European Journal of Obstetrics & Gynecology and Reproductive Biology 183 (2014) 125–131

Contents lists available at ScienceDirect

European Journal of Obstetrics & Gynecology and Reproductive Biology

journal homepage: www.elsevier.com/locate/ejogrb

Epidural analgesia and operative delivery: a ten-year population-based cohort study in The Netherlands

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ARTICLE INFO

Article history:
Received 29 April 2014
Received in revised form 25 September 2014
Accepted 22 October 2014

Keywords:
Epidural analgesia
Caesarean section
Instrumental vaginal delivery
Operative delivery

ABSTRACT

Objective: To describe trends in the use of epidural analgesia (EA) and to evaluate the association of EA with operative deliveries.
Study design: In this population-based, retrospective cohort study, women with an intention to deliver vaginally of a term, cephalic, singleton between 2000 and 2009 ($n = 1378\,458$) were included. Main outcome measures were labor EA rates, unplanned caesarean section (CS), and instrumental vaginal delivery (IVD) including deliveries by either vacuum or forceps. Data were obtained from the Perinatal Registry of The Netherlands and logistic regression analyses were used.
Results: Among nulliparous, EA use almost tripled over the 10-year span (from 7.7% to 21.9%), while rates of CS and IVD did not change much (+2.8% and −3.3%, respectively). Among multiparous, EA use increased from 2.4% to 6.8%, while rates of CS and IVD changed slightly (+0.8% and −0.7%, respectively). Multivariable analysis showed a positive association of EA with CS, which weakened in ten years, from an adjusted OR of 2.35 (95% CI, 2.18 to 2.54) to 1.69 (95% CI, 1.60 to 1.79; $p < 0.001$) in nulliparous, and from an adjusted OR of 3.17 (95% CI, 2.79 to 3.61) to 2.56 (95% CI, 2.34 to 2.81; $p < 0.001$) in multiparous women. A weak inverse association between EA and IVD was found among nulliparous (adjusted OR, 0.76; 95% CI, 0.75 to 0.78), and a positive one among multiparous women (adjusted OR, 2.08; 95% CI, 2.00 to 2.16). Both associations grew slightly weaker over time.
Conclusions: A near triplication of EA use in The Netherlands in ten years was accompanied by relatively stable rates of operative deliveries. The association between EA and operative delivery became weaker. This supports the idea that EA is not an important causal factor of operative deliveries.

Introduction

Throughout the years, many studies have been conducted to study the association of the use of epidural analgesia during labor (EA) with an increased risk of operative delivery. Earlier literature suggested that EA was associated with an increased risk of caesarean section (CS) [1–4]. More recent randomized controlled trials [5,6] and systematic reviews [7–9], however, concluded that EA does not increase the CS rate. A Cochrane systematic review did reveal an increased risk of instrumental vaginal delivery (IVD) (RR, 1.42; 95% CI, 1.28 to 1.57; 23 trials, 7935 women), but no increased risk of CS overall (RR, 1.10; 95% CI, 0.97 to 1.25; 27 trials, 8417 women) [10]. Furthermore, a systematic review showed no increased risk of CS or IVD for nulliparous women receiving early EA at three centimetres or less cervical dilation in comparison with late EA [11]. Other known adverse effect of EA are an increased risk for maternal hypotension (RR 18.23, 95% CI 5.09 to 65.35), motor-blockade (RR 31.67, 95% CI 4.33 to 231.51), maternal fever (RR 3.34, 95% CI 2.63 to 4.23), oxytocin administration (RR 1.19, 95% CI 1.03 to 1.39), urinary retention (RR 17.05, 95% CI 4.82 to 60.39), and longer second stage of labor (MD 13.66 min, 95% CI 6.67 to 20.66) [10]. EA did not appear to have an effect on neonatal status as determined by Apgar scores [10].

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http://dx.doi.org/10.1016/j.ejogrb.2014.10.023
0301-2115/

In many countries, the use of EA during labor still increases.[12–16] Traditionally, in The Netherlands, labor EA use was restricted. However, EA use increased from 5.4% in 2003 to 17.9% in 2012 [17]. This trend was attributable to a decreased reluctance of caregivers toward EA and the increasing request of laboring women for effective pain relief. Besides, the publication of a multidisciplinary guideline of the Dutch Societies of Obstetrics & Gynaecology, and Anaesthesiology in 2008, advising adequate pain relief upon request for laboring women, with EA as the preferred method also contributed to the increased use [18].

The increase in EA rate in the past ten years allows us to study the effect of a more liberal EA use on the rate of operative deliveries. The purpose of this study was to evaluate whether the increasing trend of EA use over a period of ten years in our country was accompanied by an increase of CS or IVD (including deliveries by either vacuum or forceps) rates, as might be expected under the condition of a strong causal association between the two. We also assessed whether the association between EA and CS/IVD rates weakened over time, as might be expected in an era in which use of EA becomes more liberal and less problem-driven.

Materials and methods

Study population

Data for this retrospective cohort study were obtained from the Perinatal Registry of The Netherlands (PRN). This nationwide database contains the linked and validated data from three registries: the national obstetric database for midwives (LVR-1), which includes the home deliveries that account for about 22% of all deliveries; the national obstetric database for gynecologists (LVR-2); and the national neonatal/pediatric database (LNR). The PRN database includes 96% of the approximately 180 000 yearly deliveries in The Netherlands that occur after 16 weeks' gestation [17].

For the present study, data were collected on women who delivered between January 1, 2000 and January 1, 2010. The study population included women who delivered live born singletons in cephalic position between 37^{0+} weeks and $<42^{0+}$ weeks' gestation. Women with a planned CS and women who delivered fetuses with congenital anomalies were excluded from analysis. Dead newborns and fetuses with congenital anomalies were excluded while in these cases a caesarean section would not be considered without a very important additional reason. The trial was reported in concordance with the STROBE statement [19].

Outcome measures

The primary study outcome was operative delivery, defined as either unplanned CS, or IVD (including deliveries by either vacuum or forceps).

Statistical analysis

Labor characteristics in nulliparous and multiparous women were evaluated using contingency tables and chi-square analysis.

Logistic regression analyses were used to study the association between EA and our primary outcomes. For each outcome we calculated the odds ratio (OR) and 95% confidence interval (CI) and adjusted for potential confounders known to be related to EA and CS or IVD. Potential confounders related to EA and CS or IVD were selected from literature or on clinical experience. The following

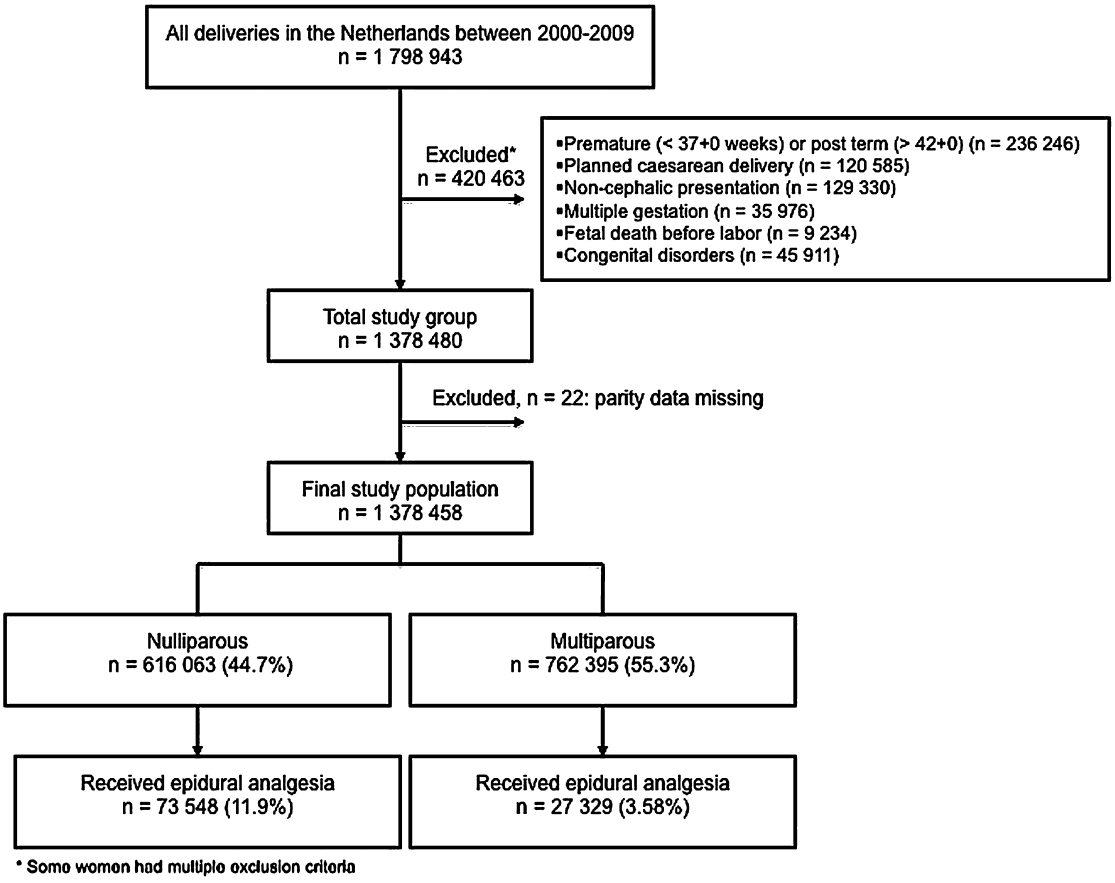

Fig. 1. Study population flowchart.