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Does induction of labour in nulliparous hypertensive women result in vaginal birth? – A descriptive study utilising birth registry data

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ABSTRACT

Background: Induction of labour (IOL) is a common procedure yet we have little information on the efficacy of the process for women with a hypertensive disorder of pregnancy (HDP).
Objective: To describe the birth type and associated factors in nulliparous HDP women undergoing an induction of labour.
Study design: Statutorily collected datasets on every birth and hospital admission which occurred in the state of NSW Australia between the years 2000–2011 were analysed. Hypertensive women were compared to normotensive women.
Results: Of the nulliparous women, 9.9% had a HDP. IOL for HDP women were 56.2% in a cohort of 447 558 women. The AOR for a woman with a HDP undergoing an IOL resulting in a vaginal delivery when compared to a normotensive woman is 0.86 (95% CI 0.83–0.88). Prior to 33 weeks, the lowest perinatal mortality rates (PMR) are seen in women who undergo elective caesarean section (C/S). For women with preeclampsia (PE), lower PMR are seen in women who undergo IOL.
Conclusion: For women with PE and SPE, IOL resulted in lower rates of vaginal delivery than spontaneous labour when compared to normotensive women who also underwent IOL. Women with PE at ≥33 weeks who underwent IOL had the lowest PMR.

1. Introduction

Induction of labour (IOL) through the use of prostaglandins, syntocinon and amniotomy are common procedures in industrialised countries. Rates of induction and associated morbidity are both increasing [1] and it is known that elective induction for non-medical reasons increases the risk of adverse events in both mothers and babies [2]. From Level 1 evidence we know that the process may be feasible in outpatient settings for low risk women [3,4], that women prefer the process to commence in the morning, although there is no increased efficacy when compared to evening commencement [4,5]. The process may prevent infant macrosomia in the babies of insulin dependent diabetic women [6], although there is no evidence to support the process as preferable when compared to repeat elective caesarean section in women with previous caesarean section [7], but the induction process in all women may be of benefit in preventing perinatal death in women at or beyond term [8]. There is not enough evidence to support the routine use of acupuncture [9], amniotomy alone [10], castor oil [11], corticosteroids [12], extraamniotic prostaglandins [13], homeopathy [14], or sexual intercourse [15] although breast stimulation may be beneficial in low risk women [16] and membrane sweeping [17,18] has been shown to increase spontaneous labour rates in low risk women at term. Hyaluronidase injections may increase vaginal birth rates [19], intravaginal prostaglandin administration is optimal to intracervical [20], syntocinon is optimal in conjunction with prostaglandin administration in comparison to syntocinon alone [21], intravenous prostaglandin is not more efficacious than intravenous syntocinon and has more side effects [22], mechanical methods may be preferable to prostaglandins in reducing caesarean section rates [23] and sub-lingual or buccal misoprostol need further trials to assess safety [24].

Even though we have a significant amount of evidence concerning the IOL process overall there is very little evidence of efficacy of the process in hypertensive women. The HYPITAT randomised controlled trial evaluated the efficacy of IOL in women with gestational hypertension and mild preeclampsia [25]. In this study women in the IOL arm had a reduced risk of the composite maternal outcome (serious morbidity or mortality) (relative risk 0·71, 95% CI 0·59—0·86,

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$p < 0.0001$) when compared to women treated with expectant management with no overall difference in operative delivery or caesarean section rates. The study reported no increase in adverse neonatal outcomes but was not powered sufficiently for this outcome. HYPITAT II examined the effect of IOL in women 34–37 weeks gestation and found no difference in maternal outcomes but significantly more neonatal distress in the IOL arm [26]. The 2.5 year follow up on women in the HYPITAT study found no difference between the women's cardiovascular status between women who underwent IOL (and were therefore exposed to short (seven days on average) time periods of disease) and women who delivered following expectant management [27]. Following the publication of these results, induction of labour in hypertensive women increased in the Netherlands from 58.3% to 67.1% [28]. In regard to women with severe hypertensive disease who require delivery to optimise either or maternal or fetal safety, there is an absence of trial data examining the effect of IOL in comparison to elective caesarean section at either term or pre-term women. Expert opinion drives clinician decision making in the majority of cases [29].

The effectiveness of the varying methods and combination of methods of induction of labour used in HDP women also requires examination as this has not previously been examined.

The aim of this study was to describe the birth type and associated factors in nulliparous HDP women undergoing an induction of labour dependent upon diagnosis and method of IOL undertaken. Validated population registry datasets, such as this, are able to provide a large cohort for analysis and enable diagnostic groupings of HDP to be examined.

2. Materials and methods

Pregnancy and birth data for the time period July 1st 2000 till December 31st 2011 of all births were provided by New South Wales (NSW), Ministry of Health as recorded in the NSW Perinatal Data Collection (PDC). This population based surveillance system contains maternal and infant data on all births of greater than 400 g birth weight and/or 20 completed weeks gestation. The NSW PDC contains statistics on all births in New South Wales – which amounts to one third of all births which occur in Australia annually. Data is provided on a variety of variables including maternal age, maternal hypertension, maternal diabetes, parity, fetal presentation, onset of labour, gestation at birth, delivery type, Apgar scores and admission to neonatal intensive care and resuscitation details for the neonate. This dataset (NSW PDC) was linked to the Admitted Patient Data Collection (APDC) for the same time period through the New South Wales Centre for Health Record Linkage (CheReL). Probabilistic data linkage techniques were utilised for data linkage and de-identified datasets were provided for analysis. Probabilistic record linkage software assigns a 'linkage weight' to pairs of records. For example, records that match perfectly or nearly perfectly on first name, surname, date of birth and address have a high linkage weight, and records that match only on date of birth have a low linkage weight. If the linkage weight is high it is likely that the records truly match, and if the linkage weight is low it is likely that the records are not truly a match. This technique has been shown to have a false positive rate of 0.3% of records [30].

Ethical approval was obtained from the NSW Population and Health Services Research Ethics Committee, Protocol No. 2010/12/291.

2.1. Subjects

There are four types of hypertension recognised within the diagnostic criteria prescribed by the Society of Obstetric Medicine of Australia and New Zealand (SOMANZ) [31]. Women were coded as having preeclampsia if their PDC record was coded for the variable 'Pre-eclampsia', or 'Pregnancy Induced Hypertension – proteinuric' (variable available 2006–2011) or if their APDC record for the birth record was coded as including the International Statistical Classification of Diseases (ICD-10-AM) [32] codes O14.0, O14.1, O14.2, O14.9 (proteinuric hypertension). Cases of gestational hypertension were derived from the PDC code 'Pregnancy Induced Hypertension – non-proteinuric' or if their APDC record for the birth event was coded as including ICD-10-AM code O13.0 (gestational hypertension). Cases of chronic hypertension were derived from either the PDC, where a positive response was recorded for chronic hypertension or from the APDC records of women who had a birth admission which included the ICD-10-AM codes O10.0, O10.1, O10.2, O10.3, O10.4, O10.9 (chronic hypertension). Cases of preeclampsia superimposed on chronic hypertension were derived where a PDC record had a positive response for both preeclampsia and chronic hypertension or from APDC records of women who had a birth admission which included the ICD-10-AM code O11 (superimposed preeclampsia on chronic hypertension). In cases where the type of hypertension differed between that recorded on the PDC and the APDC, the diagnosis considered more severe was used, for example a women coded as having gestational hypertension in one system and preeclampsia in the other was given a final diagnosis of preeclampsia. Women who received none of these hypertensive codes were coded as normotensive. The birth admission including the ICD-10-AM codes Z37.0 (single live birth), Z37.1 (single stillbirth) or Z38.0 (singleton born in hospital) was deemed the birth admission in the APDC dataset. Death may have been detected on any one of the following four datasets. The PDC 'Discharge status' variable or admissions in the APDC where the case mode separation was coded as 'Died' or the NSW RBDM or ABS Death Data where a death had been recorded.

Nulliparous women with a singleton pregnancy were only included in this study to eliminate the potential effect of previous delivery type and plurality.

2.2. Outcomes

Stillbirth and neonatal deaths were calculated from multiple sources but were limited to those that occurred within 28 days of birth and they were only counted once. The maternal admission data for any admission that occurred during the pregnancy, as well as the birth admission for all cases of stillbirth or neonatal death were examined to determine any maternal medical or pregnancy related condition. This methodology of utilising multiple data sources to identify cases has been shown by Lain et al. (2012) to be the most reliable way to increase ascertainment of cases [33].

Gestation is recorded at birth in the PDC and is also recorded in the database according to the woman's menstrual history, usually combined with a routine scan at 12–13 weeks. Onset of labour (spontaneous, induced or no labour) was as recorded in the PDC. The PDC also provided the delivery type data as well as neonatal outcomes, such as admission to neonatal intensive care (NICU) or special care nursery (SCN), resuscitation, APGAR scores, birth weight, as well as reason for caesarean section. Fetal distress was as recorded in the birth record in the APDC utilising the ICD-10-AM codes O68 – labour and delivery complicated by fetal stress. Vaginal delivery refers to both normal vaginal delivery and instrumental vaginal delivery in the context of this study.

2.3. Data analysis

Demographic data is reported between the comparison groups according to HDP status utilising Chi square for dichotomous variables and mean or median comparison for continuous data. When examining delivery type, odds ratios were calculated using logistic regression with and without adjustment for maternal age and gestation at delivery. Taking into account the size of the cohort and the number of analyses undertaken, results were considered significant at the level $p < 0.01$. Analysis was undertaken with IBM SPSS v.20®