vaginal)
- Operative vaginal birth (forceps or ventouse)
- Analgesia used
- Perineal trauma
- Prolonged labour (cut-off used by the trialists was used)
- Postpartum haemorrhage (cut-off used by the trialists was used)
- Anxiety before birth
- Other measures of satisfaction with the approach
- Breastfeeding at discharge
- Postnatal depression

We extracted other outcomes reported by the trialists if they related to the outcomes listed. Cost-related analyses were included in the results and discussion sections.

Health services use

- Length of maternal postnatal stay
- Length of neonatal postnatal stay
- Length of labour

SEARCH METHODS FOR IDENTIFICATION OF STUDIES

See: methods used in reviews.

We contacted the Trials Search Co-ordinator to search the Cochrane Pregnancy and Childbirth Group's Trials Register (June 2006).

The Cochrane Pregnancy and Childbirth Group's Trials Register is maintained by the Trials Search Co-ordinator and contains trials identified from:
(1) quarterly searches of the Cochrane Central Register of Controlled Trials (CENTRAL);
(2) monthly searches of MEDLINE;
(3) handsearches of 30 journals and the proceedings of major conferences;
(4) weekly current awareness search of a further 37 journals.

Details of the search strategies for CENTRAL and MEDLINE, the list of handsearched journals and conference proceedings, and the list of journals reviewed via the current awareness service can be found in the 'Search strategies for identification of studies'

section within the editorial information about the Cochrane Pregnancy and Childbirth Group.

Trials identified through the searching activities described above are given a code (or codes) depending on the topic. The codes are linked to review topics. The Trials Search Co-ordinator searches the register for each review using these codes rather than keywords.

We did not apply any language restrictions.

METHODS OF THE REVIEW

Methodological quality assessment

We evaluated trials under consideration for methodological quality and appropriateness for inclusion, without consideration of their results. Any differences of opinion were resolved by discussion. There was no blinding of authorship (Higgins 2005). Methodological quality assessment included:

(1) allocation concealment: A = adequate, B = unclear, C = inadequate (will be excluded);

(2) performance bias: blinding of carers and women is difficult to achieve in these trials as the interventions relate to a particular timing of birth;

(3) detection bias: blind outcome assessments (A = done, B = unclear/not reported, C = not done);

(4) attrition bias: loss to follow ups were systematically recorded. If there are unexplained imbalances or if the outcome is available in less than 80% of the participants, the study was not used for that outcome. If this occurred for all outcomes, the study was excluded.

Data extraction

We extracted data for all relevant outcomes to predesigned forms for ease of extraction. AM Gulmezoglu and P Middleton extracted the data for all trials whether they were included in the previously published version or not. We resolved discrepancies by discussion.

Analysis strategy

The statistical analyses were conducted using the Review Manager software (RevMan 2003). We analysed categorical data using relative risks and 95% confidence intervals. We assessed statistical heterogeneity between trials using both the chi-squared test and the I^2 statistic. Where there was no significant heterogeneity ($P > 0.1$, $I^2 < 25\%$), we pooled data using a fixed-effect model. If we encountered moderate heterogeneity (I^2 between 25% and 50%), we used the random-effects model and for significant heterogeneity ($I^2 > 50$ %) we did not analyse the totals. We tried to identify the sources of heterogeneity by looking at trial characteristics.

The earlier version of this review (Crowley 2004) used the Peto odds ratio (Peto OR) statistic. We used relative risk (RR) as this is widely recommended within The Cochrane Collaboration and by the Cochrane Pregnancy and Childbirth Group. The Peto OR is an appropriate statistic for meta-analysis when there are cells with 'zero' counts such as the case with the perinatal death data in this review (PCG 2005). We reported the main analysis with both RR and Peto OR and discussed the interpretation in the discussion section.

Intention-to-treat analysis

The analysis was based on 'available cases' as recommended in the Cochrane Handbook for Systematic Reviews of Interventions (Higgins 2005a). There were no imputations for missing outcome data. There were protocol violations such as postrandomization exclusions and women not receiving the allocated treatment. These occurred in both directions. Some women allocated to induction of labour had spontaneous labour and some due for expectant management had induction of labour for various reasons. We included these data in the allocated groups (either using information published or seeking clarification from authors) as much as possible (*see* below in methodological quality).

Sensitivity analysis

We planned to conduct sensitivity analysis according to the allocation concealment score, should the available data allow it. We did not conduct formal sensitivity analysis because of the limited number of studies for each comparison and outcome but discussed the impact of quality in the discussion narratively.

Subgroup analysis

We planned to conduct a priori subgroup analyses by:

(1) gestational age by week of gestation. The main groups here are gestational ages 37 to 40 + 6 and 41 + 0 and beyond. However, we will look at each week of gestation if data permit in future updates;

(2) condition of cervix (favourable: Bishop score six or more; unfavourable less than six);

(3) by method of induction (including dosage, timing, frequency and mode of administration).

We conducted the first two analyses. We did not have sufficient data to look at the results per week of gestation and by method of induction (most were similar, *see* 'Characteristics of included studies' table).

DESCRIPTION OF STUDIES

Nineteen trials (reporting on 7984 women) were included and 59 potentially eligible trials were excluded. Most of the excluded trials were comparisons of different labour induction or cervical ripening protocols. More details are provided in the 'Characteristics of excluded studies' table. There is one ongoing trial in Trondheim, Norway that has completed recruitment of 508 women and the data are currently being analysed (Norway 2006).

Gestational age

All trials included low-risk women with certain gestational age. Most trials intervened at 41 completed weeks (Augensen 1987;

Chakravarti 2000; Chanrachkul 2003; Dyson 1987; Gelisen 2005; Hannah 1992; Henry 1969; James 2001; Martin 1989; NICHHD 1994; Suikkari 1983), three intervened at 38 to 40 weeks (Breart 1982; Cole 1975; Egarter 1989) and five after 42 completed weeks (Bergsjo 1989; Herabutya 1992; Ocon 1997; Roach 1997; Witter 1987). All three trials intervening at 38 to 40 weeks were conducted before 1990.

Cervix status

Most trials did not mention or specify cervix status as a criterion (Augensen 1987; Bergsjo 1989; Breart 1982; Chakravarti 2000; Cole 1975; Hannah 1992; Henry 1969; James 2001; Roach 1997; Suikkari 1983; Witter 1987). Six trials included women with unfavourable cervix and two with favourable cervical status (Chanrachkul 2003; Egarter 1989).

Settings

Twelve trials were conducted in various industrialised country settings (seven in Europe (Augensen 1987; Breart 1982; Cole 1975; Egarter 1989; Henry 1969; Ocon 1997; Suikkari 1983), four in USA (Dyson 1987; Martin 1989; NICHHD 1994; Witter 1987); one in Canada (Hannah 1992) and the remaining seven were conducted in China (Hong Kong - Roach 1997) and one in Wuhan (Bergsjo 1989), Turkey (Gelisen 2005), Thailand (Chanrachkul 2003; Herabutya 1992) and India (Chakravarti 2000; James 2001)). All trials were conducted in hospitals with various intensities of fetal monitoring both in the induction and expectant management groups (*see* 'Characteristics of included studies' table). Labour induction was by oxytocin and artificial rupture of membranes in most trials. In trials recruiting women with unfavourable cervix priming with prostaglandins or laminaria were usually undertaken before induction. The Gelisen 2005 trial had three labour induction arms with misoprostol, oxytocin and Foley catheter.

Expectant management protocols

Expectant management protocols usually included various combinations of fetal heart rate monitoring, ultrasound for amniotic fluid measurements and, in earlier studies, biochemical tests. In seven trials, no gestational age limit was imposed or reported. In five trials, women in the expectant management group were induced at 44 completed weeks (Chanrachkul 2003; Hannah 1992; Herabutya 1992; Martin 1989; NICHHD 1994), in two trials at 43 weeks (Augensen 1987; Bergsjo 1989) and in two trials at 42 weeks (Chanrachkul 2003; Gelisen 2005).

In the remaining three trials with early term (37 to 40 weeks) induction (Breart 1982; Cole 1975; Egarter 1989), women in the expectant arms were induced at 42 weeks.

METHODOLOGICAL QUALITY

Two trials (Chakravarti 2000; Suikkari 1983) are available only as abstracts and despite intensive searches we could not locate full publications of the studies. Alternate allocation trials were not eligible for inclusion and led to the exclusion of three trials included in the previous version of the review. Seventeen of the 19 trials had unclear (B score) allocation concealment. The trials with adequate allocation concealment were Hannah 1992 (3418 women, Canada) and NICHHD 1994 (440 women, USA).

None of the trials mentioned any attempt at blind outcome assessments. This is difficult due to the nature of the intervention, but possible. The main outcome perinatal death is a hard outcome and the lack of blind outcome assessment should not bias its measurement.

Protocol violations occurred in most trials in both groups; that is, up to 30% women assigned to labour induction delivered spontaneously and others assigned to expectant management ended up with labour induction for various reasons (often due to unsatisfactory fetal test results) in some trials. Seven trials explicitly reported outcomes according to the allocated group (Augensen 1987; Bergsjo 1989; Breart 1982; Gelisen 2005; NICHHD 1994; Roach 1997; Witter 1987). In four trials less than 10% of women were excluded postrandomization (Cole 1975; Egarter 1989; Gelisen 2005; Hannah 1992) and it seems safe to assume that the remaining women were analysed according to the allocated group. Six trials did not report any protocol violations or postrandomization exclusions (Chakravarti 2000; Herabutya 1992; James 2001; Martin 1989; Ocon 1997; Suikkari 1983). Loss to follow up seemed to be minimal in most trials. There were no losses to follow up in Dyson 1987 and Henry 1969.

RESULTS

Perinatal deaths (Graphs 01.01, 01.02, 01.03)

Fewer perinatal deaths occurred in the labour induction groups in all three gestational age groups although the differences did not reach statistical significance. The relative risk (RR) of perinatal death in the 41 week group was 0.25 with 95 % confidence interval (CI) between 0.05 to 1.18 (10 trials, 0/2835 versus 6/2808). When 41 and 42 completed weeks groups are analysed together (post-term group), the RR is 0.30 (95% CI 0.09 to 0.99; 12 trials, 5939 women).

For all gestational age groups if deaths due to congenital anomalies are excluded, there are no deaths in the labour induction group and nine deaths in the expectant management group. The perinatal deaths seem to be evenly distributed between in utero and early newborn deaths. Of the nine perinatal deaths observed in the expectant management policy groups, four occurred as stillbirths and five occurred in the first seven days of life.

The cervical state subgroups did not show statistically or clinically significant differences.

Birth asphyxia (Graph 01.05)

Birth asphyxia was reported in only one study (Chanrachkul 2003) and there was a single case in the labour induction group (1/124 versus 0/125). There were more babies requiring immediate care ("réanimation") in the labour induction group in the Breart trial (29/481 versus 7/235, RR 2.02; 95% CI 0.90 to 4.55) (Breart 1982).

Other perinatal outcomes (Graphs 01.06, 01.07, 01.08, 01.09, 01.10)

Meconium aspiration syndrome and Apgar score less than seven at five minutes were reported in the 41 week and 42 week groups. In the 41 week group, labour induction reduced the risk of meconium aspiration syndrome (RR: 0.29; 95% CI 0.12 to 0.68; four trials, 1325 women) significantly. In the 42 week group, the difference was not statistically significant although fewer babies in the labour induction group suffered from meconium aspiration syndrome (RR: 0.66; 95% CI 0.24 to 1.81). There does not seem to be a clinically significant reduction in newborn intensive care unit admissions in any gestational age group (graph 01.07).

Labour induction after 41 weeks was associated with fewer infants with birthweight greater than 4000 g in three (Gelisen 2005; Hannah 1992; NICHHD 1994) of the four trials that reported this outcome. The results were not totalled because of significant heterogeneity. Mean birthweight was similar in the labour induction and expectant management groups in the 41 week gestational age group. In the 42 week group, babies in the labour induction group had smaller mean birthweight (weighted mean difference -101.67; 95% CI -179.12 to -24.23; three trials, 509 women). This outcome was not prespecified in the protocol.

Caesarean section and assisted vaginal birth (Graphs 01.11, 01.12, 02.11, 02.12)

Eighteen trials, involving 7865 women, reported on caesarean section. There was no evidence of a statistically significant difference in the risk of caesarean section (RR 0.92; 95% CI 0.76 to 1.12; RR 0.97; 95% CI 0.72 to 1.31) for women induced at 41 and 42 completed weeks respectively. Women induced at 37 to 40 completed weeks more were more likely to have a caesarean section with expectant management than those in the labour induction group (RR 0.58; 95% CI 0.34 to 0.99).

Ten trials, involving 5493 women, reported on assisted vaginal delivery. There was no evidence of a statistically significant difference in the risk of assisted vaginal delivery (RR 1.05; 95% CI 0.94 to 1.17; RR 0.95; 95% CI 0.65 to 1.38) for women induced at 41 and 42 completed weeks respectively. Women induced at 37 to 40 completed weeks more were less likely to have an assisted vaginal delivery with expectant management than those in the labour induction group (RR 1.71; 95% CI 1.23 to 2.39).

Obstetric outcomes were analysed in the second comparison which presents the results by cervical status. No differences between a policy of labour induction and expectant management were identified for caesarean section or assisted vaginal birth. We did not produce a summary estimate because of significant heterogeneity for these outcomes. The interpretation of the cervical state subgroup analyses was limited by the small number of studies reporting which women had favourable (two trials) or unfavourable cervices (six trials).

Maternal anxiety or satisfaction with care were not reported in any of the trials.

DISCUSSION

A policy of routine labour induction at 41 completed weeks or later compared to waiting for the onset of spontaneous labour for at least one week is associated with fewer perinatal deaths and meconium aspiration syndrome. The absolute number of perinatal deaths is quite small (0.03% 1/3285 versus 0.33% 11/3238) and there was one stillbirth reported among the seven trials that included 1817 women since 1992. If perinatal deaths due to congenital abnormalities are excluded the number of deaths in the labour induction and expectant management groups are zero versus nine (as opposed to one versus nine). It is probably more appropriate to keep the 37 to 40 week group separate. A policy of routine labour induction at 37 to 40 completed weeks for women with uncomplicated pregnancies would not be justifiable given the risks of respiratory distress syndrome and related adverse neonatal effects related to prematurity. In the 37 to 40 week group there were two deaths in the expectant (later induction) group and none in the induction group in the two trials that reported deaths.

The review confirms the overall findings of the previous version of the review (Crowley 2004) but this version was rewritten with a new protocol and differs from the previous in two respects (in addition to six recent trials). We excluded eight trials by applying more strict methodological criteria. The second difference is the use of relative risk (RR) instead of Peto odds ratio (Peto OR). We used RR as per the current recommendations within The Cochrane Collaboration and the Cochrane Pregnancy and Childbirth Group. However, Peto OR performs well when the data are sparse (PCG 2005). If Peto OR is used to analyse perinatal deaths, the point estimate is 0.20 (95% confidence interval (CI) 0.06 to 0.69) for the gestational age 41 weeks or more.

Fetal monitoring in the expectant arms mostly included twice weekly nonstress tests and amniotic fluid index measurements and it can perhaps be speculated that in the urban, relatively well-equipped settings and where women can access these services expectant management could be safely practised. The number needed to treat to prevent one perinatal death is not very helpful as it varies between 100 to infinity.

The data regarding caesarean section are more difficult to interpret because of heterogeneity among trials. Several trials reported higher caesarean section for fetal distress in the expectant management (Dyson 1987; Hannah 1992) while others did not (Chan-

rachkul 2003; NICHHD 1994). Without blind outcome assessments the caesarean section rates may be biased. Prostaglandins were not routinely used in the expectant management group of the Hannah trial and this may have contributed to reduced caesarean section in this trial (Keirse 1993). The caesarean section rates are likely to be confounded by cervical ripeness, agents used to ripen the cervix and induce labour, fetal monitoring during labour and threshold for fetal distress diagnosis. Even if the Hannah trial was removed from the meta-analysis, there did not seem to be a difference in caesarean section rates. Subgroup analysis by cervix status did not reveal any patterns and there was significant statistical and clinical heterogeneity in caesarean section rates among trials even within the same cervix status category. Two high-quality trials recruiting women with unfavourable cervix differed in the direction of effect. The Dyson 1987 trial had reduced caesarean section rates (RR 0.53; 95% CI 0.33 to 0.84, 302 women) while in the NICHHD 1994 trial, there were more caesarean sections in the labour induction group (RR 1.23; 95% CI 0.81 to 1.86). It is reassuring that caesarean section and assisted vaginal delivery rates are not increased with the evidence from more than 5000 women who participated in the trials. There were no adverse obstetric outcomes associated with labour induction policies.

The Canadian multicentre trial (Hannah 1992) and the earlier version of this review have influenced obstetric policies internationally since the mid 1990s. Hospital statistics in Canada indicate a gradual reduction in births at 42+ weeks and an increase in 41+ weeks between 1980 and 1995 (Sue-A-Quan 1999). Similarly, in New South Wales, Australia, between 1990 and 1996 the number of women delivering at 42 completed weeks decreased while 41 completed weeks increased (Roberts 1999). Current obstetric guidelines from Canada (BC Reproductive 2005) and the UK (RCOG/NICE 2001) recommend offering induction of labour after 41 completed weeks. An American College of Obstetricians and Gynecologists news release in May 2003 claimed that labour induction at 41 weeks lowers caesarean section rates (ACOG 2003; Sanchez-Ramos 2003). We do not think that the effect on caesarean section is clear but at least we can say that it is not increased. While a policy of labour induction at 41 completed weeks has been adopted in several countries, some have questioned the validity of the evidence leading to those recommendations (Keirse 1993; Menticoglou 2002). The criticisms mainly relate to different cervical ripening protocols used in the two arms of the Canadian trial questioning the caesarean section data and protocol violations with some women in the expectant groups being induced and some women in the induction groups having spontaneous labour onset.

We think that the results are valid and indicate beneficial outcomes with a policy of labour induction at 41 completed weeks and acknowledge that the absolute risk of the primary outcome is small. It would be prudent to discuss the pros and cons with women at 41 weeks or more who are at low risk of pregnancy complications so that an informed decision is made.

AUTHORS' CONCLUSIONS

Implications for practice

Labour induction at 41 completed weeks should be offered to low-risk women. The message from this review is that such a policy is associated with fewer deaths although the absolute risk is small. There does not seem to be any increased risk of assisted vaginal or abdominal delivery. If the woman chooses to wait for spontaneous labour onset it would be prudent to have regular fetal monitoring as longitudinal epidemiological studies suggest increased risk of perinatal death by increasing gestational age.

Implications for research

The optimal timing of offering induction of labour to women at or beyond term warrants further investigation. It may be useful to conduct research to obtain women's views about either approach.

POTENTIAL CONFLICT OF INTEREST

None known.

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As part of the pre-publication editorial process, this review has been commented on by three peers (an editor and two referees who are external to the editorial team), one or more members of the Pregnancy and Childbirth Group's international panel of consumers and the Group's Statistical Adviser.

SOURCES OF SUPPORT

External sources of support

- No sources of support supplied

Internal sources of support

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- Discipline of Obstetrics and Gynaecology, The University of Adelaide, Adelaide AUSTRALIA

REFERENCES

References to studies included in this review

Augensen 1987 *{published data only}*

* Augensen K, Bergsjo P, Eikeland T, Ashvik K, Carlsen J. Randomized comparison of early versus late induction of labour in post-term pregnancy. *BMJ* 1987;**294**:1192–5.

Augensen K, Bergsjo P, Eikeland T, Askvik K, Carlsen J. Induction of labour in prolonged pregnancy. A prospective randomized study. Proceedings of 10th European Congress of Perinatal Medicine; 1986 Aug 12-16; Leipzig, Germany. 1986.

Bergsjo 1989 *{published data only}*

Bergsjo P, Huang GD, Yu SQ, Gao Z, Bakketeig LS. Comparison of induced vs non-induced labor in post-term pregnancy. *Acta Obstetricia et Gynecologica Scandinavica* 1989;**68**:683–7.

Breart 1982 *{published data only}*

Breart G, Goujard J, Maillard F, Chavigny C, Rumeau-Rouquette C, Sureau C. Comparison of two obstetrical policies with regard to artificial induction of labour at term. A randomised trial. *Journal de Gynecologie, Obstetrique et Biologie de la Reproduction* 1982;**11**:107–12.

Chakravarti 2000 *{published data only}*

Chakravarti S, Goenka B. Conservative policy of induction of labor in uncomplicated postdated pregnancies. XVI FIGO World Congress of Obstetrics & Gynecology; 2000 Sept 3-8; Washington DC, USA (Book 3). 2000:62.

Chanrachkul 2003 *{published data only}*

Chanrachkul B, Herabutya Y. Postterm with favorable cervix: is induction necessary?. *European Journal of Obstetrics & Gynecology and Reproductive Biology* 2003;**106**:154–7.

Cole 1975 *{published data only}*

* Cole RA, Howie PW, MacNaughton MC. Elective induction of labour. A randomised prospective trial. *Lancet* 1975;**1**:767–70.

Engleman SR, Hilland MA, Howie PW, McIlwaine GM, McNay MB. An analysis of the economic implications of elective induction of labour at term. *Community Medicine* 1979;**1**:191–8.

Dyson 1987 *{published data only}*

* Dyson D, Miller PD, Armstrong MA. Management of prolonged pregnancy: induction of labour versus antepartum testing. *American Journal of Obstetrics and Gynecology* 1987;**156**:928–34.

Dyson DC, Miller P, Miller M. Management of prolonged pregnancy - induction versus antepartum fetal testing. Proceedings of 6th Annual Meeting of the Society of Perinatal Obstetricians; 1986 Jan 30-Feb 1; San Antonio, Texas, USA. 1986:205.

Egarter 1989 *{published data only}*

* Egarter CH, Kofler E, Fitz R, Husslein P. Is induction of labour indicated in prolonged pregnancy? Results of a prospective randomised trial. *Gynecologic and Obstetric Investigation* 1989;**27**:6–9.

Husslein P, Egarter C, Sevelda P, Genger H, Salzer H, Kofler E. Induction of labour with Prostaglandin E2 vaginal tablets - a revival of elective induction? Results of a prospective randomised trial [Geburtseinleitung mit 3mg Prostaglandin E2-vaginaltabletten: eine renaissance der programmierten geburt?]. *Geburtshilfe und Frauenheilkunde* 1986;**46**:83–7.

Gelisen 2005 *{published data only}*

Gelisen O, Caliskan E, Dilbaz S, Ozdas E, Dilbaz B, Ozdas E, et al. Induction of labor with three different techniques at 41 weeks of gestation or spontaneous follow-up until 42 weeks in women with definitely unfavorable cervical scores. *European Journal of Obstetrics & Gynecology and Reproductive Biology* 2005;**120**(2):164–9.

Hannah 1992 *{published data only}*

Farquharson D, Hannah ME, Hannah WJ, Hewson SA, Willan A, Young D, et al. The Canadian multicentre postterm pregnancy trial (CMPPT): outcome in the induction group based on method of induction. Proceedings of 49th Annual Clinical Meeting of the Society of Obstetricians and Gynaecologists of Canada; 1993 June 22-26; Ottawa, Ontario, Canada. 1993:15.

Goeree R, Hannah M, Hewson S, for the Canadian Postterm Pregnancy Trial Group. Cost-effectiveness of induction of labour versus serial antenatal monitoring in the Canadian multicentre postterm pregnancy trial. *Canadian Medical Association Journal* 1995; **152**:1445–50.

* Hannah ME, Hannah WJ, Hellman J, Hewson S, Milner R, Willan A. Induction of labour as compared with serial antenatal monitoring in post-term pregnancy. A randomized controlled trial. *New England Journal of Medicine* 1992;**326**:1587–92.

Henry 1969 *{published data only}*

Henry GR. A controlled trial of surgical induction of labour and amnioscopy in the management of prolonged pregnancy. *Journal of Obstetrics and Gynaecology of the British Commonwealth* 1969;**76**: 795–8.

Herabutya 1992 *{published data only}*

Herabutya Y, Prasertsawat PO, Tongyai T, Isarangura N, Ayudthya N. Prolonged pregnancy: the management dilemma. *International Journal of Gynecology & Obstetrics* 1992;**37**:253–8.

James 2001 *{published data only}*

James C, George SS, Gaunekar N, Seshadri L. Management of prolonged pregnancy: a randomized trial of induction of labour and antepartum foetal monitoring. *National Medical Journal of India* 2001; **14**:270–3.

Martin 1989 *{published data only}*

Martin JN, Sessums JK, Howard P, Martin RW, Morrison JC. Alternative approaches to the managment of gravidas with prolonged post-term postdate pregnancies. *Journal of the Mississippi State Association* 1989;**30**:105–11.

NICHHD 1994 *{published data only}*

Medearis AL. Postterm pregnancy: active labor induction (PGE2 gel) not associated with improved outcomes compared to expectant management. A preliminary report. Proceedings of 10th Annual Meeting of Society of Perinatal Obstetricians; 1990 January 23-27; Houston, Texas, USA. 1990:17.

* National Institute of Child Health and Human Development Network of Maternal-Fetal Medicine Units. A clinical trial of induction of labor versus expectant managment in postterm pregnancy. *American Journal of Obstetrics and Gynecology* 1994;**170**:716–23.

Ocon 1997 *{published data only}*

Ocon L, Hurtado R, Coteron JJ, Zubiria A, Ramirez O, Garcia JA. Prolonged pregnancy: procedure guidelines [Gestacion prolongada: pautas de actuacion]. *Progresos de Obstetricia y Ginecologia* 1997;**40**: 101–6.

Roach 1997 *{published data only}*

Roach VJ, Rogers MS. Pregnancy outcome beyond 41 weeks gestation. *International Journal of Gynecology & Obstetrics* 1997;**59**:19–24.

Suikkari 1983 *{published data only}*

Suikkari AM, Jalkanen M, Heiskala H, Koskela O. Prolonged pregnancy: induction or observation. *Acta Obstetricia et Gynecologica Scandinavica Supplement* 1983;**116**:58.

Witter 1987 *{published data only}*

Witter FR, Weitz CM. A randomised trial of induction at 42 weeks of gestation vs expectant management for postdates pregnancies. *American Journal of Perinatology* 1987;**4**:206–11.

References to studies excluded from this review

Alcalay 1996

Alcalay M, Hourvitz A, Reichman B, Luski A, Quint J, Barkai G, et al. Prelabour rupture of membranes at term: early induction of labour vs expectant management. *European Journal of Obstetrics & Gynecology and Reproductive Biology* 1996;**70**:129–33.

Amano 1999

Amano K, Saito K, Shoda T, Tani A, Yoshihara H, Nishijima M. Elective induction of labour at 39 weeks of gestation: a prospective randomized trial. *Journal of Obstetrics and Gynaecology Research* 1999; **25**:33–7.

Ascher-Walsh 2000

Ascher-Walsh C, Burke B, Baxi L. Outpatient management of prolonged pregnancy with misoprostol (MP): a randomized, double-blind placebo controlled study, prelim. data. *American Journal of Obstetrics and Gynecology* 2000;**182**(1 Pt 2):S20.

Bell 1993

Bell RJ, Permezel M, MacLennan, Hughes C, Healy D, Brennecke S. A randomized, double-blind controlled trial of the safety of vaginal recombinant human relaxin for cervical ripening. *Obstetrics & Gynecology* 1993;**82**:328–33.

Berghella 1994

Berghella V, Mickens R. Stripping of membranes as a safe method to reduce prolonged pregnancies. XIV World Congress of Gynecology and Obstetrics (FIGO);1994 Sept 26-30; Montreal, Canada. 1994: PO34.16.

* Berghella V, Rogers RA, Lescale K. Stripping of membranes as a safe method to reduce prolonged pregnancies. *Obstetrics & Gynecology* 1996;**87**:927–31.

Boulvain 1998

Boulvain M, Fraser WD, Marcoux S, Fontaine J-Y, Bazin S, Pinault J-J, et al. Does sweeping of the membranes reduce the need for formal induction of labour? A randomised controlled trial. *British Journal of Obstetrics and Gynaecology* 1998;**105**:34–40.

Buttino 1990

Buttino L, Garite T. Intracervical prostaglandin in postdate pregnancy. *Journal of Reproductive Medicine* 1990;**35**(2):155–8.

Cardozo 1986

* Cardozo L, Fysh J, Pearce JM. Prolonged pregnancy: the management debate. *BMJ* 1986;**293**:1059–63.

Cardozo L, Pearce JM, Fysh J. Conservative management of postmaturity. *Journal of Obstetrics and Gynaecology of the British Commonwealth* 1983;**4**:69–72.

Pearce JM, Cardozo L. Prolonged pregnancy: results of supplemental analysis. *BMJ* 1988;**297**:715–7.

Cohn 1992

Cohn M, Rogers M. Post maturity; a randomised study in a Hong Kong population. Proceedings of the 26th British Congress of Obstetrics and Gynaecology; 1992 July 7-10; Manchester, UK. 1992: 306.

Conway 2000

Conway DL, Groth S, Adkins WB, Langer O. Management of isolated oligohydramnios in the term pregnancy: a randomized clinical trial. *American Journal of Obstetrics and Gynecology* 2000;**182**:S21.

Damania 1992

Damania KK, Natu U, Mhatre PN, Mataliya M, Mehta AC, Daftary SN. Evaluation of two methods employed for cervical ripening. *Journal of Postgraduate Medicine* 1992;**38**(2):58–9.

Dare 2002

Dare FO, Oboro VO. The role of membrane stripping in prevention of post-term pregnancy: a randomised clinical trial in Ile-Ife, Nigeria. *Journal of Obstetrics and Gynaecology* 2002;**22**(3):283–6.

de Aquino 2003

de Aquino MMA, Cecatti JG. Misoprostol versus oxytocin for labour induction in term and post-term pregnancy: randomized controlled trial. *Sao Paulo Medical Journal* 2003;**121**:102–6.

Doany 1997

Doany W. Outpatient management of postdate pregnancy with intravaginal prostaglandin E2 and membrane stripping. *American Journal of Obstetrics and Gynecology* 1997;**174**(1 Pt 2):351.

* Doany W, McCarty J. Outpatient management of the uncomplicated postdate pregnancy with intravaginal prostaglandin E2 gel and membrane stripping. *Journal of Maternal-Fetal Medicine* 1997;**6**:71–8.

Dunn 1989

Dunn PA, Rogers D, Halford K. Transcutaneous electrical nerve stimulation at acupuncture points in the induction of uterine contractions. *Obstetrics & Gynecology* 1989;**73**:286–90.

El-Torkey 1992

El-Torkey M, Grant JM. Sweeping of the membranes is an effective method of induction of labour in prolonged pregnancy: a report of a randomized trial. *British Journal of Obstetrics and Gynaecology* 1992; **99**:455–8.

Elliott 1984

Elliott JP, Flaherty JF. The use of breast stimulation to prevent postdate pregnancy. *American Journal of Obstetrics and Gynecology* 1984; **149**:628–32.

Evans 1983

Evans MI, Dougan MB, Moawad AH, Evans WJ, Bryant-Greenwood GD, Greenwood FC. Ripening of the human cervix with porcine

ovarian relaxin. *American Journal of Obstetrics and Gynecology* 1983; **147**:410–4.

Garry 2000

Garry D, Figueroa R, Guillaume J, Cucco V. Use of castor oil in pregnancies at term. *Alternative Therapies* 2000;**6**(1):77–9.

Giacalone 1998

Giacalone PL, Targosz V, Laffargue F, Boog G, Faure JM. Cervical ripening with mifepristone before labor induction. *Obstetrics & Gynecology* 1998;**92**(4 Pt 1):487–92.

Hage 1993

Hage P, Shawi J, Zarou D, Fleisher J. Double blind randomized trial to evaluate the role of outpatient use of PGE2 in cervical ripening. *American Journal of Obstetrics and Gynecology* 1993;**168**:430.

Heden 1991

Heden L, Ingemarsson I, Ahlstrom H, Solum T. Induction of labor versus conservative management in prolonged pregnancy: controlled study. *International Journal of Feto-Maternal Medicine* 1991; **4**(4):148–52.

Ingemarsson 1987

Ingemarsson I, Heden L, Montan S, Sjoberg NO. Effect of intracervical prostaglandin gel in postterm women. Personal communication 1987.

Iqbal 2004

Iqbal S. Management of prolonged pregnancy. *JCPSP, Journal of the College of Physicians & Surgeons, Pakistan* 2004;**14**(5):274–7.

Jenssen 1977

Jenssen H, Wright PB. The effect of dexamethasone therapy in prolonged pregnancy. *Acta Obstetricia et Gynecologica Scandinavica* 1977; **56**:467–73.

Kadar 1990

Kadar N, Tapp A, Wong A. The influence of nipple stimulation at term on the duration of pregnancy. *Journal of Perinatology* 1990;**10** (2):164–6.

Katz 1983

Katz Z, Yemini M, Lancet M, Mogilner BM, Ben-Hur H, Caspi B. Non-aggressive management of post-date pregnancies. *European Journal of Obstetrics & Gynecology and Reproductive Biology* 1983;**15**: 71–9.

Kipikasa 2005

Kipikasa JH, Adair CD, Williamson J, Breen JM, Medford LK, Sanchez-Ramos L. Use of misoprostol on an outpatient basis for postdate pregnancy. *International Journal of Gynecology & Obstetrics* 2005;**88**:108–11.

Klopper 1969

Klopper AI, Dennis KJ, Farr V. Effect of intra-amniotic oestriol sulphate on uterine contractions. *BMJ* 1969;**786**(2):786–9.

Knox 1979

Knox GE, Huddleston JF, Flowers CE, Eubanks A, Sutliff G. Management of prolonged pregnancy: results of a prospective randomized trial. *American Journal of Obstetrics and Gynecology* 1979;**134**: 376–84.

Lee 1997

Lee HY. A randomised double-blind study of vaginal misoprostol vs dinoprostone for cervical ripening and labour induction in prolonged pregnancy. *Singapore Medical Journal* 1997;**38**(7):292–4.

Lemancewicz 1999

Lemancewicz A, Urban R, Skotnicki MZ, Karpiuk A, Urban J. Uterine and fetal Doppler flow changes after misoprostol and oxytocin therapy for induction of labor in post-term pregnancies. *International Journal of Gynecology & Obstetrics* 1999;**67**:139–45.

Lien 1998

Lien JM, Morgan MA, Garite TJ, Kennedy KA, Sassoon DA, Freeman RK. Antepartum cervical ripening: applying prostaglandin E2 gel in conjunction with scheduled nonstress tests in postdate pregnancies. *American Journal of Obstetrics and Gynecology* 1998;**179**:453–8.

Lyons 2001

Lyons C, Rumney P, Huang W, Morrison E, Thomas S, Nageotte M, et al. Outpatient cervical ripening with oral misoprostol postterm: induction rates decreased. *American Journal of Obstetrics and Gynecology* 2001;**184**(1):S116.

Magann 1998

Magann EF, Chauhan SP, Nevils BG, McNamara MF, Kinsella MJ, Morrison JC. Management of pregnancies beyond forty-one weeks' gestation with an unfavorable cervix. *American Journal of Obstetrics and Gynecology* 1998;**178**:1279–87.

Magann 1999

Magann EF, Chauhan SP, McNamara MF, Bass JD, Estes CM, Morrison JC. Membrane sweeping versus dinoprostone vaginal insert in the management of pregnancies beyond 41 weeks with an unfavorable cervix. *Journal of Perinatology* 1999;**19**(2):88–91.

Mancuso 1998

Mancuso S, Ferrazzani S, De Carolis S, Carducci B, De Santis L, Caruso A. Term and postterm low-risk pregnancies: management schemes for the reduction of high rates of cesarean section. *Minerva Ginecologica* 1998;**48**:95–8.

Martin 1978

Martin DH, Thompson W, Pinkerton JHM, Watson JD. A randomised controlled trial of selective planned delivery. *British Journal of Obstetrics and Gynaecology* 1978;**85**:109–13.

Meydanli 2003

Meydanli MM, Caliskan E, Burak F, Narin MA, Atmaca R. Labor induction post-term with 25 micrograms vs. 50 micrograms of intravaginal misoprostol. *International Journal of Gynecology & Obstetrics* 2003;**81**:249–55.

Misra 1994

Misra M, Vavre S. Labour induction with intracervical prostaglandin E2 gel and intravenous oxytocin in women with a very unfavourable cervix. *Australia and New Zealand Journal of Obstetrics and Gynaecology* 1994;**34**(5):511–5.

Müller 1995

Müller T, Rempen A. Comparison of 0,5 mg PG-E2-Intracervical-gel versus 3 mg PG-E2-vaginal tablet for the induction of labour [Geburtseinleitung mit Prostaglandinen: 0,5 mg PG-E2-Intrazervikalgel versus 3 mg PG-E2-vaginaltablette]. *Zeitschrift fur Geburtshilfe und Neonatologie* 1995;**199**:30–4.

Newman 1997

Newman M, Newman R. Multiple-dose PGE2 cervical ripening on an outpatient basis: safety and efficacy. *American Journal of Obstetrics and Gynecology* 1997;**176**:S112.

Ohel 1996

Ohel G, Rahav D, Rothbart H, Ruach M. Randomised trial of outpatient induction of labor with vaginal PGE2 at 40-41 weeks of gestation versus expectant management. *Archives of Gynecology and Obstetrics* 1996;**258**:109–12.

Papageorgiou 1992

Papageorgiou I, Tsionou C, Minaretzis D, Michalas S, Aravantinos D. Labor characteristics of uncomplicated prolonged pregnancies after induction with intracervical prostaglandin E2 gel versus intravenous oxytocin. *Gynecologic and Obstetric Investigation* 1992;**34**:92–6.

Paul 1988

Paul R, Romero R. Clinical trial of induction versus expectant management in postterm pregnancy. Personal communication 1988.

Rayburn 1988

Rayburn W, Gosen R, Ramadei C, Woods R, Scott J. Outpatient cervical ripening with prostaglandin E2 gel in uncomplicated postdate pregnancies. *American Journal of Obstetrics and Gynecology* 1988; **158**:1417–23.

Rayburn 1999

Rayburn WF, Gittens LN, Lucas MJ, Gall SA, Martin ME. Weekly administration of prostaglandin E2 gel compared with expectant management in women with previous cesareans. *Obstetrics & Gynecology* 1999;**94**:250–4.

Roberts 1986

Roberts WE, North DH, Speed JE, Martin JN, Palmer SM, Morrison JC. Comparative study of prostaglandin, laminaria, and minidose oxytocin for ripening of the unfavorable cervix prior to induction of labor. *Journal of Perinatology* 1986;**6**:16–9.

Sande 1983

Sande HA, Tuveng J, Fonstelien T. A prospective randomized study of induction of labor. *International Journal of Gynecology & Obstetrics* 1983;**21**:333–6.

Satin 1991

* Satin AJ, Hankins GDV, Yeomans ER. A prospective study of two dosing regimens of oxytocin for the induction of labor in patients with unfavorable cervices. *American Journal of Obstetrics and Gynecology* 1991;**165**:980–4.

Satin AJ, Hankins GDV, Yeomans ER. A randomized study of two dosing regimens of oxytocin for the induction of patients with an unfavorable cervix. *American Journal of Obstetrics and Gynecology* 1991; **164**:307.

Sawai 1991

Sawai SK, Williams MC, O'Brien WF, Angel JL, Mastrogiannis DS, Johnson L. Sequential outpatient application of intravaginal prostaglandin E2 gel in the management of postdates pregnancies. *Obstetrics & Gynecology* 1991;**78**:19–23.

Sawai 1994

* Sawai SK, O'Brien WF, Mastrogiannis DS, Krammer J, Mastry MG, Porter GW. Patient-administered outpatient intravaginal prostaglandin E2 suppositories in post-date pregnancies: a double-blind, randomized, placebo-controlled study. *Obstetrics & Gynecology* 1994;**84**(5):807–10.

Sawai SK, O'Brien WF, Mastrogiannis MS, Mastry MG, Porter GW, Johnson L. Outpatient prostaglandin E2 suppositories in postdates pregnancies. *American Journal of Obstetrics and Gynecology* 1992;**166** (1 Pt 2):400.

Stenlund 1999

Stenlund PM, Bygdeman M, Ekman G. Induction of labor with mifepristone (RU 486). A randomized double-blind study in postterm pregnant women with unripe cervices. *Acta Obstetricia et Gynecologica Scandinavica Supplement* 1994;**73**(161):FP50.

* Stenlund PM, Ekman G, Aedo AR, Bygdeman M. Induction of labor with mifepristone: a randomized, double-blind study versus placebo. *Acta Obstetrica et Gynecologica Scandinavica* 1999;**78**:793–8.

Su 1996

Su H, Li E, Weng L. Clinical observation on mifepristone for induction of term labor. *Chinese Journal of Obstetrics & Gynecology* 1996; **31**:676–80.

Surbek 1997

Surbek DV, Boesiger H, Hoesli L, Pavu N, Holzgreve W. Cervical priming and labor induction with intravaginal misoprostol versus PGE2: a double-blind randomized trial. *American Journal of Obstetrics and Gynecology* 1997;**176**(1 Pt 2):S112.

Suzuki 1999

Suzuki S, Otsubo Y, Sawa R, Yoneyama Y, Araki T. Clinical trial of induction of labor versus expectant management in twin pregnancy. *Gynecologic and Obstetric Investigation* 1999;**49**:24–7.

Tylleskar 1979

Leijon I, Finnstrom O, Hedenskog S, Ryden G, Tylleskar J. Spontaneous labor and elective induction - a prospective randomized study. II Bilirubin levels in the neonatal period. *Acta Obstetricia et Gynecologica Scandinavica* 1980;**59**:103–6.

Leijon I, Finnstrom O, Hedenskog S, Ryden G, Tylleskar J. Spontaneous labour and elective induction - a prospective randomised study. Behavioural assessment and neurological examination in the newborn period. *Acta Paediatrica Scandinavica* 1979;**68**:553–60.

Tylleskar J, Finnstrom O, Hedenskog S, Leijon I, Ryden G. Spontaneous delivery-elective induction for convenience, a comparative study. Proceedings of 6th European Congress of Perinatal Medicine; 1978 Aug 29-Sept 1; Vienna, Austria. 1978:345.

* Tylleskar J, Finnstrom O, Leijon I, Hedenskog S, Ryden G. Spontaneous labor and elective induction - a prospective randomized study. Effects on mother and fetus. *Acta Obstetricia et Gynecologica Scandinavica* 1979;**58**:513–8.

Williams 1990

Williams MG, O'Brien WF, Sawai SK, Knuppel RA. Outpatient cervical ripening in the postdates pregnancy. Proceedings of 10th Annual Meeting of Society of Perinatal Obstetricians; 1990 January 23-27; Houston, Texas, USA. 1990:533.

Wing 2000

Wing DA, Fassett MJ, Mishell DR. Mifepristone for preinduction cervical ripening beyond 41 weeks' gestation: a randomized controlled trial. *Obstetrics & Gynecology* 2000;**96**(4):543–8.

Wong 2002

Wong SF, Hui SK, Choi H, Ho LC. Does sweeping of membranes beyond 40 weeks reduce the need for formal induction of labour?.

BJOG: an international journal of obstetrics and gynaecology 2002; **109**:632–6.

Ziaei 2003

Ziaei S, Rosebehani N, Kazeminejad A, Zafarghandi S. The effects of intramuscular administration of corticosteroids on the induction of parturition. *Journal of Perinatal Medicine* 2003;**31**:134–9.

References to studies awaiting assessment

Nielsen 2005

Nielsen PE, Howard BC, Hill CC, Larson PL, Holland RH, Smith PN. Comparison of elective induction of labor with favorable Bishop scores versus expectant management: a randomized clinical trial. *Journal of Maternal-Fetal & Neonatal Medicine* 2005;**18**(1):59–64.

Sahraoui 2005

Sahraoui W, Hajji S, Bibi M, Nouira M, Essaidi H, Khair H. Management of pregnancies beyond forty-one week's gestation with an unfavorable cervix. *Journal de Gynecologie, Obstetrique et Biologie de la Reproduction* 2005;**34**(5):454–62.

References to ongoing studies

Norway 2006

Heimstad R. Misoprostol versus expectant management beyond 40 weeks gestation. Personal communication 2006.

Additional references

ACOG 2003

American College of Obstetricians and Gynecologists. Labor induction at 41 weeks lowers cesarean rate; ACOG News Release 2003. www.acog.org/from_home/publications/press_releases/nr05-31-03-4.cfm (accessed 7 January 2006).

Alfirevic 2001

Alfirevic Z. Oral misoprostol for induction of labour. *Cochrane Database of Systematic Reviews* 2001, Issue 2. Art. No.: CD001338. DOI:10.1002/14651858.CD001338.pub2.

BC Reproductive 2005

British Columbia Reproductive Care Program. Postterm pregnancy: obstetric guideline 7. www.rcp.gov.bc.ca/guidelines/Obstetrics/Postterm (accessed 17 January 2006).

Dare 2006

Dare MR, Middleton P, Crowther CA. Planned early birth versus expectant management (waiting) for prelabour rupture of membranes at term (37 weeks or more). *Cochrane Database of Systematic Reviews* 2006, Issue 1. Art. No.: CD005302. DOI: 10.1002/14651858.CD005302.pub2.

Higgins 2005

Higgins JPT, Green S, editors. Cochrane Handbook for Systematic Reviews of Interventions 4.2.5 [updated May 2005]. In: The Cochrane Library, Issue 3, 2005. Chichester, UK: John Wiley & Sons, Ltd.

Higgins 2005a

Deeks JJ, Higgins, JPT, Altman DG, editors. Analysing and presenting results. In: Higgins JPT, Green S, editors. Cochrane Handbook for Systematic Reviews of Interventions 4.2.5 [updated May 2005]; Section 8. In: The Cochrane Library, Issue 3, 2005. Chichester, UK: John Wiley & Sons, Ltd.

Hilder 1998

Hilder L, Costeloe K, Thilaganathan B. Prolonged pregnancy: evaluating gestation-specific risks of fetal and infant mortality. *British Journal of Obstetrics and Gynaecology* 1998;**105**:169–73.

Hofmeyr 2003

Hofmeyr GJ, Gülmezoglu AM. Vaginal misoprostol for cervical ripening and induction of labour. *Cochrane Database of Systematic Reviews* 2003, Issue 1. Art. No.: CD000941. DOI: 10.1002/14651858.CD000941.

Keirse 1993

Keirse MJNC. Postterm pregnancy: new lessons from an unresolved debate. *Birth* 1993;**20**:102–5.

Menticoglou 2002

Menticoglou SM, Hall PF. Routine induction of labour at 41 weeks gestation: nonsensus consensus. *BJOG: an international journal of obstetrics and gynaecology* 2002;**109**:485–91.

Neilson 1998

Neilson JP. Ultrasound for fetal assessment in early pregnancy. *Cochrane Database of Systematic Reviews* 1998, Issue 4. Art. No.: CD000182. DOI:10.1002/14651858.CD000182.

Olesen 2003

Olesen AW, Westergaard JG, Olsen J. Perinatal and maternal complications related to postterm delivery: a national register-based study, 1978-1993. *American Journal of Obstetrics and Gynecology* 2003;**189**: 222–7.

PCG 2005

The Editorial Team. Pregnancy and Childbirth Group. About The Cochrane Collaboration (Cochrane Review Groups (CRGs)) 2005, Issue 1.

RCOG/NICE 2001

Royal College of Obstetricians and Gynaecologists. *Induction of labour*. London, UK: RCOG/NICE, 2001.

RevMan 2003

The Cochrane Collaboration. Review Manager (RevMan). 4.2 for Windows. Oxford, England: The Cochrane Collaboration, 2003.

Roberts 1999

Roberts CL, Taylor L, Henderson-Smart D. Trends in births at and beyond term: evidence of a change?. *British Journal of Obstetrics and Gynaecology* 1999;**106**:937–42.

Sanchez-Ramos 2003

Sanchez-Ramos L, Olivier F, Delke I, Kaunitz AM. Labor induction versus expectant management for postterm pregnancies: a systematic review with meta-analysis. *Obstetrics & Gynecology* 2003;**101**:1312–8.

Sue-A-Quan 1999

Sue-A-Quan AK, Hannah ME, Cohen MM, Foster GA, Liston RM. Effect of labour induction on rates of stillbirth and cesarean section in post-term pregnancies. *Canadian Medical Association Journal* 1999; **160**:1145–49.

References to other published versions of this review

Crowley 2004

Crowley P. Interventions for preventing or improving the outcome of delivery at or beyond term. *Cochrane Database of Sys-*

tematic Reviews 1997, Issue 1. Art. No.: CD000170. DOI: 10.1002/14651858.CD000170.pub2.

*Indicates the major publication for the study

TABLES

Characteristics of included studies

Study	**Augensen 1987**
Methods	Random-number list. List concealed from the physicians.
Participants	409 healthy women with singleton pregnancy and certain dates in Bergen, Norway. Gestational age: 41+ weeks. Cervix ripeness: not required (about 35% in each group had unripe cervix).
Interventions	Intervention: immediate induction with oxytocin (5 IU increased in a stepwise manner). Control: NST every 3-4 days, induction of labour (IOL) after 7 days.
Outcomes	Baby: perinatal mortality, neonatal jaundice, meconium-stained amniotic fluid. Mother: caesarean section, assisted vaginal birth. Blind outcome assessment: not mentioned.
Notes	4/214 in the IOL group went into labour before IOL but data are available for ITT analysis.
Allocation concealment	B – Unclear

Study	**Bergsjo 1989**
Methods	Random-number list.
Participants	188 women in Wuhan, Hubei province, China. Healthy women with no significant risk factors. Gestational age: 42 completed weeks. Cervix ripeness: not mentioned.
Interventions	Intervention: stripping of membranes followed by oxytocin infusion and AROM if cervix sufficiently dilated. Control: no intervention for one week, IOL at 43 weeks.
Outcomes	Mother: operative birth, duration of labour, breastfeeding. Blind outcome assessment: not mentioned.
Notes	8/94 in IOL group went into labour before IOL but were kept in the allocated group.
Allocation concealment	B – Unclear

Study	**Breart 1982**
Methods	Randomly allocated. Allocation using envelopes. 2:1 allocation.
Participants	716 women in Paris, France. Low risk, no indication or contra-indication for IOL. Gestational age: 37-39 weeks. Cervix ripeness: not mentioned.
Interventions	Intervention: oxytocin and AROM. Control: fetal heart rate checking and amnioscopy every 2-3 days.
Outcomes	Mother: duration of labour, mode of birth. Baby: mortality, morbidity (Apgar scores, resuscitation). Blind outcome assessment: not mentioned.

Characteristics of included studies (*Continued*)

Notes	ITT analysis reported. 173/481 and 202/235 in the intervention and control groups followed the trial protocol.
Allocation concealment	B – Unclear

Study	**Chakravarti 2000**
Methods	Randomly allocated, no further details.
Participants	231 women in Calcutta, India. Women with certain dates and at low risk for any complications were eligible. Gestational age: 41 completed weeks. Cervix ripeness: not mentioned.
Interventions	Intervention: IOL, no details of the method are available. Control: daily fetal movement counts, biophysical profile and ultrasound. IOL after one week.
Outcomes	Mother: mode of birth, outcome of labour. Blind outcome assessment: not mentioned.
Notes	Reported as conference abstract in 2000, no journal manuscript identified. 54/117 (46%) in the expectant management group had spontaneous labour within one week.
Allocation concealment	B – Unclear

Study	**Chanrachkul 2003**
Methods	Computer-generated numbers used. No mention of allocation concealment.
Participants	250 women in Bangkok, Thailand. Low-risk women with no obstetric or medical complication. Gestational age: 41 + weeks. Cervix ripeness: favourable (Bishop score 6 or more).
Interventions	Intervention: amniotomy + oxytocin (if uterine contractions inadequate after 2 hours). Control: spontaneous labour awaited unless 1) nonreactive NST or 2) amniotic fluid index < 5 cm or 3) medical or obstetric indication for birth or 4) reaching 44 completed weeks.
Outcomes	Mother: mode of birth and their indications, death. Baby: perinatal deaths. Blind outcome assessment: not mentioned.
Notes	One women (in IOL group) excluded after randomization because of misclassification (breech presentation). No loss to follow up.
Allocation concealment	B – Unclear

Study	**Cole 1975**
Methods	Randomly allocated, no further details available.
Participants	237 low-risk women in a university hospital in Glasgow, Scotland. Gestational age: 39-40 weeks. Cervical ripeness: not a criterion.
Interventions	Intervention: IOL with amniotomy + oxytocin. Control: no intervention until 41 weeks, thereafter IOL.
Outcomes	Baby: perinatal deaths. Blind outcome assessment: not mentioned.
Notes	No loss to follow up. 7/118 and 2/119 in the intervention and control groups excluded after randomization because of misclassification as low risk.
Allocation concealment	B – Unclear

Characteristics of included studies (*Continued*)

Study	**Dyson 1987**
Methods	Table of random numbers used. Allocation concealment achieved by consecutively-numbered, sealed envelopes but no mention of opaqueness.
Participants	302 low-risk women in a Kaiser Permanente Medical Care Hospital in California, USA. Gestational age: 41 completed weeks. Cervix ripeness: unfavourable cervix (Bishop score < 6).
Interventions	Intervention: prostaglandin E2 gel (initially 3 mg but later reduced to 0.5 mg). If no labour in 24 hours, repeat prostaglandin E2 and oxytocin if needed. Control: NST twice weekly, pelvic examination and amniotic fluid determination weekly between 41-42 weeks and twice weekly afterwards.
Outcomes	Baby: perinatal outcome. Blind outcome assessment: not mentioned.
Notes	No loss to follow up or postrandomization exclusions reported.
Allocation concealment	B – Unclear

Study	**Egarter 1989**
Methods	Randomly allocated, no further details. Conducted separate random allocation for primigravidae and multigravidae.
Participants	345 low-risk women in Vienna, Austria. Gestational age: 40 completed weeks. Cervix ripeness: favourable (Modified Bishop score > 4).
Interventions	Intervention: vaginal prostaglandin E2 (PGE2) (3 mg) tablets repeated 6 and 24 hours later if no active labour. Control: spontaneous labour awaited until 42 weeks. NST monitoring every 2-3 days.
Outcomes	Mother: time to birth, mode of birth. Baby: perinatal deaths. Blind outcome assessment: not mentioned.
Notes	No loss to follow up. Excluded 8/107 and 3/91 from the intervention and control groups respectively because of requests for the alternative option.
Allocation concealment	B – Unclear

Study	**Gelisen 2005**
Methods	Randomized trial. The method of random-number generation is not mentioned. Allocation concealment was by sealed, opaque envelopes but there is no mention of numbering and sequential opening of the envelopes.
Participants	600 low-risk women at a teaching hospital in Ankara, Turkey. Gestational age: 41 completed weeks. Cervix status: unfavourable - Bishop score < 5. Women were excluded if they were allergic to prostaglandins, had a previous caesarean section, noncephalic presentation, body mass index 30 or more before conception, parity 5 or more, low-lying placenta and if they had a previous labour induction attempt.
Interventions	Labour induction in 3 groups: misoprostol vaginally (n = 100) 50 mcg or oxytocin infusion (n = 100) initially at 1 mU/min or Foley catheter (n = 100). Membrane sweeping was performed in more than 90/100 women in the induction groups. Expectant management continued until 42 completed weeks with twice-weekly amniotic fluid index and NST and one biophysical profile measurement.
Outcomes	Maternal and neonatal outcomes.
Notes	No loss to follow up. 24.3 % of women in the expectant arm were induced.
Allocation concealment	B – Unclear

Characteristics of included studies (*Continued*)

Study	**Hannah 1992**
Methods	Computer-generated random numbers, allocated centrally.
Participants	3418 low-risk women in 22 hospitals across Canada. Gestational age: 41 completed weeks. Cervix ripeness: not a criterion, if unripe first ripening and then IOL in the intervention group.
Interventions	Intervention: IOL within 4 days of randomization, first with prostaglandins and then with oxytocin if necessary. Control: daily fetal movement counting, NST and amniotic fluid measurement 2-3 times per week.
Outcomes	Mother: mode of birth. Baby: perinatal and neonatal death. Blind outcome assessment: not mentioned.
Notes	Seven women whose babies had lethal congenital anomalies were excluded after randomization.
Allocation concealment	A – Adequate

Study	**Henry 1969**
Methods	Women divided at random to two groups, no further information.
Participants	112 low-risk women in Birmingham, United Kingdom. Gestational age: 41+ weeks. Four women in expectant group and one in induction group were randomized before 41 weeks. Cervix ripeness: not mentioned as a criterion.
Interventions	Intervention: amniotomy and oxytocin. Control: weekly amnioscopy.
Outcomes	Baby: perinatal death. Blind outcome assessment: not mentioned.
Notes	No loss to follow up or exclusions reported.
Allocation concealment	B – Unclear

Study	**Herabutya 1992**
Methods	Women randomized to two groups, no further details.
Participants	108 low-risk women in Bangkok, Thailand. Gestational age: 42 completed weeks. Cervix ripeness: unfavourable cervix (Bishop score 6 or less).
Interventions	Intervention: PGE2 intracervical, repeated after 6 hours, amniotomy and oxytocin on day 2 according to contractions. Control: weekly NST.
Outcomes	Baby: perinatal deaths and morbidity. Blind outcome assessment not mentioned.
Notes	No loss to follow up or postrandomization exclusions reported.
Allocation concealment	B – Unclear

Study	**James 2001**
Methods	Table of random numbers used. Allocation in consecutively-numbered, sealed envelopes but no mention of opaqueness.
Participants	74 low-risk women in Vellore, India. Gestational age: 41 completed weeks.

Characteristics of included studies (*Continued*)

	Cervix ripeness: not mentioned as a criterion.
Interventions	Intervention: depending on the cervix ripeness either direct IOL or first ripening then IOL. Control: daily fetal movement counts, biophysical profile every second day.
Outcomes	Baby: perinatal deaths. No mention of blind outcome assessment.
Notes	No loss to follow up or postrandomization exclusion.
Allocation concealment	B – Unclear

Study	**Martin 1989**
Methods	Allocated to one of two groups according to random assignment in an envelope.
Participants	22 low-risk women in Jackson, USA. Gestational age: 41 completed weeks. Cervix ripeness: unripe cervix (Bishop score 5 or less) included.
Interventions	Intervention: laminaria tents followed by oxytocin. Control: weekly ultrasound for amniotic fluid assessment and NST.
Outcomes	Baby: perinatal deaths. No mention of blind outcome assessment.
Notes	No loss to follow up or postrandomization exclusion reported.
Allocation concealment	B – Unclear

Study	**NICHHD 1994**
Methods	Computer-generated randomization scheme stratified by site and gestational age. Randomization to 3 groups in 2:1:2 ratio. Random allocation centrally.
Participants	440 low-risk women in university hospitals in the USA. Gestational age: 41 completed weeks. Cervix ripeness: unfavourable (Bishop score 6 or less).
Interventions	Intervention: 1) cervical priming with PGE2 gel followed 12 hours later with oxytocin; 2) no cervical priming (placebo gel) followed 12 hours later with oxytocin. Control: weekly cervix assessments, twice weekly NST and amniotic fluid volume assessment.
Outcomes	Mother: maternal death, mode of delivery. Baby: perinatal death, morbidity. No mention of blind outcome assessments.
Notes	No loss to follow up reported.
Allocation concealment	A – Adequate

Study	**Ocon 1997**
Methods	Randomized but no further details.
Participants	113 low-risk women in Gran Canaria, Spain. Gestational age: 42 weeks. Cervix ripeness: unfavourable (Bishop score < 5).
Interventions	Intervention: PGE2 gel (0.5 mg) followed by induction of labour. Control: monitoring by NST, biophysical profile and amnioscopy.
Outcomes	Mother: time to birth, mode of birth. Baby: perinatal outcome (Apgar score, meconium). No mention of blind outcome assessments.
Notes	No loss to follow up or postrandomization exclusion reported.

Characteristics of included studies (*Continued*)

Allocation concealment	B – Unclear

Study	**Roach 1997**
Methods	Randomly allocated by opening the next in a series of identical envelopes.
Participants	201 low-risk women in Hong Kong, China. Gestational age: 42 completed weeks. Cervix ripeness: not mentioned as a criterion.
Interventions	Intervention: PGE2 pessaries 6-hourly if necessary. Control: serial monitoring with NST (x2) and amniotic fluid index measurements (x1) weekly.
Outcomes	Mother: mode of birth. Baby: perinatal morbidity.
Notes	ITT analysis reported. 17/96 (18%) in the induction group went into spontaneous labour and 12/105 (11%) in the expectant management group were induced.
Allocation concealment	B – Unclear

Study	**Suikkari 1983**
Methods	Randomized trial, no further details.
Participants	119 women with regular menses in Lappenranta, Finland. Gestational age: 41+ weeks. Cervix ripeness: not a criterion.
Interventions	Intervention: oxytocin alone or with amniotomy depending on the cervix. Control: obstetric examination, NST, biochemical tests and amniotic fluid determination every 3 days.
Outcomes	Mother: mode of birth. Baby: perinatal outcome. No mention of blind outcome assessment.
Notes	No loss to follow up or postrandomization exclusion reported. The study is available as an abstract only.
Allocation concealment	B – Unclear

Study	**Witter 1987**
Methods	Computer-generated random numbers used for the randomization sequence. Sealed, sequentially-numbered envelopes used for allocation concealment but no mention of opaqueness.
Participants	200 low-risk women in Baltimore, USA. Gestational age: 42 completed weeks. Cervix ripeness: not mentioned as a criterion.
Interventions	Intervention: oxytocin infusion with amniotomy when possible. Control: estriol measurements 2-3/week. In both groups women initiated fetal movement counting and if reduced fetal heart rate and estriol testing at 41 completed weeks.
Outcomes	Mother: mode of birth, days in hospital. Baby: perinatal outcome, meconium, Apgar scores. No mention of blind assessment.
Notes	Women were enrolled in the study at 41 completed weeks and all were included in the analysis although, the intervention took place at 42 completed weeks. 35/103 in the intervention group and 39/97 in the expectant group delivered prior to 42 completed weeks. 3/103 and 2/97 in the IOL and expectant management groups dropped out of the study.
Allocation concealment	B – Unclear

AROM: artificial rupture of membranes

IOL: induction of labour
ITT:- intention-to-treat analysis
IU: international units
NST: nonstress test
PGE2: prostaglandin E2

Characteristics of excluded studies

Study	Reason for exclusion
Alcalay 1996	PROM at term.
Amano 1999	Alternate allocation trial.
Ascher-Walsh 2000	Compares two forms of IOL.
Bell 1993	Trial of cervical ripening not IOL.
Berghella 1994	Membrane stripping to decrease the need for formal IOL.
Boulvain 1998	Membrane stripping to decrease the need for formal IOL.
Buttino 1990	Trial of cervical ripening not IOL.
Cardozo 1986	Alternate allocation trial.
Cohn 1992	IOL but no numerical results.
Conway 2000	Trial of active versus expectant management in women with oligohydramnios.
Damania 1992	Trial of cervical ripening (two methods) not IOL.
Dare 2002	Trial of cervical ripening not IOL.
Doany 1997	Trial of cervical ripening not IOL.
Dunn 1989	No relevant prespecified outcomes reported.
El-Torkey 1992	Trial of cervical ripening not IOL.
Elliott 1984	Trial of nipple stimulation as a method of cervical ripening. No commitment to delivery within a given time or protocol.
Evans 1983	Two forms of IOL.
Garry 2000	Alternate allocation trial.
Giacalone 1998	Trial of cervical ripening not IOL.
Hage 1993	Trial of cervical ripening not IOL.
Heden 1991	Alternate allocation trial.
Ingemarsson 1987	Trial of cervical ripening not IOL.
Iqbal 2004	Alternate allocation trial.
Jenssen 1977	Trial of cervical ripening not IOL.
Kadar 1990	Trial of nipple stimulation as a method of cervical ripening. No commitment to delivery within a given time or protocol.
Katz 1983	Alternate allocation trial.
Kipikasa 2005	Comparing alternate methods for induction of labour.
Klopper 1969	Trial of cervical ripening not IOL.
Knox 1979	Quasi-randomized (last digit of hospital number).
Lee 1997	Two forms of IOL.
Lemancewicz 1999	Two forms of IOL.
Lien 1998	Trial of cervical ripening not IOL.

Characteristics of excluded studies (*Continued*)

Lyons 2001	Trial of cervical ripening not IOL.
Magann 1998	Trial of cervical ripening not IOL.
Magann 1999	Two forms of IOL.
Mancuso 1998	Two forms of IOL.
Martin 1978	About 30% of randomly allocated women in both groups were excluded from analysis due to protocol violations.
Meydanli 2003	Two forms of IOL.
Misra 1994	Two forms of IOL.
Müller 1995	Two forms of IOL.
Newman 1997	Trial of cervical ripening not IOL.
Ohel 1996	Alternate allocation.
Papageorgiou 1992	Two forms of IOL.
Paul 1988	Protocol for RCT only - no results.
Rayburn 1988	Trial of cervical ripening not IOL.
Rayburn 1999	Trial of cervical ripening not IOL.
Roberts 1986	Trial of cervical ripening not IOL.
Sande 1983	RCT but analysis was by treatment received rather than allocated. 23/76 in IOL and 15/90 in expectant management groups received the alternate intervention and were analysed as such. It is not possible to disaggregate the switched groups.
Satin 1991	Two forms of IOL.
Sawai 1991	Trial of cervical ripening not IOL.
Sawai 1994	Trial of cervical ripening not IOL.
Stenlund 1999	Mifepristone versus placebo for IOL, but all women given PGE2 if necessary after 48 hours.
Su 1996	Both groups induced within two days with alternative methods.
Surbek 1997	Two forms of IOL.
Suzuki 1999	Immediate IOL versus expectant management in twin pregnancies.
Tylleskar 1979	RCT but > 20% of women excluded in both groups.
Williams 1990	Trial of cervical ripening not IOL.
Wing 2000	Trial of cervical ripening not IOL.
Wong 2002	Trial of cervical ripening not IOL.
Ziaei 2003	Trial of cervical ripening not IOL.
de Aquino 2003	Two forms of IOL.

IOL: induction of labour
PGE2: prostaglandin E2
PROM: premature rupture of membranes
RCT: randomized controlled trial

Characteristics of ongoing studies

Study	**Norway 2006**
Trial name or title	None.
Participants	508 women with routine ultrasound scan dating and planned delivery at St Olavs Hospital, speaking Norwegian fluently, cephalic presentation, no prelabour rupture of membranes. Gestational age: 41+ weeks.

Characteristics of ongoing studies (*Continued*)

Interventions	Misoprostol 50 mcg 6 hourly versus expectant management (assessment of amniotic fluid, cervix length, ripening and electronic fetal monitoring every third day). Labour induction at 299 days.
Outcomes	Neonatal morbidity (pH, Apgar, NICU), mode of delivery, maternal haemorrhage, uterine contraction abnormalities.
Starting date	
Contact information	Dr Runa Heimstad. Norway.
Notes	Completed recruitment as of December 2005.

NICU: neonatal intensive care unit

ANALYSES

Comparison 01. Labour induction versus expectant management by gestational age (all trials)

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Perinatal death			Relative Risk (Fixed) 95% CI	Subtotals only
02 Stillbirth			Relative Risk (Fixed) 95% CI	Subtotals only
03 Newborn death within 7 days			Relative Risk (Fixed) 95% CI	Subtotals only
04 Newborn death within 28 days			Relative Risk (Fixed) 95% CI	Subtotals only
05 Birth asphyxia			Relative Risk (Fixed) 95% CI	Subtotals only
06 Meconium aspiration syndrome			Relative Risk (Fixed) 95% CI	Subtotals only
07 Newborn intensive care unit admission			Relative Risk (Random) 95% CI	Totals not selected
08 Apgar score less than 7 at 5 minutes			Relative Risk (Fixed) 95% CI	Subtotals only
09 Birthweight > 4000 gm			Relative Risk (Fixed) 95% CI	Totals not selected
10 Birthweight (gm)			Weighted Mean Difference (Random) 95% CI	Subtotals only
11 Caesarean section			Relative Risk (Random) 95% CI	Subtotals only
12 Assisted vaginal delivery			Relative Risk (Fixed) 95% CI	Subtotals only
13 Postpartum haemorrhage			Relative Risk (Fixed) 95% CI	Subtotals only
14 Maternal anxiety			Relative Risk (Fixed) 95% CI	Subtotals only

Comparison 02. Labour induction versus expectant management by cervical status

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Perinatal death	12	5939	Relative Risk (Fixed) 95% CI	0.30 [0.09, 0.99]
02 Stillbirth	12	5939	Relative Risk (Fixed) 95% CI	0.28 [0.05, 1.67]
03 Newborn death within 7 days	12	5936	Relative Risk (Fixed) 95% CI	0.38 [0.09, 1.60]
04 Newborn death within 28 days	0	0	Relative Risk (Fixed) 95% CI	Not estimable
05 Birth asphyxia	1	249	Relative Risk (Fixed) 95% CI	3.02 [0.12, 73.52]
06 Meconium aspiration syndrome	6	1713	Relative Risk (Fixed) 95% CI	0.39 [0.21, 0.75]
07 Newborn intensive care unit admission	8	5427	Relative Risk (Fixed) 95% CI	0.91 [0.78, 1.05]
08 Apgar score less than 7 at 5 minutes	9	4994	Relative Risk (Fixed) 95% CI	0.70 [0.42, 1.17]
09 Birthweight > 4000 gm			Relative Risk (Fixed) 95% CI	Totals not selected
10 Birthweight (gm)	7	1845	Weighted Mean Difference (Random) 95% CI	-42.52 [-90.53, 5.50]
11 Caesarean section			Relative Risk (Fixed) 95% CI	Totals not selected
12 Assisted vaginal delivery			Relative Risk (Random) 95% CI	Totals not selected

13 Postpartum haemorrhage	0	0	Relative Risk (Fixed) 95% CI	Not estimable
14 Maternal anxiety	0	0	Relative Risk (Fixed) 95% CI	Not estimable

INDEX TERMS

Medical Subject Headings (MeSH)

Cesarean Section; Infant, Newborn; Infant Mortality; * Labor, Induced [adverse effects]; * Pregnancy, Prolonged; Randomized Controlled Trials; Risk

MeSH check words

Female; Humans; Pregnancy

COVER SHEET

Title	Induction of labour for improving birth outcomes for women at or beyond term
Authors	Gülmezoglu AM, Crowther CA, Middleton P
Contribution of author(s)	AM Gulmezoglu (AMG) wrote the protocol with input from CA Crowther. P Middleton extracted data with AMG. All three authors contributed to the text of the full review. AMG is the guarantor of the review.
Issue protocol first published	2004/4
Review first published	2006/4
Date of most recent amendment	20 February 2007
Date of most recent SUBSTANTIVE amendment	21 August 2006
What's New	February 2007 The 'Implications for research' section has been amended to include the uncertainty about timing of labour induction beyond term, which was unintentionally left out during the revision process. June 2006 The previous version of this review included studies up to 1997 and included 21 labour induction trials (Crowley 2004). This version has been re-written, including a new protocol which now limits the scope to labour induction, and includes 19 trials. Thirteen of the 21 trials included in the previous version are included in this version. The remaining eight trials were excluded because of alternate allocation (Cardozo 1986; Heden 1991; Katz 1983), a high proportion of postrandomization exclusion (greater than 30% in Martin 1978 and greater than 24% in Tylleskar 1979), cervical ripening with breast stimulation (Elliott 1984; Kadar 1990), and analysis by intervention received (i.e. groups switched, Sande 1983). Six trials published since the publication of the previous version have been included in this update (Chakravarti 2000; Chanrachkul 2003; Gelisen 2005; James 2001; Ocon 1997; Roach 1997).
Date new studies sought but none found	Information not supplied by author
Date new studies found but not yet included/excluded	Information not supplied by author
Date new studies found and included/excluded	30 June 2006

Date authors' conclusions section amended	Information not supplied by author
Contact address	Dr A Metin Gülmezoglu Scientist UNDP/UNFPA/WHO/World Bank Special Programme of Research, Development and Research Training in Human Reproduction (HRP) Department of Reproductive Health and Research World Health Organization Geneva 27 1211 SWITZERLAND E-mail: gulmezoglum@who.int Tel: +41 22 7913417 Fax: +41 22 7914171
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Editorial group code	HM-PREG

GRAPHS AND OTHER TABLES

Analysis 01.01. Comparison 01 Labour induction versus expectant management by gestational age (all trials), Outcome 01 Perinatal death

Review: Induction of labour for improving birth outcomes for women at or beyond term

Comparison: 01 Labour induction versus expectant management by gestational age (all trials)

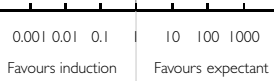
Outcome: 01 Perinatal death

Study	Induction n/N	Expectant n/N	Relative Risk (Fixed) 95% CI	Weight (%)	Relative Risk (Fixed) 95% CI
01 37-40 completed weeks					
Cole 1975	0/111	1/117		48.0	0.35 [0.01, 8.53]
Egarter 1989	0/188	1/168		52.0	0.30 [0.01, 7.27]
Subtotal (95% CI)	299	285		100.0	0.32 [0.03, 3.09]
Total events: 0 (Induction), 2 (Expectant)					
Test for heterogeneity chi-square=0.01 df=1 p=0.94 I^2 =0.0%					
Test for overall effect z=0.98 p=0.3					
02 41 completed weeks					
× Augensen 1987	0/214	0/195		0.0	Not estimable
× Chanrachkul 2003	0/124	0/125		0.0	Not estimable
Dyson 1987	0/152	1/150		19.0	0.33 [0.01, 8.01]

(*Continued . . .*)

(. . . *Continued*)

Study	Induction n/N	Expectant n/N	Relative Risk (Fixed) 95% CI	Weight (%)	Relative Risk (Fixed) 95% CI
Gelisen 2005	0/300	1/300		18.8	0.33 [0.01, 8.15]
Hannah 1992	0/1701	2/1706		31.4	0.20 [0.01, 4.18]
Henry 1969	0/55	2/57		30.8	0.21 [0.01, 4.22]
× James 2001	0/37	0/37		0.0	Not estimable
× Martin 1989	0/12	0/10		0.0	Not estimable
× NICHHD 1994	0/174	0/175		0.0	Not estimable
× Suikkari 1983	0/66	0/53		0.0	Not estimable
Subtotal (95% CI)	2835	2808		100.0	0.25 [0.05, 1.18]
Total events: 0 (Induction), 6 (Expectant)					
Test for heterogeneity chi-square=0.09 df=3 p=0.99 I^2 =0.0%					
Test for overall effect z=1.75 p=0.08					
03 42 completed weeks					
Bergsjo 1989	1/94	2/94		55.8	0.50 [0.05, 5.42]
Herabutya 1992	0/57	1/51		44.2	0.30 [0.01, 7.18]
Subtotal (95% CI)	151	145		100.0	0.41 [0.06, 2.73]
Total events: 1 (Induction), 3 (Expectant)					
Test for heterogeneity chi-square=0.06 df=1 p=0.80 I^2 =0.0%					
Test for overall effect z=0.92 p=0.4					

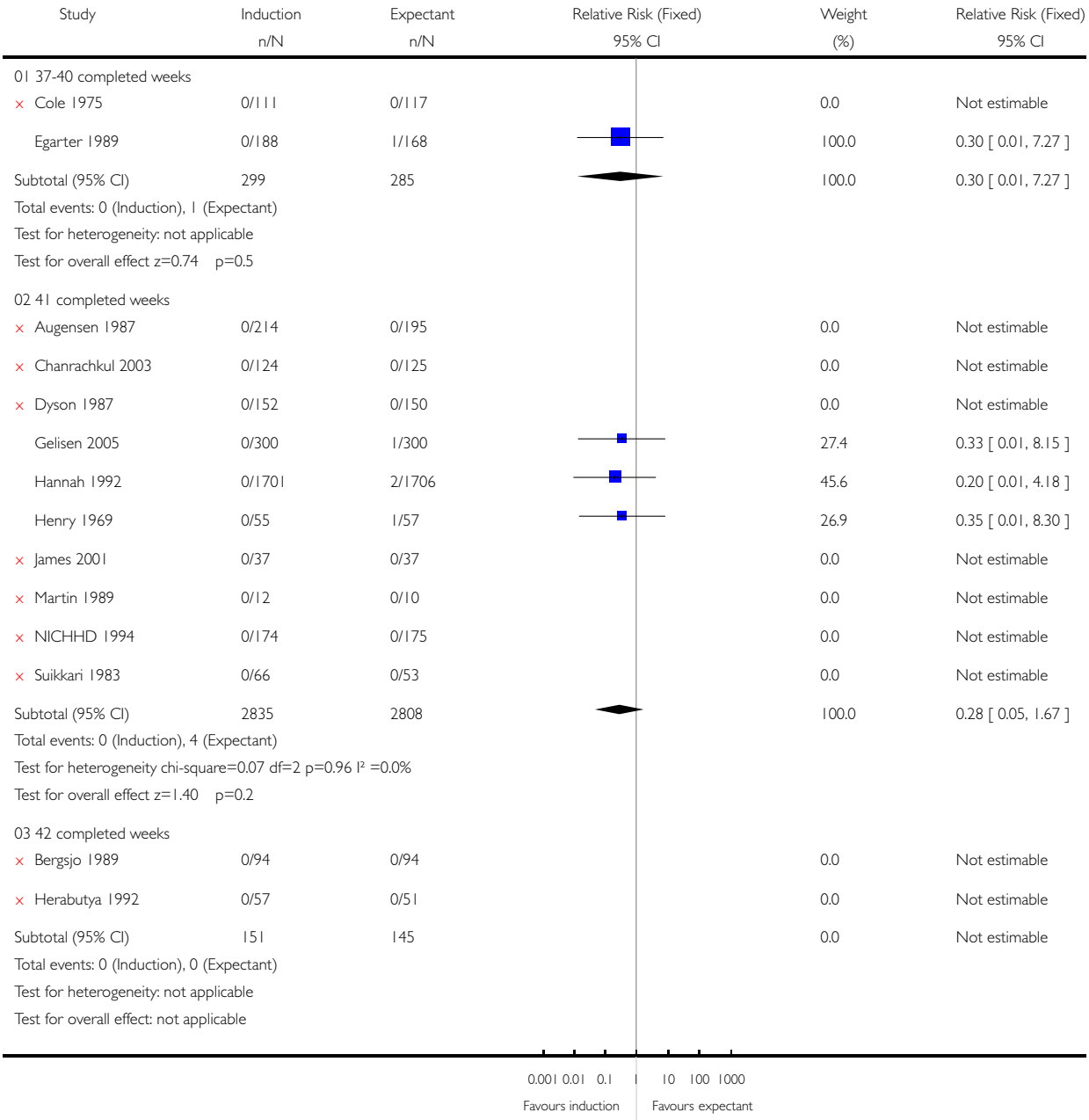


Analysis 01.02. Comparison 01 Labour induction versus expectant management by gestational age (all trials), Outcome 02 Stillbirth

Review: Induction of labour for improving birth outcomes for women at or beyond term

Comparison: 01 Labour induction versus expectant management by gestational age (all trials)

Outcome: 02 Stillbirth

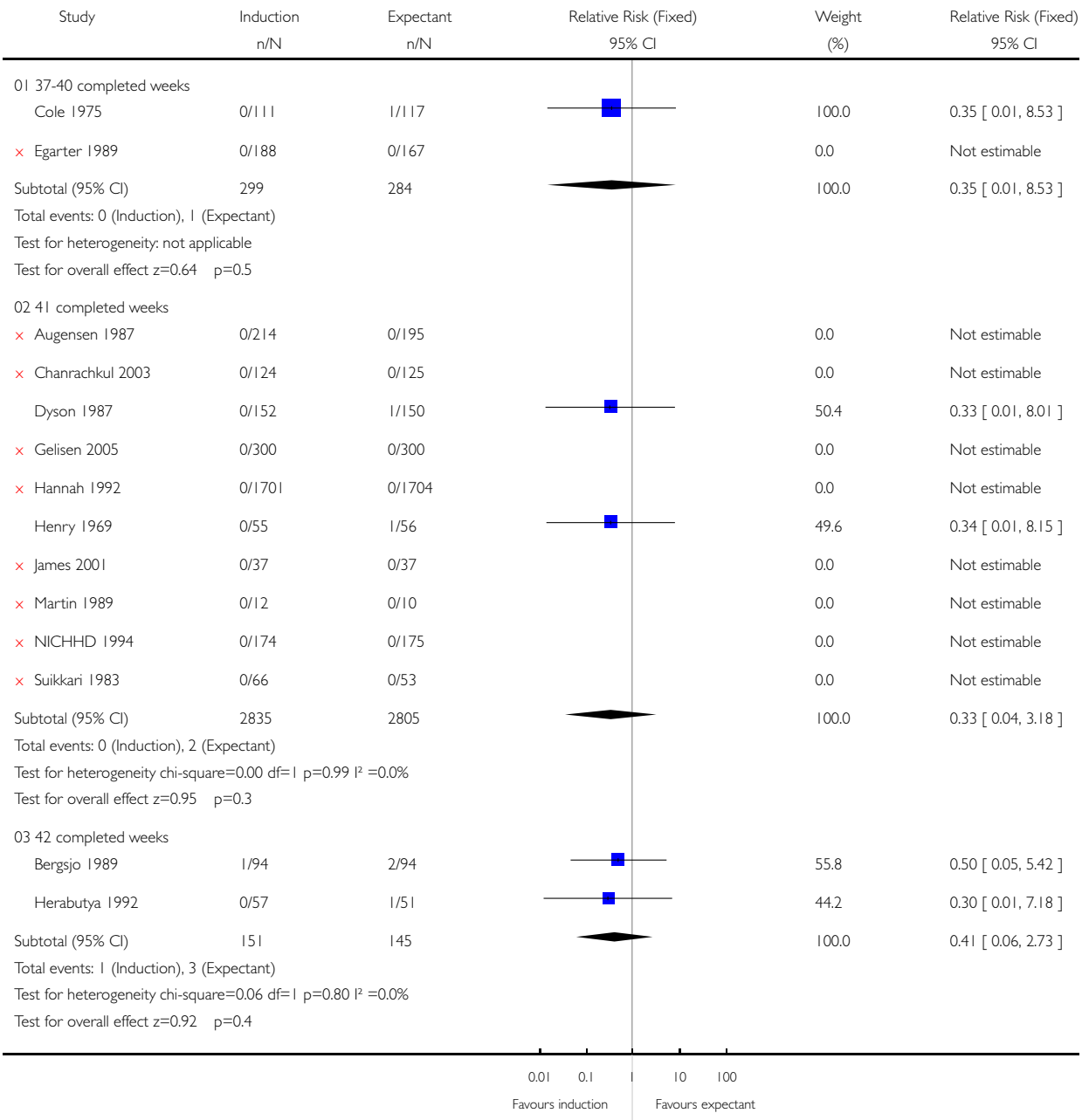


Analysis 01.03. Comparison 01 Labour induction versus expectant management by gestational age (all trials), Outcome 03 Newborn death within 7 days

Review: Induction of labour for improving birth outcomes for women at or beyond term

Comparison: 01 Labour induction versus expectant management by gestational age (all trials)

Outcome: 03 Newborn death within 7 days

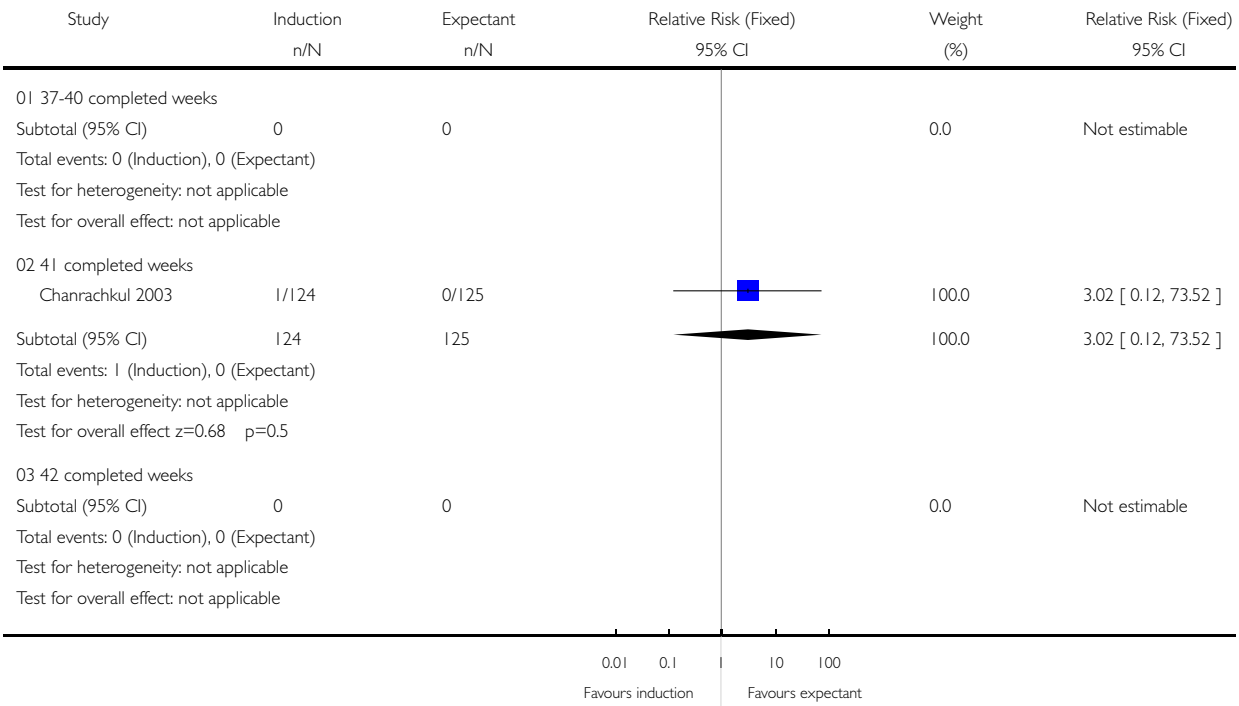


Analysis 01.05. Comparison 01 Labour induction versus expectant management by gestational age (all trials), Outcome 05 Birth asphyxia

Review: Induction of labour for improving birth outcomes for women at or beyond term

Comparison: 01 Labour induction versus expectant management by gestational age (all trials)

Outcome: 05 Birth asphyxia



Analysis 01.06. Comparison 01 Labour induction versus expectant management by gestational age (all trials), Outcome 06 Meconium aspiration syndrome

Review: Induction of labour for improving birth outcomes for women at or beyond term

Comparison: 01 Labour induction versus expectant management by gestational age (all trials)

Outcome: 06 Meconium aspiration syndrome

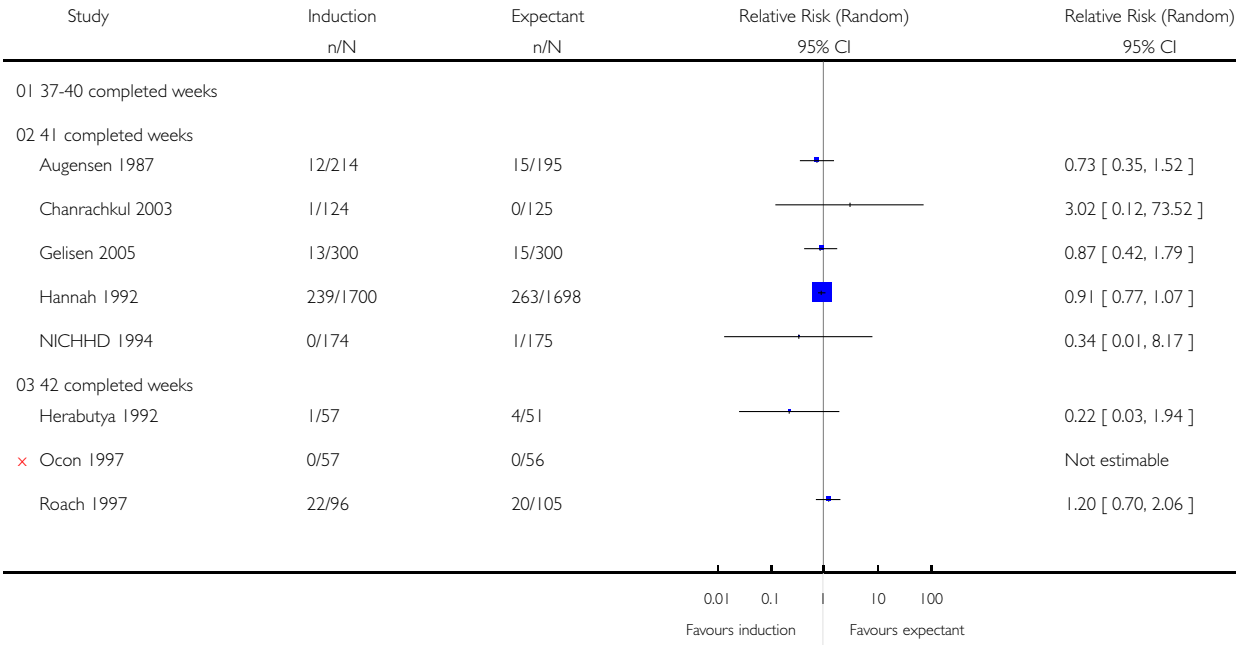
Study	Induction n/N	Expectant n/N	Relative Risk (Fixed) 95% CI	Weight (%)	Relative Risk (Fixed) 95% CI
01 37-40 completed weeks					
Subtotal (95% CI)	0	0		0.0	Not estimable
Total events: 0 (Induction), 0 (Expectant)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					
02 41 completed weeks					
Dyson 1987	0/152	6/150		29.0	0.08 [0.00, 1.34]
Gelisen 2005	4/300	12/300		53.2	0.33 [0.11, 1.02]
James 2001	1/37	2/37		8.9	0.50 [0.05, 5.28]
NICHHD 1994	1/174	2/175		8.8	0.50 [0.05, 5.50]
Subtotal (95% CI)	663	662		100.0	0.29 [0.12, 0.68]
Total events: 6 (Induction), 22 (Expectant)					
Test for heterogeneity chi-square=1.31 df=3 p=0.73 I^2 =0.0%					
Test for overall effect z=2.82 p=0.005					
03 42 completed weeks					
Bergsjo 1989	4/94	8/94		88.6	0.50 [0.16, 1.60]
Witter 1987	2/103	1/97		11.4	1.88 [0.17, 20.44]
Subtotal (95% CI)	197	191		100.0	0.66 [0.24, 1.81]
Total events: 6 (Induction), 9 (Expectant)					
Test for heterogeneity chi-square=0.96 df=1 p=0.33 I^2 =0.0%					
Test for overall effect z=0.81 p=0.4					

Analysis 01.07. Comparison 01 Labour induction versus expectant management by gestational age (all trials), Outcome 07 Newborn intensive care unit admission

Review: Induction of labour for improving birth outcomes for women at or beyond term

Comparison: 01 Labour induction versus expectant management by gestational age (all trials)

Outcome: 07 Newborn intensive care unit admission



Analysis 01.08. Comparison 01 Labour induction versus expectant management by gestational age (all trials), Outcome 08 Apgar score less than 7 at 5 minutes

Review: Induction of labour for improving birth outcomes for women at or beyond term

Comparison: 01 Labour induction versus expectant management by gestational age (all trials)

Outcome: 08 Apgar score less than 7 at 5 minutes

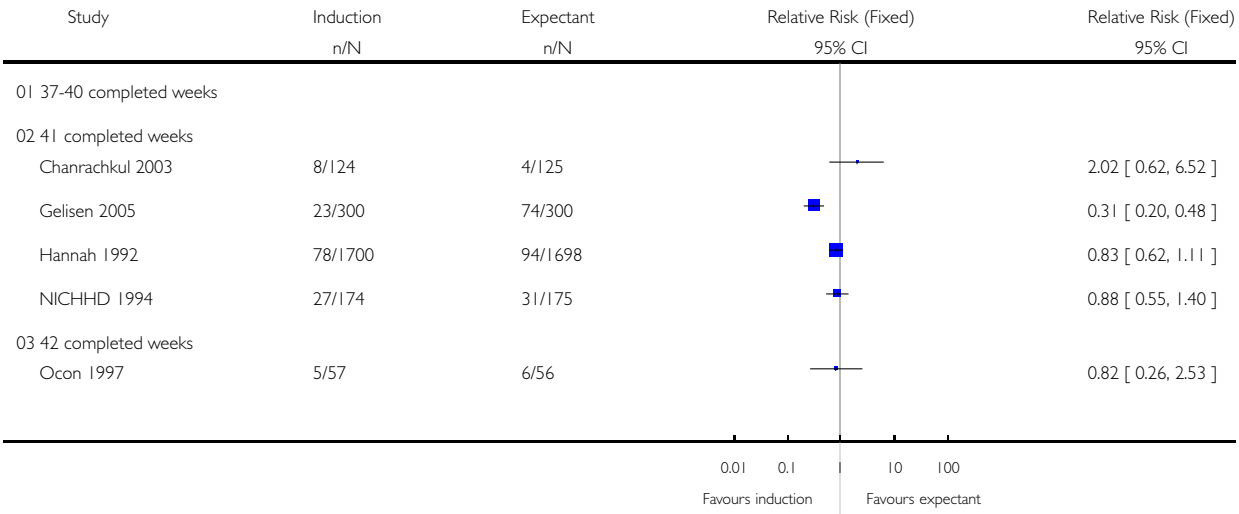
Study	Induction n/N	Expectant n/N	Relative Risk (Fixed) 95% CI	Weight (%)	Relative Risk (Fixed) 95% CI
01 37-40 completed weeks					
Subtotal (95% CI)	0	0		0.0	Not estimable
Total events: 0 (Induction), 0 (Expectant)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					
02 41 completed weeks					
Chanrachkul 2003	1/124	0/125		1.9	3.02 [0.12, 73.52]
Dyson 1987	2/152	3/150		11.4	0.66 [0.11, 3.88]
Hannah 1992	18/1700	20/1698		75.4	0.90 [0.48, 1.69]
James 2001	0/37	1/37		5.7	0.33 [0.01, 7.93]
NICHHD 1994	0/174	1/175		5.6	0.34 [0.01, 8.17]
Subtotal (95% CI)	2187	2185		100.0	0.85 [0.48, 1.48]
Total events: 21 (Induction), 25 (Expectant)					
Test for heterogeneity chi-square=1.38 df=4 p=0.85 I² =0.0%					
Test for overall effect z=0.58 p=0.6					
03 42 completed weeks					
Herabutya 1992	1/57	4/51		51.3	0.22 [0.03, 1.94]
× Ocon 1997	0/57	0/56		0.0	Not estimable
Roach 1997	0/96	1/105		17.4	0.36 [0.02, 8.84]
Witter 1987	0/103	2/97		31.3	0.19 [0.01, 3.88]
Subtotal (95% CI)	313	309		100.0	0.24 [0.05, 1.10]
Total events: 1 (Induction), 7 (Expectant)					
Test for heterogeneity chi-square=0.09 df=2 p=0.95 I² =0.0%					
Test for overall effect z=1.84 p=0.07					

Analysis 01.09. Comparison 01 Labour induction versus expectant management by gestational age (all trials), Outcome 09 Birthweight > 4000 gm

Review: Induction of labour for improving birth outcomes for women at or beyond term

Comparison: 01 Labour induction versus expectant management by gestational age (all trials)

Outcome: 09 Birthweight > 4000 gm

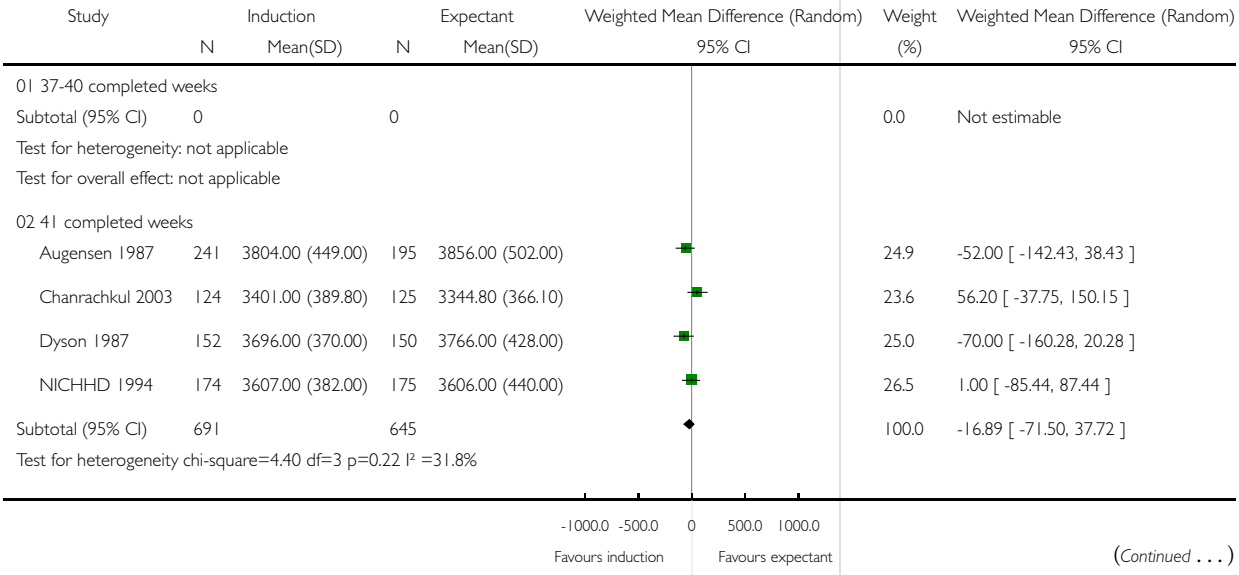


Analysis 01.10. Comparison 01 Labour induction versus expectant management by gestational age (all trials), Outcome 10 Birthweight (gm)

Review: Induction of labour for improving birth outcomes for women at or beyond term

Comparison: 01 Labour induction versus expectant management by gestational age (all trials)

Outcome: 10 Birthweight (gm)



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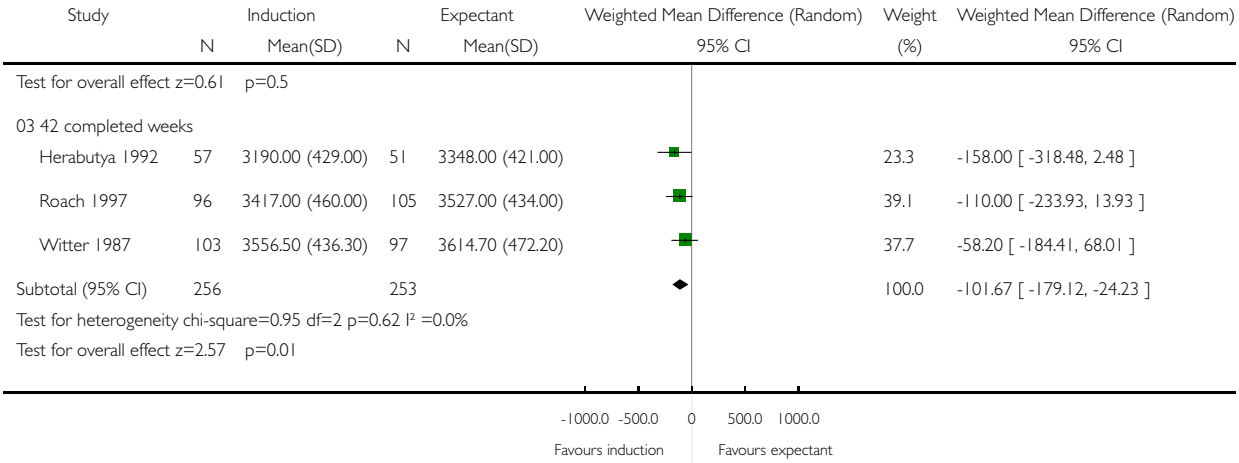
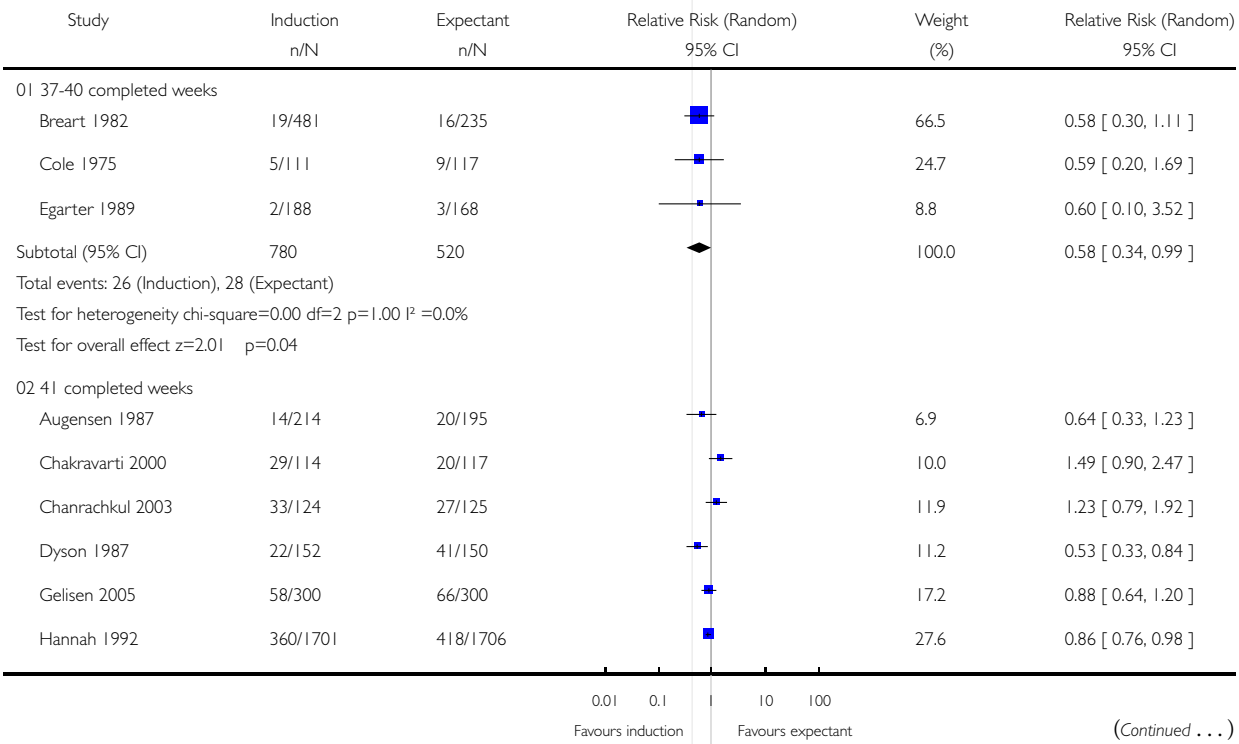


Analysis 01.11. Comparison 01 Labour induction versus expectant management by gestational age (all trials), Outcome 11 Caesarean section

Review: Induction of labour for improving birth outcomes for women at or beyond term

Comparison: 01 Labour induction versus expectant management by gestational age (all trials)

Outcome: 11 Caesarean section



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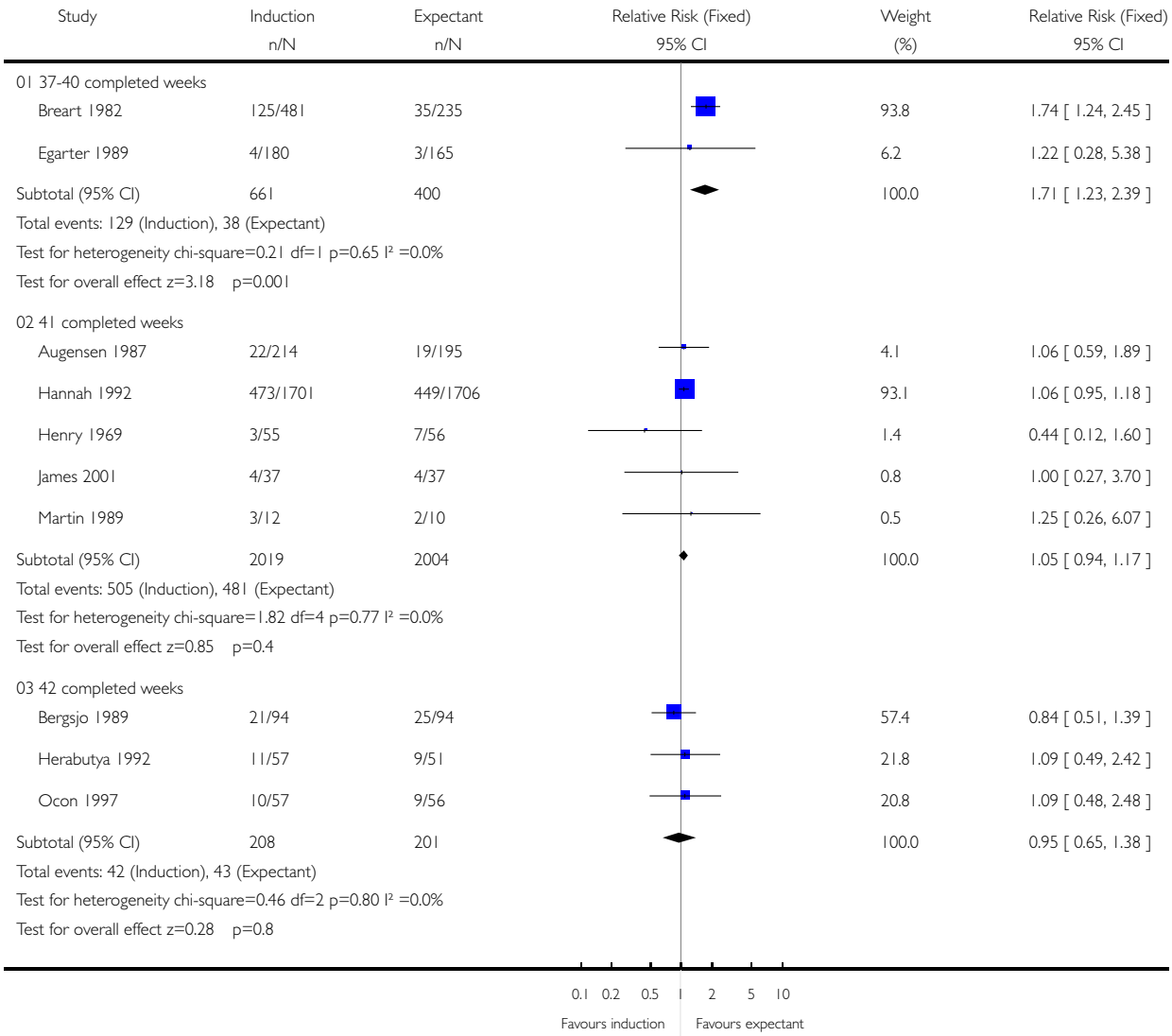
Study	Induction n/N	Expectant n/N	Relative Risk (Random) 95% CI	Weight (%)	Relative Risk (Random) 95% CI
Henry 1969	0/55	1/57		0.4	0.35 [0.01, 8.30]
James 2001	2/37	4/37		1.4	0.50 [0.10, 2.56]
Martin 1989	2/12	1/10		0.7	1.67 [0.18, 15.80]
NICHHD 1994	39/174	32/175		12.8	1.23 [0.81, 1.86]
Subtotal (95% CI)	2883	2872		100.0	0.92 [0.76, 1.12]
Total events: 559 (Induction), 630 (Expectant)					
Test for heterogeneity chi-square=15.36 df=9 p=0.08 I^2 =41.4%					
Test for overall effect z=0.84 p=0.4					
03 42 completed weeks					
Bergsjo 1989	27/94	39/94		27.1	0.69 [0.46, 1.03]
Herabutya 1992	27/57	24/51		27.0	1.01 [0.68, 1.50]
Ocon 1997	10/57	3/56		5.2	3.27 [0.95, 11.28]
Roach 1997	16/96	18/105		16.2	0.97 [0.53, 1.80]
Witter 1987	30/103	27/97		24.5	1.05 [0.67, 1.62]
Subtotal (95% CI)	407	403		100.0	0.97 [0.72, 1.31]
Total events: 110 (Induction), 111 (Expectant)					
Test for heterogeneity chi-square=6.58 df=4 p=0.16 I^2 =39.2%					
Test for overall effect z=0.20 p=0.8					

Analysis 01.12. Comparison 01 Labour induction versus expectant management by gestational age (all trials), Outcome 12 Assisted vaginal delivery

Review: Induction of labour for improving birth outcomes for women at or beyond term

Comparison: 01 Labour induction versus expectant management by gestational age (all trials)

Outcome: 12 Assisted vaginal delivery



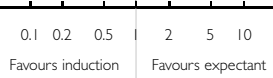
Analysis 01.13. Comparison 01 Labour induction versus expectant management by gestational age (all trials), Outcome 13 Postpartum haemorrhage

Review: Induction of labour for improving birth outcomes for women at or beyond term

Comparison: 01 Labour induction versus expectant management by gestational age (all trials)

Outcome: 13 Postpartum haemorrhage

Study	Induction n/N	Expectant n/N	Relative Risk (Fixed) 95% CI	Weight (%)	Relative Risk (Fixed) 95% CI
01 37-40 completed weeks					
Subtotal (95% CI)	0	0		0.0	Not estimable
Total events: 0 (Induction), 0 (Expectant)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					
02 41 completed weeks					
Chanrachkul 2003	3/124	3/125		100.0	1.01 [0.21, 4.90]
Subtotal (95% CI)	124	125		100.0	1.01 [0.21, 4.90]
Total events: 3 (Induction), 3 (Expectant)					
Test for heterogeneity: not applicable					
Test for overall effect z=0.01 p=1					
03 42 completed weeks					
Subtotal (95% CI)	0	0		0.0	Not estimable
Total events: 0 (Induction), 0 (Expectant)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					

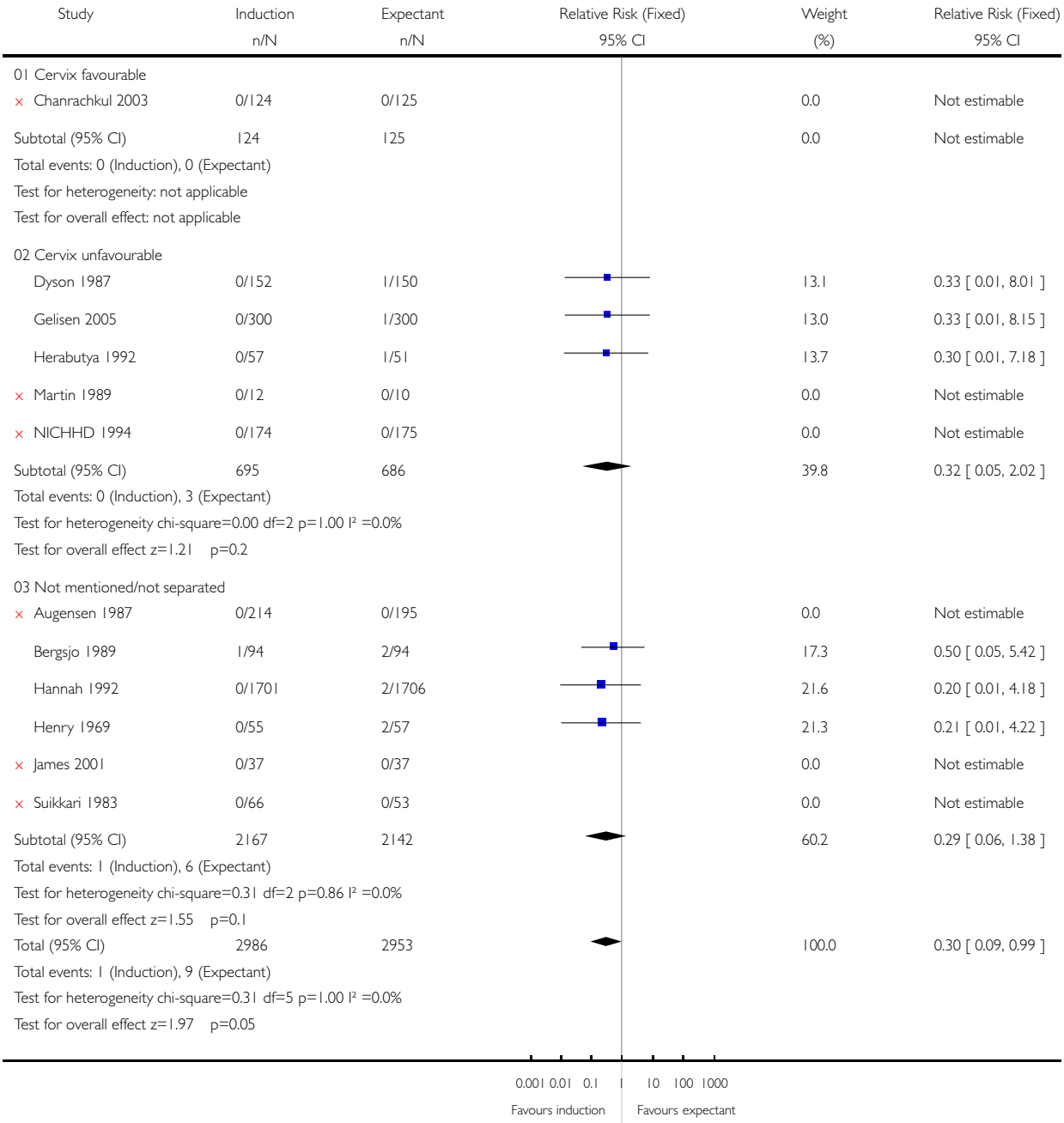


Analysis 02.01. Comparison 02 Labour induction versus expectant management by cervical status, Outcome 01 Perinatal death

Review: Induction of labour for improving birth outcomes for women at or beyond term

Comparison: 02 Labour induction versus expectant management by cervical status

Outcome: 01 Perinatal death



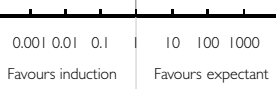
Analysis 02.02. Comparison 02 Labour induction versus expectant management by cervical status, Outcome 02 Stillbirth

Review: Induction of labour for improving birth outcomes for women at or beyond term

Comparison: 02 Labour induction versus expectant management by cervical status

Outcome: 02 Stillbirth

Study	Induction n/N	Expectant n/N	Relative Risk (Fixed) 95% CI	Weight (%)	Relative Risk (Fixed) 95% CI
01 Cervix favourable					
× Chanrachkul 2003	0/124	0/125		0.0	Not estimable
Subtotal (95% CI)	124	125		0.0	Not estimable
Total events: 0 (Induction), 0 (Expectant)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					
02 Cervix unfavourable					
× Dyson 1987	0/152	0/150		0.0	Not estimable
Gelisen 2005	0/300	1/300		27.4	0.33 [0.01, 8.15]
× Herabutya 1992	0/57	0/51		0.0	Not estimable
× Martin 1989	0/12	0/10		0.0	Not estimable
× NICHHD 1994	0/174	0/175		0.0	Not estimable
Subtotal (95% CI)	695	686		27.4	0.33 [0.01, 8.15]
Total events: 0 (Induction), 1 (Expectant)					
Test for heterogeneity: not applicable					
Test for overall effect z=0.67 p=0.5					
03 Not mentioned/not separated					
× Augensen 1987	0/214	0/195		0.0	Not estimable
× Bergsjo 1989	0/94	0/94		0.0	Not estimable
Hannah 1992	0/1701	2/1706		45.6	0.20 [0.01, 4.18]
Henry 1969	0/55	1/57		26.9	0.35 [0.01, 8.30]
× James 2001	0/37	0/37		0.0	Not estimable
× Suikkari 1983	0/66	0/53		0.0	Not estimable
Subtotal (95% CI)	2167	2142		72.6	0.25 [0.03, 2.26]
Total events: 0 (Induction), 3 (Expectant)					
Test for heterogeneity chi-square=0.06 df=1 p=0.81 I^2 =0.0%					
Test for overall effect z=1.23 p=0.2					
Total (95% CI)	2986	2953		100.0	0.28 [0.05, 1.67]
Total events: 0 (Induction), 4 (Expectant)					
Test for heterogeneity chi-square=0.07 df=2 p=0.96 I^2 =0.0%					
Test for overall effect z=1.40 p=0.2					



Analysis 02.03. Comparison 02 Labour induction versus expectant management by cervical status, Outcome 03 Newborn death within 7 days

Review: Induction of labour for improving birth outcomes for women at or beyond term

Comparison: 02 Labour induction versus expectant management by cervical status

Outcome: 03 Newborn death within 7 days

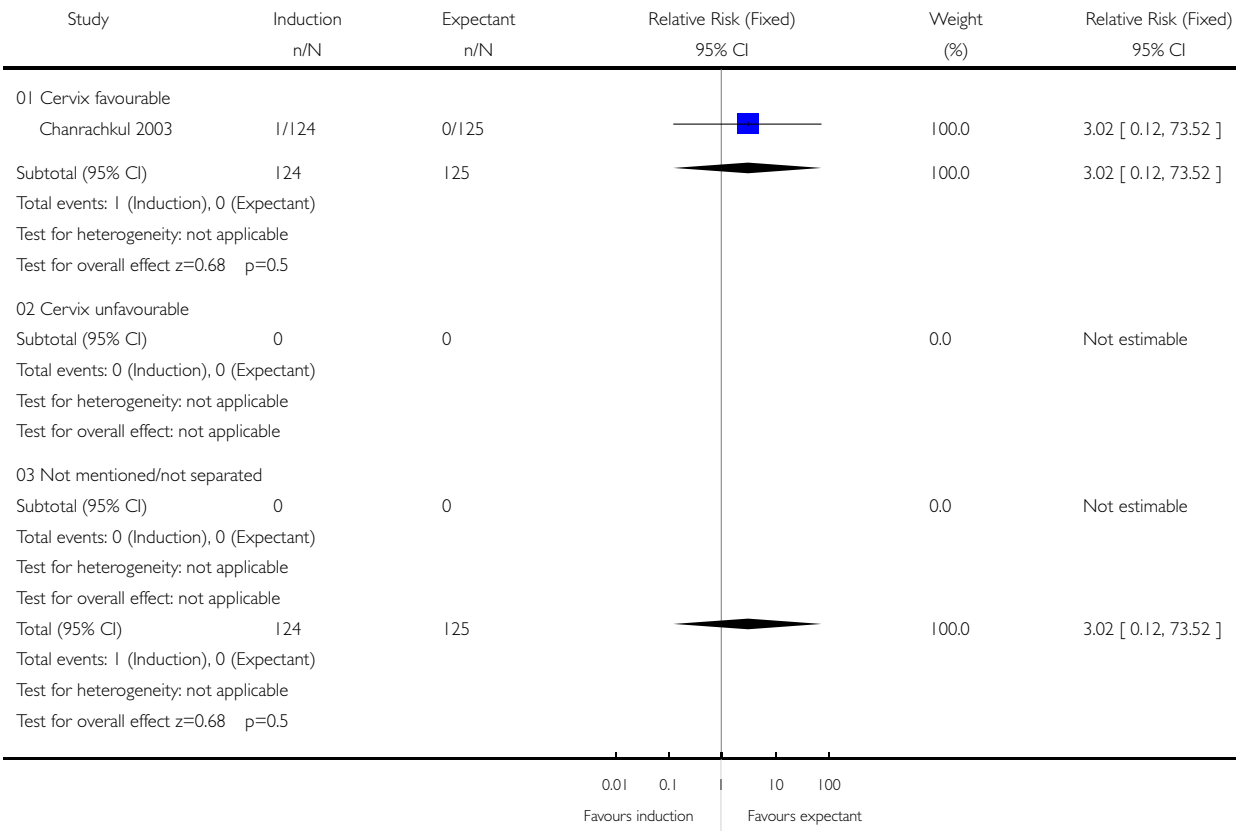
Study	Induction n/N	Expectant n/N	Relative Risk (Fixed) 95% CI	Weight (%)	Relative Risk (Fixed) 95% CI
01 Cervix favourable					
× Chanrachkul 2003	0/124	0/125		0.0	Not estimable
Subtotal (95% CI)	124	125		0.0	Not estimable
Total events: 0 (Induction), 0 (Expectant)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					
02 Cervix unfavourable					
Dyson 1987	0/152	1/150		23.0	0.33 [0.01, 8.01]
× Gelisen 2005	0/300	0/300		0.0	Not estimable
Herabutya 1992	0/57	1/51		24.0	0.30 [0.01, 7.18]
× Martin 1989	0/12	0/10		0.0	Not estimable
× NICHHD 1994	0/174	0/175		0.0	Not estimable
Subtotal (95% CI)	695	686		47.0	0.31 [0.03, 2.98]
Total events: 0 (Induction), 2 (Expectant)					
Test for heterogeneity chi-square=0.00 df=1 p=0.97 I^2 =0.0%					
Test for overall effect z=1.01 p=0.3					
03 Not mentioned/not separated					
× Augensen 1987	0/214	0/195		0.0	Not estimable
Bergsjo 1989	1/94	2/94		30.4	0.50 [0.05, 5.42]
× Hannah 1992	0/1701	0/1704		0.0	Not estimable
Henry 1969	0/55	1/56		22.6	0.34 [0.01, 8.15]
× James 2001	0/37	0/37		0.0	Not estimable
× Suikkari 1983	0/66	0/53		0.0	Not estimable
Subtotal (95% CI)	2167	2139		53.0	0.43 [0.06, 2.89]
Total events: 1 (Induction), 3 (Expectant)					
Test for heterogeneity chi-square=0.04 df=1 p=0.85 I^2 =0.0%					
Test for overall effect z=0.87 p=0.4					
Total (95% CI)	2986	2950		100.0	0.38 [0.09, 1.60]
Total events: 1 (Induction), 5 (Expectant)					
Test for heterogeneity chi-square=0.09 df=3 p=0.99 I^2 =0.0%					
Test for overall effect z=1.32 p=0.2					

Analysis 02.05. Comparison 02 Labour induction versus expectant management by cervical status, Outcome 05 Birth asphyxia

Review: Induction of labour for improving birth outcomes for women at or beyond term

Comparison: 02 Labour induction versus expectant management by cervical status

Outcome: 05 Birth asphyxia



Analysis 02.06. Comparison 02 Labour induction versus expectant management by cervical status, Outcome 06 Meconium aspiration syndrome

Review: Induction of labour for improving birth outcomes for women at or beyond term

Comparison: 02 Labour induction versus expectant management by cervical status

Outcome: 06 Meconium aspiration syndrome

Study	Induction n/N	Expectant n/N	Relative Risk (Fixed) 95% CI	Weight (%)	Relative Risk (Fixed) 95% CI
01 Cervix favourable					
Subtotal (95% CI)	0	0		0.0	Not estimable
Total events: 0 (Induction), 0 (Expectant)					
Test for heterogeneity: not applicable					
Test for overall effect: not applicable					
02 Cervix unfavourable					
Dyson 1987	0/152	6/150		20.7	0.08 [0.00, 1.34]
Gelisen 2005	4/300	12/300		38.0	0.33 [0.11, 1.02]
NICHHD 1994	1/174	2/175		6.3	0.50 [0.05, 5.50]
Subtotal (95% CI)	626	625		65.1	0.27 [0.11, 0.68]
Total events: 5 (Induction), 20 (Expectant)					
Test for heterogeneity chi-square=1.16 df=2 p=0.56 I^2 =0.0%					
Test for overall effect z=2.77 p=0.006					
03 Not mentioned/not separated					
Bergsjo 1989	4/94	8/94		25.3	0.50 [0.16, 1.60]
James 2001	1/37	2/37		6.3	0.50 [0.05, 5.28]
Witter 1987	2/103	1/97		3.3	1.88 [0.17, 20.44]
Subtotal (95% CI)	234	228		34.9	0.63 [0.25, 1.59]
Total events: 7 (Induction), 11 (Expectant)					
Test for heterogeneity chi-square=1.00 df=2 p=0.61 I^2 =0.0%					
Test for overall effect z=0.98 p=0.3					
Total (95% CI)	860	853		100.0	0.39 [0.21, 0.75]
Total events: 12 (Induction), 31 (Expectant)					
Test for heterogeneity chi-square=3.25 df=5 p=0.66 I^2 =0.0%					
Test for overall effect z=2.82 p=0.005					

Analysis 02.07. Comparison 02 Labour induction versus expectant management by cervical status, Outcome 07 Newborn intensive care unit admission

Review: Induction of labour for improving birth outcomes for women at or beyond term

Comparison: 02 Labour induction versus expectant management by cervical status

Outcome: 07 Newborn intensive care unit admission

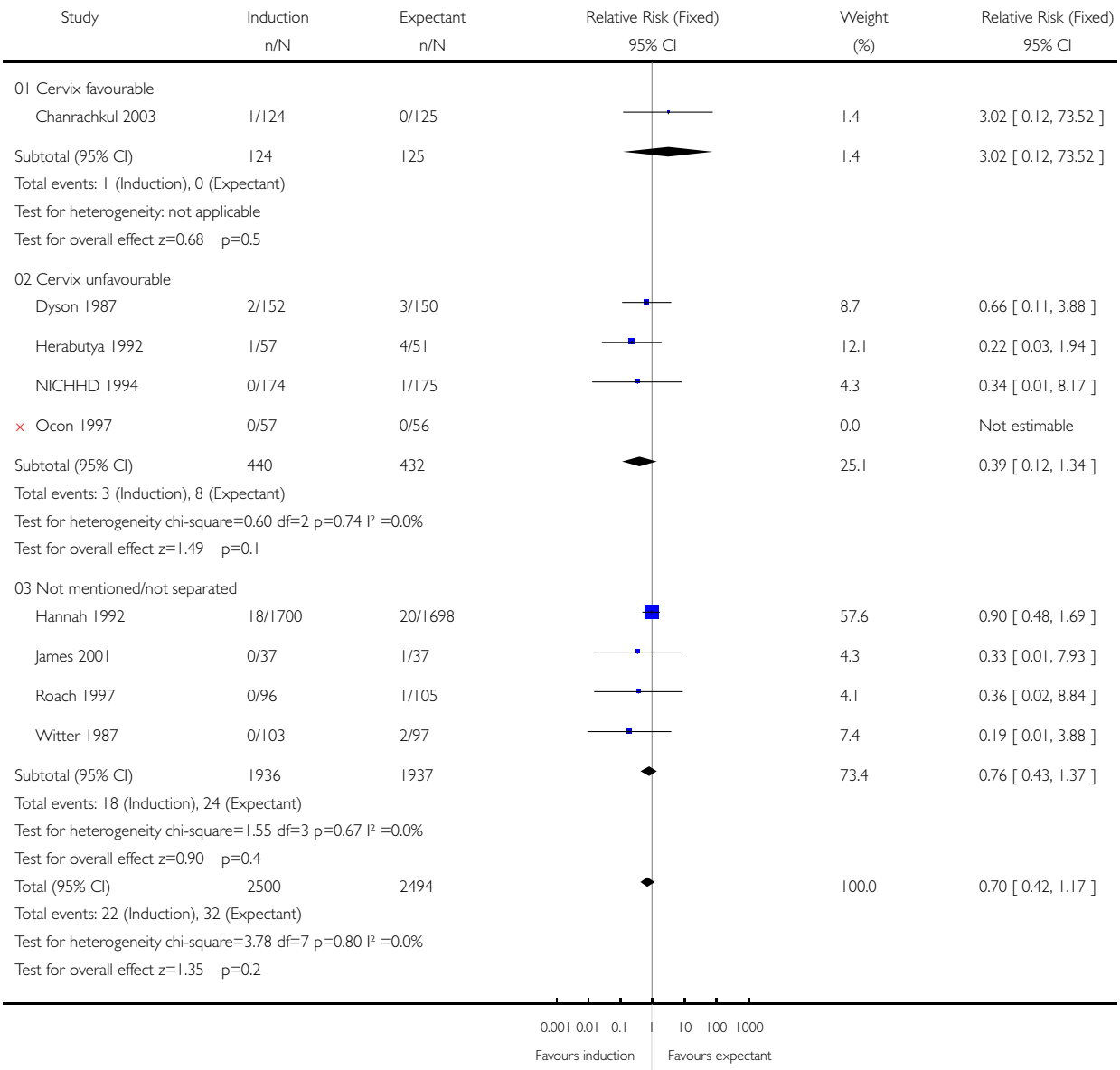
Study	Induction n/N	Expectant n/N	Relative Risk (Fixed) 95% CI	Weight (%)	Relative Risk (Fixed) 95% CI
01 Cervix favourable					
Chanrachkul 2003	1/124	0/125		0.2	3.02 [0.12, 73.52]
Subtotal (95% CI)	124	125		0.2	3.02 [0.12, 73.52]
Total events: 1 (Induction), 0 (Expectant)					
Test for heterogeneity: not applicable					
Test for overall effect z=0.68 p=0.5					
02 Cervix unfavourable					
Gelisen 2005	13/300	15/300		4.7	0.87 [0.42, 1.79]
Herabutya 1992	1/57	4/51		1.3	0.22 [0.03, 1.94]
NICHHD 1994	0/174	1/175		0.5	0.34 [0.01, 8.17]
× Ocon 1997	0/57	0/56		0.0	Not estimable
Subtotal (95% CI)	588	582		6.5	0.70 [0.36, 1.34]
Total events: 14 (Induction), 20 (Expectant)					
Test for heterogeneity chi-square=1.61 df=2 p=0.45 I^2 =0.0%					
Test for overall effect z=1.08 p=0.3					
03 Not mentioned/not separated					
Augensen 1987	12/214	15/195		4.9	0.73 [0.35, 1.52]
Hannah 1992	239/1700	263/1698		82.4	0.91 [0.77, 1.07]
Roach 1997	22/96	20/105		6.0	1.20 [0.70, 2.06]
Subtotal (95% CI)	2010	1998		93.4	0.92 [0.79, 1.07]
Total events: 273 (Induction), 298 (Expectant)					
Test for heterogeneity chi-square=1.37 df=2 p=0.50 I^2 =0.0%					
Test for overall effect z=1.12 p=0.3					
Total (95% CI)	2722	2705		100.0	0.91 [0.78, 1.05]
Total events: 288 (Induction), 318 (Expectant)					
Test for heterogeneity chi-square=3.95 df=6 p=0.68 I^2 =0.0%					
Test for overall effect z=1.31 p=0.2					

Analysis 02.08. Comparison 02 Labour induction versus expectant management by cervical status, Outcome 08 Apgar score less than 7 at 5 minutes

Review: Induction of labour for improving birth outcomes for women at or beyond term

Comparison: 02 Labour induction versus expectant management by cervical status

Outcome: 08 Apgar score less than 7 at 5 minutes

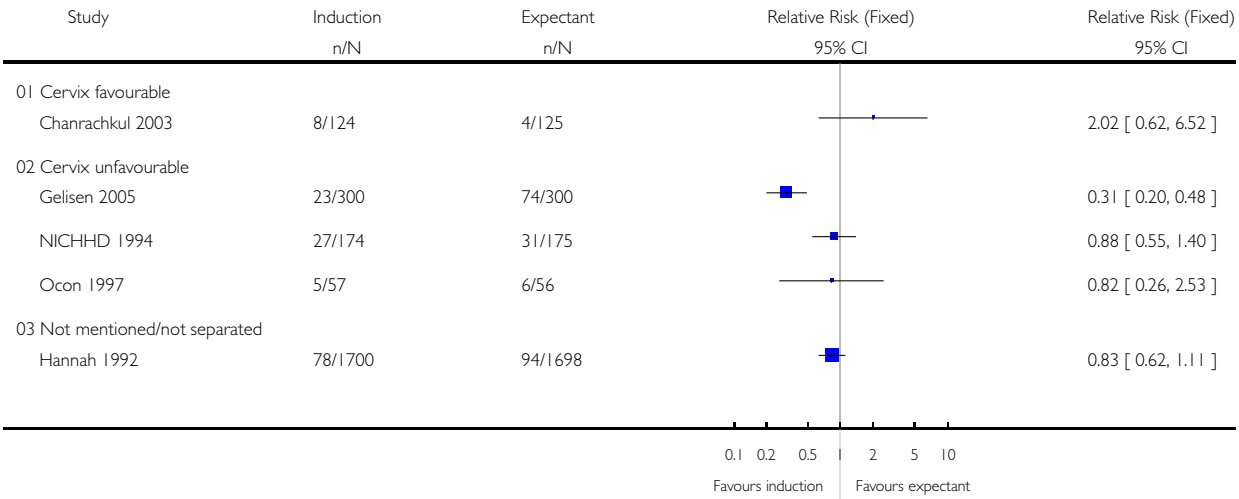


Analysis 02.09. Comparison 02 Labour induction versus expectant management by cervical status, Outcome 09 Birthweight > 4000 gm

Review: Induction of labour for improving birth outcomes for women at or beyond term

Comparison: 02 Labour induction versus expectant management by cervical status

Outcome: 09 Birthweight > 4000 gm

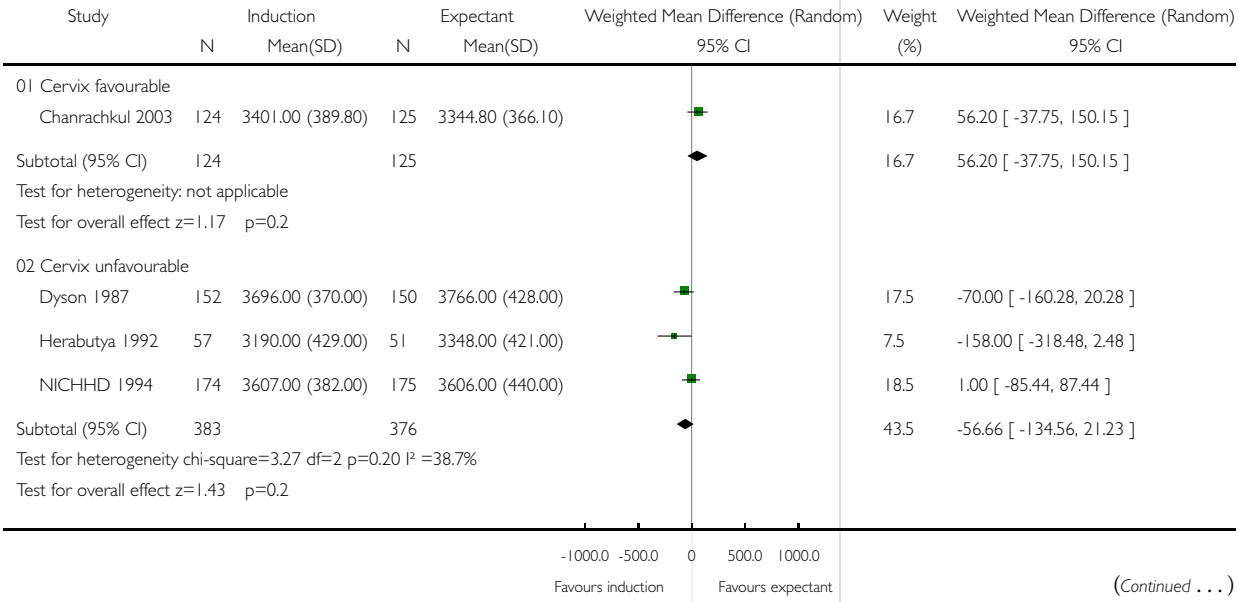


Analysis 02.10. Comparison 02 Labour induction versus expectant management by cervical status, Outcome 10 Birthweight (gm)

Review: Induction of labour for improving birth outcomes for women at or beyond term

Comparison: 02 Labour induction versus expectant management by cervical status

Outcome: 10 Birthweight (gm)



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Study	Induction N	Induction Mean(SD)	Expectant N	Expectant Mean(SD)	Weighted Mean Difference (Random) 95% CI	Weight (%)	Weighted Mean Difference (Random) 95% CI
03 Not mentioned/not separated							
Augensen 1987	241	3804.00 (449.00)	195	3856.00 (502.00)		17.5	-52.00 [-142.43, 38.43]
Roach 1997	96	3417.00 (460.00)	105	3527.00 (434.00)		11.3	-110.00 [-233.93, 13.93]
Witter 1987	103	3556.50 (436.30)	97	3614.70 (472.20)		11.0	-58.20 [-184.41, 68.01]
Subtotal (95% CI)	440		397			39.8	-68.65 [-131.88, -5.43]
Test for heterogeneity chi-square=0.58 df=2 p=0.75 I^2 =0.0%							
Test for overall effect z=2.13 p=0.03							
Total (95% CI)	947		898			100.0	-42.52 [-90.53, 5.50]
Test for heterogeneity chi-square=8.76 df=6 p=0.19 I^2 =31.5%							
Test for overall effect z=1.74 p=0.08							

-1000.0 -500.0 0 500.0 1000.0

Favours induction Favours expectant

Analysis 02.11. Comparison 02 Labour induction versus expectant management by cervical status, Outcome 11 Caesarean section

Review: Induction of labour for improving birth outcomes for women at or beyond term

Comparison: 02 Labour induction versus expectant management by cervical status

Outcome: 11 Caesarean section

Study	Induction n/N	Expectant n/N	Relative Risk (Fixed) 95% CI	Relative Risk (Fixed) 95% CI
01 Cervix favourable				
Chanrachkul 2003	33/124	27/125		1.23 [0.79, 1.92]
02 Cervix unfavourable				
Dyson 1987	22/152	41/150		0.53 [0.33, 0.84]
Gelisen 2005	58/300	66/300		0.88 [0.64, 1.20]
Herabutya 1992	27/57	24/51		1.01 [0.68, 1.50]
Martin 1989	2/12	1/10		1.67 [0.18, 15.80]
NICHHD 1994	39/174	32/175		1.23 [0.81, 1.86]
Ocon 1997	10/57	3/56		3.27 [0.95, 11.28]
03 Not mentioned/not separated				
Augensen 1987	14/214	20/195		0.64 [0.33, 1.23]
Bergsjo 1989	27/94	39/94		0.69 [0.46, 1.03]
Chakravarti 2000	29/114	20/117		1.49 [0.90, 2.47]

0.01 0.1 1 10 100

Favours induction Favours expectant

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Study	Induction n/N	Expectant n/N	Relative Risk (Fixed) 95% CI	Relative Risk (Fixed) 95% CI
Hannah 1992	360/1701	418/1706		0.86 [0.76, 0.98]
Henry 1969	0/55	1/57		0.35 [0.01, 8.30]
James 2001	2/37	4/37		0.50 [0.10, 2.56]
Roach 1997	16/96	18/105		0.97 [0.53, 1.80]
Witter 1987	30/103	27/97		1.05 [0.67, 1.62]

Analysis 02.12. Comparison 02 Labour induction versus expectant management by cervical status, Outcome 12 Assisted vaginal delivery

Review: Induction of labour for improving birth outcomes for women at or beyond term

Comparison: 02 Labour induction versus expectant management by cervical status

Outcome: 12 Assisted vaginal delivery

Study	Induction n/N	Expectant n/N	Relative Risk (Random) 95% CI	Relative Risk (Random) 95% CI
01 Cervix favourable				
02 Cervix unfavourable				
Herabutya 1992	11/57	9/51		1.09 [0.49, 2.42]
Martin 1989	3/12	2/10		1.25 [0.26, 6.07]
Ocon 1997	10/57	9/56		1.09 [0.48, 2.48]
03 Not mentioned/not separated				
Augensen 1987	22/214	19/195		1.06 [0.59, 1.89]
Bergsjo 1989	21/94	25/94		0.84 [0.51, 1.39]
Hannah 1992	473/1701	449/1706		1.06 [0.95, 1.18]
Henry 1969	3/55	7/56		0.44 [0.12, 1.60]
James 2001	4/37	4/37		1.00 [0.27, 3.70]