BMJ Open

Maternal childbirth experience and pain relief methods: a retrospective 7-year cohort study of 85 488 parturients in Finland

Johanna Joensuu ,[1,2] Hannu Saarijärvi,[3] Hanna Rouhe,[1,4] Mika Gissler,[5,6] Veli-Matti Ulander,[1] Seppo Heinonen,[1,4] Paulus Torkki,[2] Tomi Mikkola[1,4]

To cite: Joensuu J, Saarijärvi H, Rouhe H, *et al*. Maternal childbirth experience and pain relief methods: a retrospective 7-year cohort study of 85 488 parturients in Finland. *BMJ Open* 2022;**12**:e061186. doi:10.1136/bmjopen-2022-061186

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (http://dx.doi.org/10.1136/bmjopen-2022-061186).

Received 18 January 2022
Accepted 22 April 2022

Check for updates

© Author(s) (or their employer(s)) 2022. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

[1]Department of Obstetrics and Gynaecology, Helsinki University Central Hospital, Helsinki, Uusimaa, Finland
[2]Department of Public Health, University of Helsinki, Helsinki, Uusimaa, Finland
[3]Faculty of Management and Business, Tampere University, Tampere, Finland
[4]Faculty of Medicine, University of Helsinki, Helsinki, Uusimaa, Finland
[5]Knowledge Brokers, Finnish Institute for Health and Welfare, Helsinki, Uusimaa, Finland
[6]Molecular Medicine and Surgery, Karolinska Institute, Stockholm, Sweden

Correspondence to
Mrs Johanna Joensuu;
johanna.joensuu@hus.fi

ABSTRACT

Objectives The aim of this study was to analyse the relation between the used labour pain relief and childbirth experience measured by Visual Analogue Scale (VAS).

Design A retrospective cohort study.

Setting Childbirth in five Helsinki University Hospital delivery units from 2012 to 2018.

Primary outcome measure Childbirth experience measured by VAS and classified in three groups (negative VAS=1–5, positive VAS=6–8 and highly positive=9–10).

Results The use of epidural or non-epidural compared with non-medical pain relief methods decreased the likelihood to experience highly positive childbirth for primiparous (adjusted OR (aOR)$_{EPIDURAL}$=0.64, 95% CI 0.57 to 0.73; and aOR$_{NON\text{-}EPIDURAL}$=0.76, 95% CI 0.66 to 0.87) and multiparous (aOR$_{EPIDURAL}$=0.90, 95% CI 0.84 to 0.97 and aOR$_{NON\text{-}EPIDURAL}$=0.80, 95% CI 0.74 to 0.86) parturients. The effects of epidural differed between primiparas and multiparas. In multiparas epidural was associated with decreased odds for experiencing negative childbirth compared with the non-medical group (aOR=0.70, 95% CI 0.57 to 0.87), while the effect of epidural was considered insignificant in primiparas (aOR=1.28, 95% CI 0.93 to 1.77).

Conclusion While the use of medical—epidural and non-epidural—pain relief methods were not associated with odds for experiencing negative childbirth in primiparas, using epidural helps to avoid negative experience in multiparas. However, the odds for experiencing highly positive childbirth were decreased if the parturients used any medical pain relief for both primiparas and multiparas. Consequently, the effect of pain relief on the childbirth experience is strongly confounded by indication. Thus, the use of pain relief per se plays a limited role in the complex formation of the overall childbirth experience.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The study was conducted with large data with 85 488 parturients.
⇒ In hospitals routinely collected childbirth experience measure (Visual Analogue Scale (VAS)) minimises the selection bias.
⇒ Using VAS to measure the overall childbirth experience poorly regards the multidimensional nature of the individual experience but works better for management of services.
⇒ Logistic regression models were used to distinguish between negative, positive and highly positive childbirth experiences.
⇒ The childbirth experience was examined according to epidural, non-epidural, and none or non-medical pain relief use.

INTRODUCTION

Childbirth is one of the most painful events that women experience during their lifetime[1]. However, in contrast to the pathological pain, labour pain is an essential part of childbirth signing the onset and progression of labour.[2] Labour pain is described as bearable and positive as well—even simultaneously—as intolerable and traumatic.[3] The experience of pain is affected by several factors including physical, psychological, cultural and fetal elements.[2] Managing that pain according to the wishes of parturient herself is therefore a cornerstone of good quality obstetrical care. In modern obstetrical care it is important to inform and support parturients to opt for suitable pain relief that alleviates the pain and does not impede the natural course of childbirth. Parity is considered as a major determinant of experiencing labour pain.[2 4 5]

Neuraxial analgesia including epidural, spinal and combined spinal–epidural techniques is the most powerful method for labour pain relief.[6 7] Several studies confirm the safety of these methods in maternal and neonatal outcomes.[6] The increased risk of a prolonged second stage of labour and instrumental deliveries associated to these techniques has been suggested.[7–9] However, this has not been supported by recent studies.[6] Having also a few contraindications, epidural techniques have formed a golden standard in labour pain management.[10] Nevertheless,

there are parturients who adhere to natural childbirth and are reluctant to opt for epidural anaesthesia but still permit the use of some medical pain relief, such as nitrous oxide.[11 12]

Effective labour pain relief has been suggested to lead to maternal satisfaction in childbirth.[13] While safe and effective pain reliefs are currently available for every parturient in the developed world, the assumption of direct correlation between effective pain relief and maternal satisfaction has appeared to be too simplistic.[14] Toward that end, prior studies have shown the association between epidural and childbirth experience as being either positive,[15 16] negative[17–19] or insignificant.[20 21] In addition, several other studies have indicated complex relations between pain relief, labour pain and the childbirth experience.[14 22 23] Altogether, the findings are inconsistent, and no consensus exists between the used pain relief and the childbirth experience. We therefore aim to study the relation between the used labour pain relief and the childbirth experience measured by Visual Analogue Scale (VAS) in a large cohort of both primiparas and multiparas.

MATERIALS AND METHODS

The data used in this study comprises 120 437 childbirths in the Helsinki University Hospital District delivery hospitals during the years 2012–2018, as described previously.[24] Excluding multiple pregnancies, preterm deliveries (<37 weeks gestation), stillbirths and caesarean sections, the number of eligible participants was 94 442 (figure 1). The childbirth experience was collected from 90% of parturients concluding the final number of respondents in 36 835 primiparas and 48 653 multiparas.

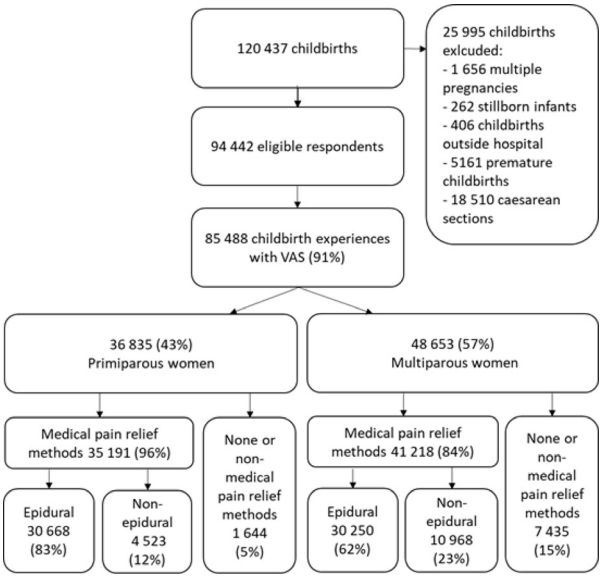

Figure 1 Inclusion criteria and distribution of data according to used pain relief methods. VAS, Visual Analogue Scale.

Measures

The childbirth experience was measured using a 10-point VAS, 1 indicating very negative and 10 indicating very positive childbirth experience.[24] The VAS score was collected during a conversation with a midwife before the discharge from the postpartum unit mostly less than 72 hours after delivery. The patients were encouraged to use a validated VAS ruler, however, they were also able to give the nurse a numerical value for the childbirth experience. The VAS ruler value or the numerical value given by the parturient was recorded as a whole number, in exception, the values less than 0.5 which were rounded to the number one since zero was indicating the missing value in the hospital database. These values form a 10-point non-normally distributed ordinal scale of VAS. For the VAS distribution we divided the scale into three categories (VAS3): negative (VAS=1–5), positive (VAS=6–8) and highly positive childbirth experience (VAS=9–10). The rationale of these categories was based on hospital practices as well as previous studies. The parturients rating their childbirth with VAS ≤5 were contacted for further support by hospital's midwife. These were considered as negative childbirth experiences following former studies.[24 25] Since the rest of scale comprised the majority of all parturients we also aimed to differentiate between positive and highly positive childbirth experiences hypothesising that there might be some diversity in childbirth experience according to used pain relief.

The medical birth register includes data on all pain relief methods used during labour, as recorded by midwifes. We classified the methods used into three groups: epidural, non-epidural and none or non-medical. Parturients in the epidural group had used epidural, spinal or combined spinal–epidural (CSE) anaesthesia. Non-epidural pain relief techniques included nitrous oxide analgesia, local anaesthesia including paracervical and pudendal blocks, and available opioids. Non-pharmacological methods, such as massage, acupuncture or acupressure, water immersion/bath, sterile water injections and breathing techniques were classified as non-medical pain relief methods. These pain relief categories were considered as ordinal. Parturients with several pain relief methods were classified into the most potent group, that is, using both bath and epidural classified them into the epidural group.

There are controversial results about how epidural anaesthesia affects the duration of the first and second stages of labour.[7] It seems that for some parturients the epidural lengthens the first stage of labour while for the others the effect is opposite. As no established definitions were found, we decided to use our data (n=94 833) to classify the duration into reasonable categories. Primiparas and multiparas were separately categorised in quartiles according to the duration of first stage of labour. The differences between these quartiles were analysed using a χ^2 test and significant differences were met according to outcome (VAS3) and key interest variable (used pain relief methods) (table 1).

Table 1 Sample characteristics by used pain relief methods

	Primiparas					Multiparas				
	Epidural	Non-epidural	None or non-medical	All	Sig.	Epidural	Non-epidural	None or non-medical	All	Sig.
	%	%	%	%		%	%	%	%	
Maternal age (%)					<0.001					<0.001
≥30	47.1	51.4	49.5	47.8		69.5	71.3	73.3	70.5	
<30	52.9	48.6	50.5	52.2		30.5	28.7	26.7	29.5	
BMI before pregnancy (%)					<0.001					<0.001
≥30	8.2	5.9	4.6	7.7		12.3	11.3	8.5	11.5	
<30	91.8	94.1	95.4	92.3		87.7	88.7	91.5	88.5	
Diagnosis of fear of childbirth (%)					<0.001					<0.001
Yes	4.0	2.4	2.1	3.7		7.2	3.5	3.2	5.7	
No	96.0	97.6	97.9	96.3		92.8	96.5	96.8	94.3	
Onset of labour					<0.001					<0.001
Induced	25.1	15.3	11.9	23.3		23.7	15.1	10.9	19.7	
Spontaneous	74.9	84.7	88.1	76.7		76.3	84.9	89.1	80.3	
Mode of delivery					<0.001					<0.001
Instrumental vaginal	23.6	13.7	10.0	21.8		6.7	2.7	1.9	5.0	
Normal vaginal	76.4	86.3	90.0	78.2		93.3	98.3	98.1	95.0	
OR	2.77 (2.35 to 3.26)	1.42 (1.18 to 1.70)	ref.			3.74 (3.15 to 4.45)	1.43 (1.17 to 1.76)	ref.		
Birth weight (%)					<0.001					<0.001
≥4000 g	11.5	7.7	5.7	10.8		22.3	17.8	15.1	20.1	
<4000 g	88.5	92.3	94.3	89.2		77.7	82.2	84.9	79.9	
Oxytocin augmentation during labour (%)					<0.001					<0.001
Yes	87.0	47.4	27.8	79.5		64.4	23.7	13.1	47.1	
No	13.0	52.6	72.2	20.5		35.6	76.3	86.9	52.9	
OR	17.38 (15.53 to 19.46)	2.345 (2.07 to 2.65)	ref.			11.95 (11.13 to 12.83)	2.052 (1.89 to 2.22)	ref.		
Duration of first stage of labour (%)					<0.001					<0.001
The shortest quartile	19.8	48.4	56.0	24.9		13.9	38.2	47.4	24.3	
Second quartile	25.4	23.2	21.4	25.0		24.3	27.7	25.6	25.3	
Third quartile	27.0	16.5	12.5	25.0		28.9	20.3	16.6	25.2	
The longest quartile	27.8	11.9	10.2	25.1		32.8	13.9	10.4	25.3	

Continued

Table 1 Continued

	Primiparas					Multiparas				
	Epidural	Non-epidural	None or non-medical	All	Sig.	Epidural	Non-epidural	None or non-medical	All	Sig.
	%	%	%	%		%	%	%	%	
Duration of second stage of labour (%)					<0.001					<0.001
The shortest quartile	23.0	23.1	32.2	23.4		17.0	26.5	36.8	22.1	
Second quartile	25.5	23.5	22.7	25.1		24.6	28.0	27.9	25.9	
Third quartile	26.1	26.7	22.7	26.0		28.3	24.7	20.5	26.3	
The longest quartile	25.5	26.7	22.4	25.5		30.1	20.8	14.7	25.7	
N	30 668	4523	1644	36 835		30 250	10 968	7435	48 653	

BMI, body mass index.

We replicated the similar procedure for the duration of the second stage of labour. The dependency between the childbirth experience and second stage quartiles as well as between the pain relief methods and second stage quartiles were also confirmed using χ^2 test (table 1). The marginal distributions of quartiles appear to differ from exact quartiles especially when the second stage is considered (table 1). This is due to the measurement in minutes and narrow distribution of second stage. Setting the limits necessarily violates the quartile proportions.

Oxytocin is used to accelerate the progress of labour when poor uterine contradictions are considered to decelerate the labour. It is also recognised that inappropriate use of oxytocin may cause harm to maternal outcomes.[23] An association between epidural anaesthesia and the need for oxytocin augmentation of labour was not confirmed by the Cochrane review on only two randomised controlled trials,[26] while the opposite effects of oxytocin and epidural on the length of labour are commonly known.[27–29] Therefore, we consider controlling this association essential in order to better understand the linkage between the used pain relief and the childbirth experience.

The induction of labour is associated with a higher risk of prolonged labour. Moreover, inducting labour has been shown to harm the childbirth experience, especially if additional interventions have been required during the labour and delivery.[30]

Maternal age, body mass index (BMI) before pregnancy, diagnosed fear of childbirth (FOC, International Classification of Diseases 10th Revision (ICD-10) code O99.80 in Finland) and birth weight of infant are potential confounding factors in a relation between the pain relief used and the childbirth experience. The information of these factors was classified into two groups in order to reduce the excessive dimensions in the model. Maternal age was divided into two groups using 30 years as a limit. BMI before pregnancy was categorised with the limit of 30 indicating obesity. A birth weight of at least 4000 g was supposed to cause a potential challenge in delivery due to fetal macrosomia. Moreover, the effect of a potentially increased proportion of instrumental deliveries due to epidural on the childbirth experience was controlled in the model.

Statistical analysis

Model construction started including the key interest variable *Used pain relief* to a model 1 to explain the ordinal childbirth experience dividing negative, positive and highly positive childbirth experiences. Model 2 was added with background variables— maternal age, BMI before pregnancy, FOC, onset of labour and birth weight of infant—to control the potential confounding effects. The statistically significant dependence between these background variables and used pain relief are displayed in table 1. Some background variables lost their significance in multivariate models and were excluded on each step, in order to find the most parsimonious model. The duration of the first and second stages of labour was included

in model 3. Despite the non-significant coefficients of specific quartiles of duration, these variables were kept in the model. In model 4 the variable indicating oxytocin augmentation in labour was added. The final model 5 is the parsimonious model including the mode of delivery (spontaneous vs instrumental vaginal delivery).

We used logistic regressions (OR with 95% CIs) to examine the association between used pain relief and childbirth experience. We defined a positive childbirth experience with VAS=6–8 as a reference group. The model construction is executed separately to primiparas (table 2) and multiparas (table 3). Model results are reported with ORs and corresponding asterisks indicating the significant difference from the reference group with OR=1. The p value of less than 0.05 is considered significant in this study. Statistical analysis of this study was performed using IBM SPSS software V.25.

Patient and public involvement

According to the design and data of this study, the involvement of patients and public was not feasible.

RESULTS

In this study, 30 668 (83.3%) primiparous women were classified into the epidural group according to their pain relief usage during labour. Of them, 29 179 were administered an epidural, 6773 a spinal and 5284 CSE anaesthesia. Medical but non-epidural pain relief was used in 4523 (12.3%) primiparous women. Nitrous oxide was used by 4213 of them and 1623 were administered local anaesthesia (271 paracervical and 1352 pudendal blocks), while 422 women used non-epidural pain relief including opioids. The none or non-medical pain relief group constituted 1644 (4.5%) primiparous women and 422 of them used registered non-medical pain relief methods.

Respectively, 30 250 (62.2%) multiparous women were classified into the epidural group, including 22 296 women who used an epidural, 11 514 a spinal and 3560 CSE pain relief. Medical but non-epidural pain relief methods were used by 10 968 (22.5%) multiparous women of whom 10 106 received nitrous oxide, 2953 who were administered local anaesthesia (704 paracervical and 2249 pudendal blocks) and 214 who used non-epidural pain relief including opioids. There were 7435 (15.3%) multiparous women who had no medical pain relief, of whom 1126 had used at least one registered non-medical pain relief methods.

The distribution of data categories according to childbirth experience categories as well as associations between instrumental deliveries and pain relief were checked. The classification of VAS in negative, positive and highly positive childbirth experience produced categories of 2904 (7.9%), 18 386 (49.9%) and 15 545 (42.2%) primiparas, as well as 1546 (3.2%), 17 053 (35.1%) and 30 054 (61.7%) multiparas. Our results indicated an increased association with instrumental deliveries and epidural administered during labour when compared with the group of parturients who did not use any medical pain relief. The elevated ORs (OR=2.8, 95% CI 2.4 to 3.3 for primiparas and OR=3.7, 95% CI 3.2 to 4.5 for multiparas) indicated a substantial increase in risk of instrumental delivery for those using epidural compared with those without any medical pain relief.

Primiparas

Negative compared with positive childbirth experience

In model 1, parturients with epidural anaesthesia had higher odds for experiencing negative childbirth compared with those with none or non-medical pain relief while non-epidural anaesthesia had no effect. However, controlling background variables, duration of labour stages and oxytocin augmentation had no effect to the likelihood for negative childbirth experience in epidural nor non-epidural pain relief groups when compared with those without any medical pain relief (model 4). The increased odds of epidural anaesthesia on a negative childbirth experience were confounded by duration and oxytocin augmentation of labour. Model 5 revealed that instrumental delivery referenced to normal vaginal delivery increases the likelihood of experiencing childbirth as negative (adjusted OR (aOR)=1.89, 95% CI 1.72 to 2.08). Including the mode of delivery to the model of primiparas had only a minor effect to aORs of other factors, but the obvious change was the maternal age losing its significance in model 5. The final model proves that epidural (aOR=1.28, 95% CI 0.93 to 1.77) or non-epidural pain relief methods (aOR=0.89, 95% CI 0.63 to 1.26) had no effect on the likelihood for negative childbirth experience when compared with the none or non-medical group. In addition to instrumental delivery and oxytocin augmentation significant confounding factors in the model were preceding FOC, induced labour and duration of the labour stages.

Highly positive compared with positive childbirth experience

The used pain relief during labour decreased the likelihood of experiencing highly positive childbirth (model 1). These effects stayed significant even when all background variables, duration of labour stages as well as oxytocin augmentation of labour were considered (models 2–4). Interestingly, in the comparison between positive and highly positive childbirth experiences, adding oxytocin augmentation in model 4 changed the aOR of the epidural from 0.56 to 0.63 indicating that a part of the effect of epidural was associated with oxytocin. The final model (5) demonstrated that including the major effect of instrumental delivery (aOR=0.62, 95% CI 0.58 to 0.66), nonetheless, the use of both epidural anaesthesia (aOR=0.64, 95% CI 0.57 to 0.73) and non-epidural pain relief (aOR=0.76, 95% CI 0.67 to 0.87) during labour decreased the likelihood of experiencing highly positive referenced to positive childbirth (see online supplemental table for 95% CIs of aOR).

Multiparas

Model construction for multiparas is depicted in table 3.

Table 2 ORs (with significance) of multinomial logistic models on positive childbirth experience for primiparas

		Model 1	Model 2	Model 3	Model 4	Model 5
		OR	aOR*	aOR	aOR	aOR
Negative childbirth experience (VAS=1–5) (ref. positive childbirth experience (VAS=6–8)						
Used pain relief (ref. none or non-medical)	Epidural	1.919†	1.808†	1.566‡	1.365	1.280
	Medical, non-epidural	1.160	1.172	0.974	0.912	0.885
	None or non-medical	ref.	ref.	ref.	ref.	ref.
Maternal age	≥30 years		1.200†	1.139‡	1.131‡	1.080
BMI before pregnancy	≥30		1.001			
Fear of childbirth	Diagnosed		1.762†	1.712†	1.713†	1.733†
Birth weight	≥4000 g		1.202‡	1.030		
Onset of labour	Induced		1.419†	1.539†	1.504†	1.461†
Duration of first stage (ref. the shortest quartile)	Fourth quartile			1.655†	1.610†	1.519†
	Third quartile			1.175§	1.151§	1.101
	Second quartile			1.080	1.066	1.039
Duration of second stage (ref. the shortest quartile)	Fourth quartile			1.876†	1.841†	1.579†
	Third quartile			1.374†	1.357†	1.324†
	Second quartile			1.101	1.094	1.101
Oxytocin augmentation	Yes				1.295†	1.200§
Mode of delivery	Instrumental					1.891†
Highly positive childbirth experience (VAS=9–10) (ref. positive childbirth experience (VAS=6–8)						
Used pain relief (ref. none or non-medical)	Epidural	0.511†	0.520†	0.562†	0.626†	0.641†
	Medical, non-epidural	0.738†	0.744†	0.734†	0.757†	0.760†
	None or non-medical	ref.	ref.	ref.	ref.	ref.
Maternal age	≥30 years		0.881†	0.900†	0.908†	0.932‡
BMI before pregnancy	≥30		1.016			
Fear of childbirth	Diagnosed		0.743†	0.707†	0.704†	0.703†
Birth weight	≥4000 g		0.880†	0.943		
Onset of labour	Induced		0.831†	0.798†	0.819†	0.829†
Duration of first stage (ref. the shortest quartile)	Fourth quartile			0.707	0.729†	0.747†
	Third quartile			0.850†	0.869†	0.884†
	Second quartile			0.970	0.98	0.988
Duration of second stage (ref. the shortest quartile)	Fourth quartile			0.712†	0.729†	0.791†
	Third quartile			0.840†	0.851†	0.856†
	Second quartile			0.921§	0.928§	0.922§
Oxytocin augmentation	Yes				0.805†	0.834†
Mode of delivery	Instrumental					0.618†
Classification %		51.5	51.6	52.3	52.4	52.9

* Adjusted OR (aOR)—adjusted for all other variables in the column by multinomial logistic regression.
†P<0.001.
‡P<0.01.
§P<0.05.
BMI, body mass index; VAS, Visual Analogue Scale.

Table 3 ORs (with significance) of multinomial logistic models on positive childbirth experience for multiparas

		Model1	Model 2	Model 3	Model 4	Model 5
		OR	aOR*	OR	OR	OR
Negative childbirth experience (VAS=1–5) (ref. positive childbirth experience (VAS=6–8)						
Used pain relief (ref. none or non-medical)	Epidural	1.117	1.021	0.807†	0.700‡	0.702‡
	Medical, non-epidural	1.252†	1.213	1.078	1.044	1.057
	None or non-medical	ref.	ref.	ref.	ref.	ref.
Maternal age	≥30 years		0.995	1.009		
BMI before pregnancy	≥30		1.047			
Fear of childbirth	Diagnosed		1.554‡	1.564‡	1.564‡	1.498‡
Birth weight	≥4000 g		1.067	0.988		
Onset of labour	Induced		1.456‡	1.479‡	1.362‡	1.339‡
Duration of first stage (ref. the shortest quartile)	Fourth quartile			1.307§	1.253†	1.177
	Third quartile			1.002	0.990	0.974
	Second quartile			0.913	0.913	0.913
Duration of second stage (ref. the shortest quartile)	Fourth quartile			1.499‡	1.425‡	1.217
	Third quartile			1.162	1.114	1.118
	Second quartile			0.988	0.981	0.982
Oxytocin augmentation	Yes				1.384‡	1.306‡
Mode of delivery	Instrumental					2.244‡
Highly positive childbirth experience (VAS=9–10) (ref. positive childbirth experience (VAS=6–8)						
Used pain relief (ref. none or non-medical)	Epidural	0.692‡	0.726‡	0.842‡	0.904§	0.904†
	Medical, non-epidural	0.760‡	0.770‡	0.788‡	0.798‡	0.795‡
	None or non-medical	ref.	ref.	ref.	ref.	ref.
Maternal age	≥30 years		0.947†	0.971		
BMI before pregnancy	≥30		0.944			
Fear of childbirth	Diagnosed		0.702‡	0.750‡	0.751‡	0.763‡
Birth weight	≥4000 g		0.918‡	0.959		
Onset of labour	Induced		0.801‡	0.767‡	0.805‡	0.809‡
Duration of first stage *(ref. the shortest quartile)*	Fourth quartile			0.789‡	0.810‡	0.827‡
	Third quartile			0.957‡	0.966	0.968
	Second quartile			1.057	1.058	1.057
Duration of second stage *(ref. the shortest quartile)*	Fourth quartile			0.562‡	0.575‡	0.614‡
	Third quartile			0.790‡	0.793‡	0.800‡
	Second quartile			0.869‡	0.869‡	0.870‡
Oxytocin augmentation	Yes				0.838‡	0.856‡
Mode of delivery	Instrumental					0.527‡
Classification %		61.7	61.8	62.4	62.4	62.9

*Adjusted OR (aOR)—adjusted for all other variables in the column by multinomial logistic regression.
†P<0.05.
‡P<0.001.
§P<0.01.
BMI, body mass index; VAS, Visual Analogue Scale.

Negative compared with positive childbirth experience

ORs of epidural or non-epidural pain relief methods in table 3 (model 1) were above 1, indicating an increased likelihood for negative childbirth experience compared with those who had no medical pain relief. After adding background variables to model 2, ORs revealed that the effects of pain relief methods did not differ from each other. Adding the duration of the first and second stages of labour (model 3) and oxytocin augmentation after that (model 4), epidural decreased the likelihood for negative childbirth experience while non-epidural had no effect. Accounting the mode of delivery in model 5, the changes in estimates of aOR were minor, while the effect of instrumental delivery on a negative childbirth experience was substantial (aOR=2.24, 95% CI 1.88 to 2.68). In addition, regarding multiparas, the duration of the first or second stages of labour had no significant effect on the likelihood of experiencing negative childbirth (model 5). In addition to the epidural's decreasing effect on negative childbirth experience (aOR=0.70, 95% CI 0.57 to 0.87), there were several increasing effects listed in order of magnitude: instrumental delivery, FOC, induced labour and oxytocin augmentation.

Highly positive compared with positive childbirth experience

When investigating which factors differed in highly positive childbirth experiences versus positive childbirth experiences, only two background variables (FOC and onset of labour) were considered significant when adding the durations of labour stages in model 3. All quartiles of the second stage of labour had a strong negative effect on the likelihood of a highly positive childbirth experience, while the duration of the first stage had a significant effect only if the labour was included in the longest (fourth) quartile. After controlling these confounding effects both epidural and non-epidural pain relief methods decreased the odds of having a highly positive childbirth experience. This effect persisted after controlling the effect of oxytocin augmentation (aOR=0.84, 95% CI 0.80 to 0.88), even though it reduced the independent decreasing effects of epidural and non-epidural pain relief methods on a highly positive childbirth experience. Adding the mode of delivery in model 5, the aOR estimates of other factors stayed stable resulting in aOR=0.90 (95% CI 0.84 to 0.97) of epidural and aOR=0.80 (95% CI 0.74 to 0.86) of non-epidural pain relief, although the decreasing effect of instrumental delivery is strong (aOR=0.53, 95% CI 0.47 to 0.58) (see online supplemental table for 95% CIs of aOR).

DISCUSSION

In our study we found that the effects of epidural anaesthesia or non-epidural pain relief had no impact on the likelihood for a negative childbirth experience among primiparas compared with positive when all confounding effects were controlled. However, both pain relief methods reduced the odds of experiencing a highly positive childbirth referenced to a positive childbirth. The parallel decreasing effects of both epidural and non-epidural pain relief methods were identified for multiparas when odds of a highly positive childbirth experience were compared with a positive childbirth experience. In spite of that, it should be noticed that the effect of epidural is barely significant and, therefore, it should be interpreted with caution. The reversed effect was obtained regarding epidural usage among multiparas. An epidural decreased the odds for a negative childbirth experience when other known factors were controlled, while non-epidural pain relief had no effect.

The results of this study follow the findings that the association between pain relief and the overall childbirth experience is complex.[14] The experience of labour pain, the course of labour and many psychological factors have an impact on what pain relief methods are opted. Retrospective design of this study cannot investigate in detail the sequence of various birth-related events, but nevertheless addresses the sum of those events. This perspective is highly prone to an effect of confounding by indication. The multidirectional relations of pain relief, onset of labour, duration of labour, oxytocin augmentation, mode of delivery and FOC confound the results and may lead to misinterpretations of their impact on the experience. This is supported by our finding that labours with none or few risk factors (FOC, high maternal age, high BMI before pregnancy, macrosomia or labour induction) were associated with more positive childbirth experiences. It is widely known that intolerable pain contributes to the negative childbirth experience for some parturients[25 31 32] and epidural is the most effective in pain management.[6] Consequently, decreasing the likelihood of medical pain relief methods (both epidural and non-epidural) to experience highly positive childbirth might be due to the effect of confounding by indication. The more challenging and painful the labour, the more likely parturients request medical pain relief,[33] which is itself a risk for a more negative childbirth experience.

Another perspective to the impeding effect of medical pain relief on a highly positive childbirth experience might be the view that some women in our culture seek natural childbirth as the dominant discourse of a successful delivery.[11 12] This expectation might impair the experience, especially for primiparas who may be more vulnerable due to the lack of experience of labour pain.[12] It has been shown that mismatch between expectations and experiences impact negatively on women's satisfaction with birth.[34] Furthermore, some women have a desire for a drug-free labour though simultaneously they expect to need some sort of pain relief to go through it.[1] This all has been well summarised by saying 'people are generally happy when they get what they want'.[14]

Our findings clearly show that the crude risk for instrumental delivery was increased in the epidural group. However, it should be acknowledged that these risks are not controlled for any potential confounders, and therefore they should be interpreted with caution. Our data

are in line with most[7–9] but not all studies.[6] The impact of instrumental delivery on the childbirth experience was strong, as it nearly doubled the aOR of negative childbirth experience in primiparas and more than doubled the aOR in multiparas when compared with unassisted vaginal delivery which is congruent with the findings in previous studies.[35–37] Correspondingly, the aORs for experiencing a highly positive childbirth were nearly halved for both primiparas and multiparas in case of instrumental delivery. It is also noteworthy that the use of oxytocin gave higher odds to a negative childbirth experience for both primiparas and multiparas.[37]

A limitation of our study is that we had no data of expectations or hopes of parturients regarding pain relief methods and midwife support. Preferring non-medical pain relief methods and ending up with epidural might impair the childbirth experience compared with the parturient with a similar course of labour and delivery with the epidural as she wanted. It's noteworthy that model classification percentages were 53% for primiparas and 63% for multiparas indicating that these included factors partly explain the childbirth experience. It signifies that many other factors outside this study influence the overall childbirth experience.[14 33] However, these models giving consistent results according to prior studies confirmed that this method is a valid tool for studying the relations between the childbirth experience and used pain relief methods. Since this was a register-based study, the measure of midwife support was not available. However, it should be considered that in Finnish delivery system the deliveries are primarily midwife-led while the obstetrician is requested if complications occur. Thus, the behaviour and attitudes of caregivers are more powerful factors than used pain relief methods when explaining the childbirth experience.[33]

Using VAS to measure the overall childbirth experience inevitably affects the multidimensional nature of the childbirth experience. However, it has shown to measure the childbirth experience sufficiently.[25 30 37] The classification of VAS scale into three categories was a novel way to differentiate between negative, positive and highly positive childbirth experience. The limit of negative childbirth experience (VAS≤5) was based on routines of hospital[24] and was also used in Larsson's and colleagues' study.[25] In addition, we wanted to differentiate between positive and highly positive childbirth experience to discover potential disparities between these groups according to used pain relief methods. This separation was hypothesised to reveal potential differences between an ideal natural childbirth and childbirth with medical pain relief which was slightly supported by our findings. These shortages are then diluted with the large data with minimal selection bias. Measurement of the childbirth experience shortly after delivery (<72 hours) produces mostly stable perceptions,[38] although traumatic experience may take longer to integrate.[39] Using the validated register-based data, we pass many measurement issues that challenge the validity of measures.

To conclude, this study indicates that association between the experience and used pain relief during labour is strongly confounded by indication. The optimum childbirth experience is achieved when the uncomplicated course of labour is combined with sufficient pain relief according to the wishes of parturient. Therefore, the wide variety of pain relief methods available should allow parturients to opt for the most appropriate combination of methods through the delivery to assure the best possible childbirth experience. The parturients should beforehand be well informed about possible pain relief methods and supported to be open-minded to do their own journey without any restrictive scenarios, since every childbirth is unique and, therefore, unpredictable.

Contributors The study design and data collection by TM, SH, V-MU and MG. JJ planned and made the statistical analysis and wrote the manuscript acting as a guarantor of the article. The manuscript was read and improved by TM, SH, MG, HS, HR and PT. All authors approved the final manuscript.

Funding This study was supported by Helsinki University Hospital Research Grant (grant number TYH2019302). The funding source did not participate in the design and the conduction of the study; the collection, management, analysis or interpretation of the data; the preparation, review or approval of the manuscript; and the decision to submit the article for publication. Open access funded by Helsinki University Library.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval The study was approved by the Institutional Review Board of the Helsinki University Hospital (HUS/483/2020). As the data used in this study were register based and all pseudonymised before the accession, additional ethical approval was not required.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement No data are available. The data was granted to use in this study and is not allowed to reuse without other permission.

Supplemental material This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: http://creativecommons.org/licenses/by-nc/4.0/.

ORCID iD

Johanna Joensuu http://orcid.org/0000-0002-6349-7419

REFERENCES

1 Lally JE, Murtagh MJ, Macphail S, *et al*. More in hope than expectation: a systematic review of women's expectations and experience of pain relief in labour. *BMC Med* 2008;6:1–10.
2 Lowe NK. The nature of labor pain. *Am J Obstet Gynecol* 2002;186:S16–24.
3 Lundgren I, Dahlberg K. Women's experience of pain during childbirth. *Midwifery* 1998;14:105–10.

4 Brownridge P. The nature and consequences of childbirth pain. *Eur J Obstet Gynecol Reprod Biol* 1995;59 Suppl:S9–15.
5 Sheiner E, Sheiner EK, Shoham-Vardi I. The relationship between parity and labor pain. *Int J Gynaecol Obstet* 1998;63:287–8.
6 Anim-Somuah M, Smyth RMD, Cyna AM. Epidural versus non-epidural or no analgesia for pain management in labour5). *Cochrane Database Syst Rev* 2018;2018.
7 Cambic CR, Wong CA. Labour analgesia and obstetric outcomes. *Br J Anaesth* 2010;105 Suppl(1):50–60.
8 Antonakou A, Papoutsis D. The effect of epidural analgesia on the delivery outcome of induced labour: a retrospective case series. *Obstet Gynecol Int* 2016;2016:1–5.
9 Jones L, Othman M, Dowswell T. Pain management for women in labour: an overview of systematic reviews 3. *Cochrane Database Syst Rev* 2012;96.
10 Gizzo S, Noventa M, Fagherazzi S, *et al*. Update on best available options in obstetrics anaesthesia: perinatal outcomes, side effects and maternal satisfaction. fifteen years systematic literature review. *Arch Gynecol Obstet* 2014;290:21–34.
11 Lupton D. *Medicine as Culture: Illness, Disease and the Body*. 3rd ed. Sage, 2012.
12 Símonardóttir S, Rúdólfsdóttir AG. The “good” epidural: Women’s use of epidurals in relation to dominant discourses on “natural” birth. *Fem Psychol* 2021;31:212–30.
13 Skowronski GA. Pain relief in childbirth: changing historical and feminist perspectives. *Anaesth Intensive Care* 2015;43 Suppl:25–8.
14 Camann W, Pain CW. Pain, pain relief, satisfaction and excellence in obstetric anesthesia: a surprisingly complex relationship. *Anesth Analg* 2017;124:383–5.
15 Dickinson JE, Paech MJ, McDonald SJ, *et al*. Maternal satisfaction with childbirth and intrapartum analgesia in nulliparous labour. *Aust N Z J Obstet Gynaecol* 2003;43:463–8.
16 Söderholm NT, Turkmen S. Impact of epidural analgesia in labour on neonatal and maternal outcomes. *Open J Obstet Gynecol* 2018;08:767–79. Journal Article.
17 Fenaroli V, Molgora S, Dodaro S, *et al*. The childbirth experience: obstetric and psychological predictors in Italian primiparous women. *BMC Pregnancy Childbirth* 2019;19:1–7.
18 Lindholm A, Hildingsson I. Women's preferences and received pain relief in childbirth - A prospective longitudinal study in a northern region of Sweden. *Sex Reprod Healthc* 2015;6:74–81.
19 Maimburg RD, Væth M, Dahlen H. Women's experience of childbirth - A five year follow-up of the randomised controlled trial "Ready for Child Trial". *Women Birth* 2016;29:450–4.
20 Howell CJ, Kidd C, Roberts W, *et al*. A randomised controlled trial of epidural compared with non-epidural analgesia in labour. *BJOG* 2001;108:27–33.
21 Bhatt H, Pandya S, Kolar G. The impact of labour epidural analgesia on the childbirth expectation and experience at a tertiary care center in southern India. *J Clin Diagn Res* 2014;8:73.
22 Garthus-Niegel S, Knoph C, von Soest T, *et al*. The role of labor pain and overall birth experience in the development of posttraumatic stress symptoms: a longitudinal cohort study. *Birth* 2014;41:108–15.
23 Selin L, Berg M, Wennerholm U-B, Wennerholm Ulla-Britt, *et al*. Dosage of oxytocin for augmentation of labor and women's childbirth experiences: a randomized controlled trial. *Acta Obstet Gynecol Scand* 2021;100:971–8.
24 Joensuu J, Saarijärvi H, Rouhe H, *et al*. Maternal childbirth experience and time of delivery: a retrospective 7-year cohort study of 105 847 parturients in Finland. *BMJ Open* 2021;11:e046433.
25 Larsson C, Saltvedt S, Edman G, *et al*. Factors independently related to a negative birth experience in first-time mothers. *Sex Reprod Healthc* 2011;2:83–9.
26 Costley PL, East CE. Oxytocin augmentation of labour in women with epidural analgesia for reducing operative deliveries. *Cochrane Database Syst Rev* 2012;5:CD009241.
27 Alexander JM, Lucas MJ, Ramin SM, *et al*. The course of labor with and without epidural analgesia. *Am J Obstet Gynecol* 1998;178:516–20.
28 Shmueli A, Salman L, Orbach-Zinger S, *et al*. The impact of epidural analgesia on the duration of the second stage of labor. *Birth* 2018;45:377–84.
29 Leighton BL, Halpern SH. The effects of epidural analgesia on labor, maternal, and neonatal outcomes: a systematic review. *Am J Obstet Gynecol* 2002;186:S69–77.
30 Adler K, Rahkonen L, Kruit H. Maternal childbirth experience in induced and spontaneous labour measured in a visual analog scale and the factors influencing it; a two-year cohort study. *BMC Pregnancy Childbirth* 2020;20:1–7.
31 Simpson M, Catling C. Understanding psychological traumatic birth experiences: a literature review. *Women Birth* 2016;29:203–7.
32 Nystedt A, Hildingsson I. Diverse definitions of prolonged labour and its consequences with sometimes subsequent inappropriate treatment. *BMC Pregnancy Childbirth* 2014;14:1–11.
33 Hodnett ED. Pain and women's satisfaction with the experience of childbirth: a systematic review. *Am J Obstet Gynecol* 2002;186:S160–72.
34 Webb R, Ayers S, Bogaerts A, *et al*. When birth is not as expected: a systematic review of the impact of a mismatch between expectations and experiences. *BMC Pregnancy Childbirth* 2021;21:1–14.
35 Carquillat P, Boulvain M, Guittier M-J. How does delivery method influence factors that contribute to women's childbirth experiences? *Midwifery* 2016;43:21–8. Journal Article.
36 Waldenström U. Women's memory of childbirth at two months and one year after the birth. *Birth* 2003;30:248–54.
37 Falk M, Nelson M, Blomberg M. The impact of obstetric interventions and complications on women’s satisfaction with childbirth a population based cohort study including 16,000 women. *BMC Pregnancy Childbirth* 2019;19:1–9.
38 Turkmen S, Tjernström M, Dahmoun M, *et al*. Post-Partum duration of satisfaction with childbirth. *J Obstet Gynaecol Res* 2018;44:2166–73.
39 Waldenström U. Why do some women change their opinion about childbirth over time? *Birth* 2004;31:102–7.