Maternal Childbirth Experience and Time in Labor - A Population-Based Cohort Study

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Abstract

A negative childbirth experience may have long term negative effects on maternal health. New international guidelines allow a slower progress of labor in the early active phase, however a longer time in labor may influence the childbirth experience.

In this population-based cohort study including 26,429 women, who gave birth between Jan 2016 to March 2020, the association between duration of the different phases of active labor and childbirth experience was studied. The women assessed their childbirth experience by visual analogue scale (VAS) score. Data including VAS score and labor time estimates were obtained from electronic medical records and adjusted odds ratios (aOR) were calculated.

The prevalence of negative childbirth experience (VAS 1-3) was 4,9%. A significant association between longer duration of all phases of active labor and a negative childbirth experience (VAS 1-3) was found for primi- and multipara. The aOR for negative childbirth experience and longer time in active labor in primipara was 1.88, 95% CI (1.59-2.22) and for multipara aOR 1.90, 95% CI (1.59-2.28).

It is of great importance to identify and optimize the clinical care of women with prolonged labor to reduce the risk of negative childbirth experience and associated adverse long-term effects.

Introduction

The woman's experience of care during childbirth is as important as an optimal clinical care to achieve desired outcomes of childbirth and labor according to the World Health Organization (WHO) ¹. Despite this, a negative childbirth experience has been reported in 5-10% of laboring women ²⁻⁵ which may have long-term effects on maternal health ⁶. Posttraumatic stress disorder, postpartum depression and dysfunctional bonding with the newborn have been related to a traumatic childbirth experience ^{7,8}. Furthermore, a negative childbirth experience may lead to secondary fear of childbirth, longer interval to subsequent deliveries and increased risk of future cesarean section (CS) ⁹⁻¹².

Maternal childbirth experience is affected by several factors including maternal age, mode of delivery, postpartum hemorrhage, low Apgar score, induction of labor and obstetric anal sphincter injury ^{2,3,6,13}. Emergency CS has been described as a significant risk factor for a negative childbirth experience ^{2,4,6,14,15}.

The CS rate increases worldwide ¹⁶. To reduce the incidence of emergency CS due to failure to progress, new guidelines on normal labor progression has been published by the WHO ¹ and the American College of Obstetricians and Gynecologists (ACOG) ¹⁷, allowing a slower progress in the beginning of the active phase of labor compared with the traditional guidelines by Friedman ¹⁸. However, a long time in labor may increase the risk of a negative childbirth experience, which in turn may lead to a future demand of CS in the following pregnancy ^{19,20}.

The knowledge about maternal childbirth experience in relation to time in active labor is sparse and studies show conflicting results. A few studies have analyzed duration of the active labor in primiparous women, most without taking possible confounders into account, and concluded that prolonged labor was a risk factor for a negative childbirth experience^{14,19,21}. Another study could not confirm that duration of the first stage of labor affected the childbirth experience but found that a longer pushing phase contributed to a negative childbirth experience²². Further, in a Swedish single center study the maternal childbirth satisfaction was not affected by the duration of neither the latent nor the active phase of labor²³.

There are not only conflicting results concerning the impact of time in labor on maternal childbirth experience in the previous literature, but there is also inconsistent data on relevant adjustments related to time in labor as the exposure. Most of these studies are based on single center cohorts, increasing the risk of selection bias. To the best of our knowledge, no previous population-based study has examined the association between time in labor and maternal childbirth experience.

Thus, this study aimed to evaluate whether the duration of the different phases of active labor affected the women's self-reported childbirth experience in a large population-based cohort, taking relevant confounders into consideration. We hypothesized that prolonged duration of active labor increased the risk for a negative childbirth experience.

Methods

Study-design and population

This retrospective population-based cohort study was conducted between January 2016 to March 2020 at all the seven delivery units in the southeast health care region of Sweden. All women giving birth to a singleton infant at or above 37 gestational weeks were included. The exclusion criteria were missing data on childbirth experience and missing labor time estimates. Further exclusion criteria were elective CS, non-cephalic presentation and stillbirth.

After delivery, the women were asked by the midwife at the postnatal ward to assess their overall experience of the childbirth by using a visual analog scale (VAS) ranging from 1 to 10, where 1 is a very negative experience and 10 is a very positive experience. This assessment of satisfaction of childbirth by VAS is a well-established routine in the postnatal care at all participating delivery units included in this study. The VAS scoring is usually completed within two days after delivery, before discharge from the postnatal ward and is documented in the women's electronical medical record.

Data collection and definitions

Data in this study were obtained from the women's electronical medical records. The maternal variables that were extracted included the self-reported childbirth experience VAS score, maternal age at time of delivery, early pregnancy body mass index (BMI), parity and gestational age at delivery. Labor and

neonatal variables assessed were onset of labor (spontaneous or induction), usage of epidural anesthesia, oxytocin augmentation, mode of birth (non-operative vaginal delivery, operative vaginal delivery or emergency CS), obstetric anal sphincter injury, postpartum hemorrhage, Apgar score at five minutes and birth weight. Further, the time estimates for start of active labor, start of pushing contractions, and time of birth were extracted from the electronic medical records.

Maternal BMI was categorized according to the World Health Organization (WHO) classification: <18.5 kg/m² (underweight), 18.5-24.9 kg/m² (normal weight), 25.0-29.9 kg/m² (overweight), 30-34.9 kg/m² (class I obesity), 35.0-39.9 kg/m² (class II obesity) and ≥ 40 kg/m² (class III obesity).

Primiparous women and multiparous women were analyzed separately. Women with induced labor and a spontaneous onset of labor were included in the analyses as well as women with emergency CS.

The main exposure was duration of labor. The different labor time variables that were analyzed were the duration of the total active labor (from start of the active labor until the time of birth), the active phase in the first stage of labor (from start of the active labor until start of the pushing efforts) and the pushing phase. In the absence of internationally established definitions of prolonged duration of labor and for the purpose of the present study, prolonged labor was defined based on clinically relevant cut offs. The total active labor was defined prolonged if duration was ≥ 12 hours in primiparous women and ≥ 6 hours in multiparous women. The active phase of the first stage of labor was defined prolonged if duration was ≥ 10 hours in primiparous women and ≥ 5 hours in multiparous women. The pushing phase was defined prolonged if the duration was ≥ 60 minutes in primiparous women and ≥ 30 minutes in multiparous women. Incorrect values of the labor time estimates were excluded. Information on start of the pushing phase was not available for all women. Start of active labor was defined according to the Swedish nationally recommended definition, which states that at least two out of three of the following criteria must be fulfilled: spontaneous rupture of the membranes, regular painful contractions (2-3/10 minutes), and the cervix dilated four centimetres or effaced and dilated more than one centimetre. In addition to these criteria, the labor should progress within the following two hours ²⁴.

The midwife at the delivery ward prospectively documented the time when the active phase and the pushing efforts started and the time of birth.

Outcomes

The main outcome was maternal childbirth experience by VAS score. The VAS score was dichotomized into negative birth experience (VAS 1-3) and not being dissatisfied with childbirth (VAS 4-10). The definition of negative childbirth experience was based on the clinical recommendation at the participating study sites to offer extra psychologic support to the women scoring VAS 1-3 ². The VAS score was further coded into three groups for descriptive analyses: negative birth experience (VAS 1-3), intermediate birth experience (VAS 4-7) and positive birth experience (VAS 8-10). The classification of positive birth experience as VAS 8-10 was based on the definition used in the national Swedish pregnancy register ²⁵.

Statistics

Data is presented as mean and one standard deviation (SD), or number and per cent. Differences in the categorical labor time variables between the VAS groups were analyzed with Chi-square test. One-way ANOVAs were used to compare mean durations of the total active labor, the active phase in first stage of labor and the pushing phase among the three VAS groups. When the labor time variables were not normally distributed, the logarithmic values were used. Multivariable logistic regression analyses were used to study the association between time in labor and binary outcomes; negative birth experience (VAS 1-3) and not being dissatisfied with childbirth (VAS 4-10), presented as crude and adjusted odds ratios (ORs and aORs). In the multivariable analyses, adjustments were made for maternal age, BMI and fetal birthweight. The reference categories for the analyses of the labor time estimates in primiparous women were set as 6-11.9 hours in total active labor, < 10 hours in the active phase in first stage of labor, and < 60 minutes in the pushing phase. For multiparous women the reference categories were chosen as < 6 hours in total active labor, <5 hours in the active phase in first stage of labor, and < 30 minutes in the pushing phase. The statistical analyses were performed using IBM SPSS version 26 (IMB inc, Armok, NY). A p-value <0.05 was considered statistically significant.

Ethical approval

The Regional Ethical Review Board in Linköping, Sweden approved this study on October 26th, 2018 (Dnr 2018/337-31) and on January 1st, 2020 (Dnr 2019-04529). All methods were performed in accordance with the relevant guidelines and regulations.

Results

A total number of 26,429 women who had assessed their childbirth experience by VAS score were included in the study. A flowchart is presented in Figure 1. Of all eligible women, 82.7 % had a documented VAS score. Overall, 69.7 % ($n = 18,428$) of the women had a positive birth experience (VAS 8-10), whereas 4.9 % ($n = 1,298$) reported a negative birth experience (VAS 1-3).

The maternal characteristics, obstetric interventions and outcomes in the study-population, categorized according to a positive, intermediate or negative childbirth experience, are presented in Table 1. The women who had a negative childbirth experience were statistically significantly older, primiparous, at gestational age ³ 41 weeks, had induced labor, an infant with Apgar score < 7 at 5 minutes or with a birthweight of ³ 4.5 kg, compared with the women in the total study population. Further, the frequencies of epidural anesthesia, oxytocin augmentation, operative vaginal birth or emergency CS, occurrence of obstetric anal sphincter injury and postpartum hemorrhage ³ 1000ml were statistically significantly higher among women with a negative childbirth experience (Table 1, $p < 0.05$ for all variables, not shown in Table 1).

Table 1. Maternal characteristics, obstetric interventions and outcomes in women with categorized childbirth experiences (VAS).

	Total study population n = 26,429 n (%)	VAS 1-3 (negative childbirth experience)	VAS 4-7 (intermediate childbirth experience)	VAS 8-10 (positive childbirth experience)
Maternal age (years)				
Mean [SD]		30.6 [4.8]	30.2 [4.7]	30.0 [4.8]
N (%)	26,295 (99.5)			
< 25	3,593 (13.6)	143 (11.1)	865 (12.9)	2,585 (14.1)
25-29.9	10,130 (38.3)	491 (38.0)	2,585 (38.7)	7,054 (38.5)
30-34.9	8,508 (32.2)	430 (33.3)	2,161 (32.3)	5,917 (32.3)
³ 35	4,064 (15.4)	227 (17.6)	1,071 (16.0)	2,766 (15.1)
BMI (kg/m²)				
Mean [SD]		25.6 [5.00]	25.3 [4.89]	25.2 [4.84]
n (%)	25,742 (97.4)			
<18.5	605 (2.3)	20 (1.6)	142 (2.2)	443 (2.5)
18,5-24.9	13,919 (52.7)	644 (51.0)	3,571 (54.5)	9,704 (54.1)
25-29.9	7,231 (27.4)	382 (30.3)	1,803 (27.5)	5,046 (28.1)
30-34.9	2,811 (10.6)	146 (11.6)	729 (11.1)	1,936 (10.8)
35-39.9	881 (3.3)	51 (4.0)	232 (3.5)	598 (3.3)
³ 40	295 (1.1)	19 (1.5)	76 (1.2)	200 (1.1)
Parity n (%)	26,228 (99.2)			
Primipara	10,739 (40.6)	748 (58.3)	3,216 (48.3)	6,775 (37.0)
Multipara	15,489 (58.6)	534 (41.7)	3,442 (51.7)	11,513 (63.0)
Gestational age (weeks) n (%)				
37+0-39+6	10,416 (39.4)	448 (34.5)	2,507 (37.4)	7,461 (40.5)
40+0-40+6	8,924 (33.8)	431 (33.2)	2,307(34.4)	6,186 (33.6)
41+0-41+6	5,393 (20.4)	308 (23.7)	1,391 (20.8)	3,694 (20.0)
³ 42+0	1,696 (6.4)	111 (8.6)	498 (7.4)	1,087 (5.9)

Onset of Labor n (%)				
Induction	3,947 (14.9)	294 (22.7)	1,038 (16.2)	2,570 (13.9)
Spontaneous	22,482 (85.1)	1,004 (77.3)	5,620 (83.8)	15,858 (86.1)
Epidural anesthesia n (%)	10,846 (41.0)	836 (64.4)	3,323 (49.6)	6,687 (36.3)
Oxytocin augmentation n (%)	11,321 (42.9)	885 (68.2)	3,452 (51.5)	6,984 (37.9)
Mode of birth n (%)				
Non-operative vaginal birth	24,149 (91.4)	933 (71.9)	5,782 (86.3)	17,434 (94.6)
Operative vaginal birth	1,418 (5.4)	189 (14.5)	571 (8.5)	658 (3.6)
Emergency CS	862 (3.3)	176 (13.6)	350 (5.2)	336 (1.8)
OASI n (%)	616 (2.3)	78 (6.0)	223 (3.3)	315 (1.7)
PPH ^a 1000 ml n (%)	1,401 (5.3)	150 (11.7)	487 (7.3)	764 (4.2)
Apgarscore < 7 at 5 min n (%)	216 (0.8)	43 (3.3)	81 (1.2)	92 (0.5)
Birthweight ^a 4,5 kg n (%)	879 (3.3)	64 (4.9)	266 (4.0)	549 (3.0)

VAS= visual analogue scale, BMI = body mass index, CS= cesarean section, OASI= obstetric anal sphincter injury, PPH=Postpartum hemorrhage. Categorical data are presented as number and (%) and continuous data as mean and [SD].

The associations between the time in labor and childbirth experience in primiparous and multiparous women are shown in Table 2. The longer mean duration of all the labor phases, the worse was the childbirth experience, in both primiparous and multiparous women ($p < 0.001$). Further, the proportion of primiparous and multiparous women with prolonged labor phases increased with worse childbirth experience (p for homogeneity < 0.001). More than half of the primiparous women with a negative childbirth experience had a prolonged active phase and in multiparous women with a negative childbirth experience 41.9 % had a prolonged active phase (Table 2).

Table 2. Duration of labor and childbirth experience in primiparous and multiparous women.

VAS= visual analogue scale; h= hours; min =minutes; Categorical data are presented as number and (%) and continuous data as mean and [SD]. P-values <0.05 were considered statistically significant. * P-value for one-way ANOVA of log mean values.

Table 3 and 4 demonstrate a significant association between duration of labor and risk of negative childbirth experience in primiparous and multiparous women, in all labor time categories that were analyzed. The analyses were adjusted for maternal age, BMI and fetal birthweight (Model 1 in Table 3,4).

Primiparous women with a prolonged total active labor or active phase had almost a doubled risk for a negative childbirth experience compared with women with normal duration of labor (aOR 1.88, 95% CI (1.59-2.22) and aOR1.89, 95%CI (1.59-2.24) respectively). The risk of negative childbirth experience was also increased (aOR 1.49, 95% CI (1.22-1.83)), if the pushing phase was ³ 60 minutes. On the contrary, a short duration of total time in active labor significantly reduced the risk for a negative childbirth experience (aOR 0.72, 95% CI (0.57-0.90) (Model 1, Table 3).

Table 3. Time in labor and risk of negative childbirth experience (VAS 1-3) in primiparous women.

	Total study- population	VAS 1-3 (negative childbirth experience)	VAS 4-7 (intermediate childbirth experience)	VAS 8-10 (positive childbirth experience)	p-value
Primiparous women					
Total active labor(h) Mean [sd]	10.05 [5.70]	12.66 [6.87]	10.75 [6.03]	9.43 [5.25]	<0.001*
n (%)					
< 2 h		7 (0.9)	55 (1.7)	139 (2.1)	<0.001
2-5.9 h		107 (14.3)	674 (21.0)	1,789 (26.4)	
6-11.9 h		274 (36.7)	1,337 (41.6)	3,054 (45.1)	
³ 12 h		359 (48.1)	1,146 (35.7)	1,789 (26.4)	
Active phase in first stage of labor (h) Mean [sd]	9.04 [5.30]	11.40 [6.52]	9.58 [5.50]	8.58 [4.99]	<0.001*
n (%)					
< 10 h		269 (47.0)	1,622 (57.9)	4,126 (66.3)	<0.001
³ 10 h		303 (53.0)	1,177 (42.1)	2,094 (33.7)	
Pushing phase (min) Mean [sd]	38.47 [24.87]	43.89 [29.84]	39.84 [26.22]	37.36 [23.63]	<0.001*
n (%)					
< 60 min		440 (76.9)	2293 (81.9)	5260 (84.6)	<0.001
³ 60 min		132 (23.1)	507 (18.1)	955 (15.4)	
Multiparous women					
Total active labor(h) Mean [sd]	4.78 [3.68]	6.14 [4.67]	5.32 [4.25]	4.57 [3.41]	<0.001*
n (%)					
< 1 h		18 (3.4)	135 (3.9)	521(4.5)	<0.001
1-6 h		302(56.7)	2,211 (64.3)	8,195 (71.2)	
³ 6 h		213 (40.0)	1,094 (31.8)	2,788 (24.2)	

Active phase in first stage of labor (h)	4.41 [3.40]	5.40 [4.33]	4.78 [3.74]	4.26 [3.24]	<0.001*
Mean [sd]					
n (%)					
< 5 h		265 (58.1)	1,961 (63.4)	7,407 (69.3)	<0.001
³ 5 h		191 (41.9)	1,134 (36.6)	3,275 (30.7)	
Pushing phase (min)	15.70 [15.64]	20.89 [22.35]	17.65 [17.62]	14.92 [14.55]	<0.001*
Mean [sd]					
n (%)					
< 30 min		362 (79.2)	2,626 (84.9)	9,572 (89.6)	<0.001
³ 30 min		95 (20.8)	468 (15.1)	1,113 (10.4)	

	Total study-population n (%)	Negative childbirth experience (VAS 1-3)			
	n = 10,739	Number n (%)	Crude OR (95% CI)	Model 1* aOR (95% CI)	Model 2* aOR (95%CI)
Total active labor	10,730 (99.9)	747 (7.0)			
<2h	201 (1.9)	7 (0.9)	0.58 (0.27-1.24)	0.50 (0.22-1.14)	0.47 (0.20-1.07)
2-5.9 h	2,570 (24.0)	107 (14.3)	0.70 (0.55-0.88)	0.72 (0.57-0.90)	0.74 (0.59-0.93)
6-11.9 h	4,665 (43.5)	274 (36.7)	reference	reference	reference
³ 12 h	3,294 (30.7)	359(48.1)	1.96(1.66-2.31)	1.88 (1.59-2.22)	1.54 (1.29-1.83)
Active phase in first stage of labor	9,591 (89.3)				
< 10 h	6,017 (62.7)	269 (47.0)	reference	reference	
³ 10 h	3,574 (37.3)	303 (53.0)	1.99 (1.67-2.35)	1.89 (1.59-2.24)	1.89 (1.59-2.24)
Pushing phase	9,587 (89.3)				
< 60 min	7,993 (83.4)	440 (76.9)	reference	reference	reference
³ 60 min	1,594 (16.6)	132 (23.1)	1.55 (1.27-1.90)	1.49 (1.22-1.83)	1.26(1.02-1.56)

VAS= visual analogue scale; h= hours; min =minutes; OR= odds ratio; CI= confidence interval.

*Adjustments in

Model 1: maternal age, BMI and fetal birthweight.

Model 2: maternal age, BMI, fetal birthweight, start of labor (spontaneous vs induction) and mode of delivery (vaginal birth vs cesarean section).

The risk for a negative childbirth experience was almost doubled in multiparous women with a prolonged total active labor (aOR 1.90, 95% CI (1.59-2.28) and increased if the active phase was prolonged (aOR1.55, 95%CI (1.28-1.88) compared with women with normal duration of labor. A prolonged pushing phase in multiparous women doubled the risk for a negative birth experience aOR 2.05, 95%CI (1.62-2.60) (Model 1, Table 4).

Table 4. Time in labor and risk of negative childbirth experience (VAS 1-3) in multiparous women.

	Total study-population n (%)	Negative childbirth experience (VAS 1-3)			
	n=15,489	Number n (%)	Crude OR (95% CI)	Model 1* aOR (95% CI)	Model 2* aOR (95%CI)
Total active labor	15,477 (99.9)	533 (3.4)			
<1h	674 (4.4)	18 (3.4)	0.95 (0.58-1.53)	0.97 (0.60-1.57)	0.95 (0.58-1.54)
1-5.9h	10,708 (69.2)	302 (56.7)	reference	reference	reference
³ 6h	4,095 (26.5)	213 (40.0)	1.89 (1.58-2.26)	1.90 (1.59-2.28)	1.68 (1.38-2.03)
Active phase in first stage of labor	14,233 (91.9)	456 (3.2)			
< 5h	9,633 (67.7)	265 (58.1)	reference	reference	reference
³ 5h	4,600 (32.3)	191 (41.9)	1.53 (1.27-1.85)	1.55 (1.28-1.88)	1.54 (1.27-1.88)
Pushing phase	14,236 (91.9)	457 (3.2)			
< 30 min	12,560 (88.2)	362 (79.2)	reference	reference	reference
³ 30 min	1,676 (11.8)	95 (20.8)	2.03 (1.61-2.55)	2.05 (1.62-2.60)	1.89 (1.48-2.42)

VAS= visual analogue scale; h= hours; min =minutes; OR= odds ratio; CI= confidence interval.

*Adjustments in

Model 1: maternal age, BMI and fetal birthweight.

Model 2: maternal age, BMI, fetal birthweight, start of labor (spontaneous vs induction) and mode of delivery (vaginal birth vs cesarean section).

When the multivariable logistic regression analyses on the association between time in labor and childbirth experience also included adjustments for onset of labor and mode of delivery, the aORs only changed marginally (Model 2, Table 3,4).

Discussion

In this large multi-center population-based cohort study, we found a significant association between longer duration of active labor and a negative childbirth experience in both primiparous and multiparous women. All different labor phases that were studied were significantly related to the women's childbirth satisfaction score. The longer duration of total labor, active phase and pushing phase, respectively, the lower both primiparous women and multiparous women rated their childbirth satisfaction score by VAS.

There are some studies that have examined the relationship between prolonged labor and birth experience, although the definition of prolonged labor was not specified in all studies^{26,27}. A Swedish study found that nulliparous women with negative birth experience reported longer labors measured in hours than women with positive birth experience²⁶. An Iranian study stated that labor dystocia was a strong predictor of low birth satisfaction²⁷. Our results are consistent with previous studies concluding that prolonged labor, defined as >12 hours, increased the risk for negative childbirth experience^{14,19}. However, these studies were conducted at a single center, included smaller study populations, were restricted to primiparous women and did not study the active phase of first stage of labor and the pushing phase separately^{14,19}. In contrast to these studies, Fenaroli et al found that the duration of first stage of labor did not affect the woman's birthing experience among 111 Italian primiparous women who completed Wijma Delivery Experience Questionnaire, however a longer pushing phase contributed to a negative childbirth experience²². An association between prolonged second stage of labor and a negative childbirth experience, evaluated more than a decade after delivery was also found in primi and multiparous American women who delivered by CS but not for those who delivered vaginally⁶. In another single center study including 70 primiparous women, Turkmen et al. showed that the childbirth satisfaction score by Childbirth Experience Questionnaire was not affected by the duration of neither the latent phase nor the active phase of labor²³.

In line with previous research, the women in our cohort with negative childbirth experience were more likely to be primiparous, have induced labor, an infant with Apgar score < 7 at 5 minutes, oxytocin augmentation, operative vaginal birth or emergency CS, obstetric anal sphincter injury or postpartum hemorrhage^{2,3,13}.

A major strength of this study is the multicenter population-based design with prospectively recorded data in standardized medical records, which reduces the risk of selection bias and recall bias. To our knowledge, this study has the largest cohort of women with detailed information on maternal

characteristics, known time in active labor and assessed childbirth experience, which gave sufficient power to evaluate the association between duration of the different labor phases and childbirth experience and in addition, enabled adjustments for possible confounding factors. In contrast to Kempe et al. who only analyzed the mean VAS score in relation to time in labor ¹⁴, we categorized the VAS scores. To categorize the VAS scale into negative and positive childbirth experience might give a wider dimension of the childbirth experience compared with the mean value. Further, the high response rate of VAS (82.7%), increases the likelihood of representative study samples. The prevalence of negative childbirth experience of 4,9 % is similar to the reported prevalence in previous studies ^{2,13} which also strengthens the generalizability of the study results.

The evaluation of the overall childbirth experience by VAS score is an accessible, easy and valid method that correlates with other birthing experience instruments such as Wijma Delivery Experience Questionnaire and Childbirth Experience Questionnaire ^{23,28,29}. This method is used nationwide in Sweden to assess women's birth experience a few days after childbirth and the VAS scores are registered in the national Swedish Pregnancy Register ^{2,3,14,30}. Another advantage of the VAS method is that it is part of the clinical routine and reaches the majority of all parturients and therefore is a good method to study a larger cohort.

On the other hand, the VAS method is a limitation due to its simplified and non-specific measure on childbirth experience overall that does not give a deeper understanding of the childbirth experience. Another limitation is that the childbirth experience was evaluated within the first 72 hours after childbirth, since women's rating of childbirth might be influenced by the initial positive feelings shortly after birth ³¹. A certain amount of time estimates for the different phases of labor were missing, although there is no reason to suspect an association between missing time estimates and VAS that could have biased the results.

The definition of normal labor progression is currently under international debate. The WHO and ACOG has changed their definitions and allow a slower progress in the beginning of the active phase of labor ^{1,17}. The reason for this change has mainly been to reduce the incidence of emergency CS and avoid unnecessary emergency CS due to failure to progress. However, since long time in labor increase the risk of a negative birthing experience, as demonstrated in this study, it may also increase future demands on CS in the following pregnancy due to fear of childbirth ^{9,10}. Since a negative birth experience also may have every day and life-long consequences affecting the bonding with the newborn and the women's mental health and result in avoidance of a future pregnancy as a result from fear of childbirth, care givers must pay attention to the women with prolonged labor ³²⁻³⁴. The childbirth experience is multidimensional. Some contributing factors for a negative childbirth experience, like unexpected events such as instrumental delivery, emergency CS, postpartum hemorrhage, are difficult to prevent, while other factors might be noticed and thus improve the care of women in labor. It is described that women who experienced more pain than expected, did not received the support by the care givers that they needed, had insufficient continuous information and did not feel included in decisions made during labor were at

risk for a negative childbirth experience^{5,19,35}. Reducing the risk for these known factors might compensate for the effect of a prolonged labor. Hence, it might be of extra importance to make sure that women with prolonged labor have enough pain relief and be aware of a possible need for extra support and guidance during labor. Clear information on labor interventions like induction procedure or instrumental delivery may also reduce the risk of negative birth experience³⁶

In conclusion, our data show that a prolonged active labor significantly increases the risk for a negative childbirth experience for both primiparous and multiparous women. This risk also applies to the active phase of first stage of labor and the pushing phase separately. It is of great importance to identify and optimize the clinical care of women with prolonged labor to reduce the risk of negative childbirth experience and associated adverse long-term effects.

Abbreviations

WHO: World Health Organization

CS: cesarean section

ACOG: American College of Obstetricians and Gynecologists

VAS: visual analog scale

BMI: body mass index

OR: odds ratio

aOR: adjusted odds ratio

Declarations

Data availability

The data that support the findings of this study are available on request from the corresponding author.

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Author Contributions:

SC and MB contributed to the study concept and design. MN, SC and MB contributed to the data acquisition. SC and MB performed the statistical analyses and SC, MB, DA and MS interpreted the data. SC wrote the manuscript. MB, DA and MS critically revised the manuscript. All authors gave final approval and agreed to be accountable for all aspects of work ensuring integrity and accuracy. All authors gave final approval and agreed to be accountable for all aspects of work ensuring integrity and accuracy.

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Competing interests:

The authors declare no competing interests.

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Figures

Figure 1

Flow chart of the study population