

# Epidural analgesia for labour pain in nulliparous women in Norway in relation to maternal country of birth and migration related factors

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## ABSTRACT

**Objective:** To investigate associations between maternal country of birth and other migration related factors (length of residence, reason for migration, paternal origin) and epidural analgesia for labour pain in nulliparous women in Norway.

**Design:** Population-based register study including nulliparous migrant women ( $n = 75,922$ ) and non-migrant women ( $n = 444,496$ ) with spontaneous or induced labour. Data were retrieved from the Medical Birth Registry and Statistics Norway, 1990–2013. Odds ratios (OR) with 95% confidence intervals (CI) were estimated by logistic regression, and adjusted for maternal age, marital status, maternal education, gross income, birth year, hospital size and health region.

**Main outcome:** Epidural analgesia for labour pain.

**Results:** Epidural analgesia was administered to 38% of migrant women and 31% of non-migrant women. Compared with non-migrants, the odds of having epidural analgesia were lowest in women from Vietnam (adjOR 0.54; CI 0.50–0.59) and Somalia (adjOR 0.63; CI 0.58–0.68) and highest in women from Iran (adjOR 1.32; CI 1.19–1.46) and India (adjOR 1.19; CI 1.06–1.33). Refugees (adjOR 0.83; CI 0.79–0.87) and newly arrived migrants (adjOR 0.92; CI 0.89–0.94) had lower odds of epidural analgesia. Migrant women with a non-migrant partner (adjOR 1.14; CI 1.11–1.17) and those with length of residence  $\geq 10$  years (adjOR 1.06; CI 1.02–1.10) had higher odds.

**Conclusion:** The use of epidural analgesia varied by maternal country of birth, reason for migration, paternal origin and length of residence. Midwives and obstetricians should pay extra attention to the provision of adequate information about pain relief options for refugees and newly arrived migrants, who had the lowest use.

## Introduction

Disparities in maternity care between migrant and non-migrant pregnant women is a well-known challenge [1]. In particular, communication difficulties, lack of familiarity with health care systems and discrimination may contribute to migrant women's experiences of sub-optimal care during labour and birth [2]. Managing labour pain and receiving adequate support and pain relief are important aspects of a woman's experience of birth [3,4]. In general, women may need pain relief to a greater extent if they have a strong fear of childbirth, difficulties managing labour pain, a prolonged or complicated labour and birth, or previous traumatic sexual experiences, than those without such experiences [4]. Adequate and appropriate support and pain relief

can therefore be regarded as an indicator of equity of care [5].

Epidural analgesia provides the most effective *pharmacological* pain relief to women in labour [6], however, it is associated with negative side effects, such as hypotension, dystocia and operative delivery [6]. Higher rates of epidural analgesia are associated with not only factors related to high pain intensity, such as nulliparity [7,8], induced labour [9] and a large infant [10], but also with socio-economic factors, such as higher education and income [7,10] and advanced maternal age [8], and lower rates are associated with one-to-one intrapartum continuous support [3]. This indicates that the decision to offer a woman epidural analgesia is influenced by a range of factors: the woman's preparedness for what to expect during labour and birth [11], her expression of pain and her own preferences [12], her knowledge about what can be

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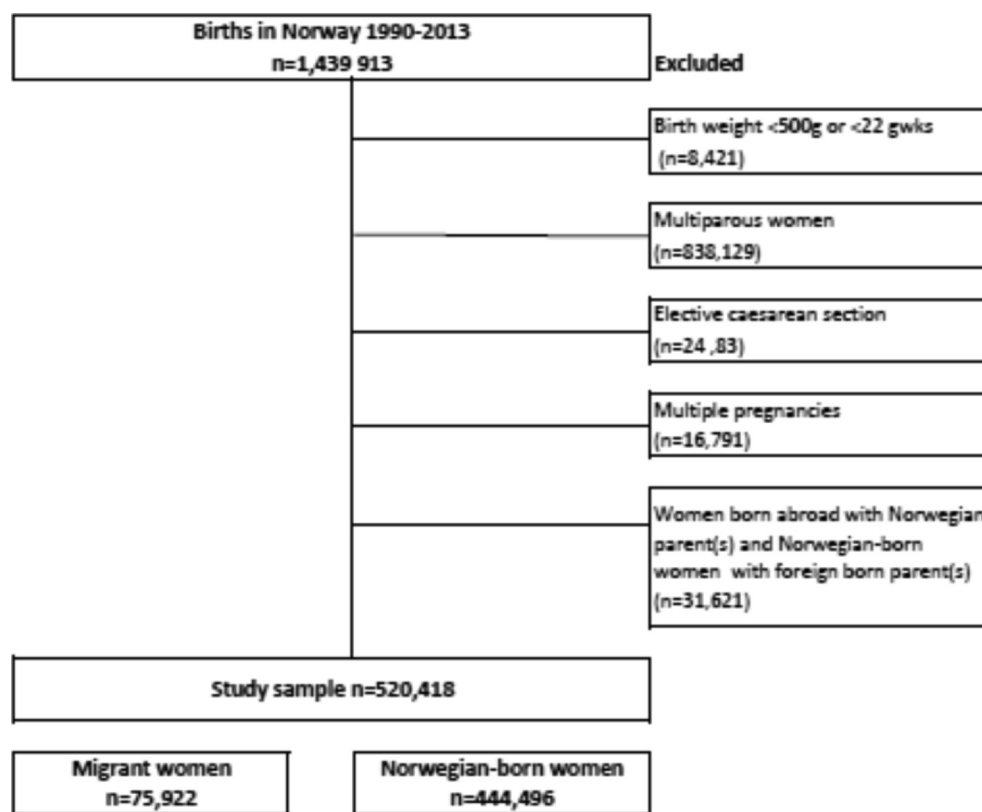


Fig. 1. Study sample of migrant and non-migrant nulliparous women giving birth in Norway 1990–2013 (n = 520,418).

offered, the quality of labour support she is given [3], the midwives' attitudes and local practice in the delivery unit [11,12]. All these factors may differ in the care of migrant and non-migrant women [2].

Few studies have investigated women's use of epidural analgesia in relation to maternal country of birth. A large Swedish population-based study [13] and a smaller Norwegian study [14] showed that epidural analgesia rates varied substantially by country of birth, ranging from 26% to 52%. Lower rates were reported in women from Somalia [13,14], Iraq, the Former Yugoslavia and Turkey [13] and higher rates in women from Chile, Iran, Poland and Finland [13]. One German study reported that women from Turkey were less likely to have epidural analgesia during labour than non-migrants [15]. Migrant women comprise a heterogeneous group, not least in terms of their reason for migration, their family situation or length of residence in the host country [16], and little is known about the significance of these migration related factors for the use of epidural analgesia.

The aim of this study was to investigate associations between maternal country of birth and other migration related factors (reason for migration, length of residence, paternal country of birth) and the use of epidural analgesia during labour in nulliparous women in Norway.

## Materials and methods

This is a Norwegian population-based registry study covering all births in Norway during the study period 1990–2013.

### Data sources

The study was based on data from the Medical Birth Registry of Norway (MBRN) and Statistics Norway. The MBRN includes information on maternal health, obstetric history, pregnancy, labour and birth from standardised medical records used by all antenatal clinics and delivery units [17]. Data from the MBRN were linked to migration data from the Statistics Norway, using each woman's unique national

identity number. Statistics Norway is the main producer of official statistics in Norway [18] and includes data on all individuals who are, or have been resident in Norway. The collection of data relies on official registries and other administrative data in Norway, including the Norwegian Population Registry and the Norwegian Directorate of Immigration Database [19].

### Setting

In Norway, the proportion of births to migrant women has more than doubled over the last three decades, from less than 10% in the 1990s to 29% in 2018 [18]. Maternity care in Norway is free of charge and midwives are the primary caregivers in all labour wards, with an obstetrician taking responsibility only when complications occur. The first information about pharmacological and non-pharmacological pain relief is given by midwives or general practitioners at the antenatal check-ups or in antenatal education classes, which are attended to a lesser extent by migrants [20]. During labour, a woman can express a wish for pain relief or specifically request epidural analgesia, or the initiative could come from the midwife or the obstetrician. The midwife may prescribe epidural analgesia for labour pain without consulting the obstetrician and the epidural is then administered by an anesthesiologist. Epidural analgesia is free of charge. During the time period 1990–2013 epidural analgesia was available around the clock in most delivery units, except in some of the very small maternity homes (50–100 births per year) where nulliparous women seldom give birth.

### Study population

The present study included nulliparous women who had given birth from gestational week 22 in Norway from 1990 to 2013 and who were: 1) migrants, i.e. first-generation migrants who were foreign-born with two foreign-born parents or 2) non-migrants, i.e. Norwegian-born women with Norwegian-born parents (Fig. 1). Women with the

following characteristics were excluded: planned caesarean section, multiple pregnancy, born abroad to Norwegian-born parents, being Norwegian-born with foreign born parents or missing data on country of birth and migration.

### Variables

Data on epidural analgesia were retrieved from the MBRN, a registry known for high quality data [17]. There is just one category for the use of epidural analgesia and this is recorded by a check box (reported/not reported). The main exposures (retrieved from Statistics Norway) were maternal country of birth, length of residence in Norway, reason for migration and whether the infant's father was foreign-born or Norwegian-born. Maternal countries contributing  $\geq 2000$  births to the total number of births during the period are reported separately, all other countries were merged into 'Other countries'. The mother's length of residence in Norway was estimated as the difference in years between the registered year of immigration to Norway and the year of birth. The year of immigration was extracted from the registration date when the woman received her national identity number at the National Registry. This number is essential for all public correspondence in Norway and is only provided to foreigners with a valid residence permit of more than 6 months [19].

Reason for migration included the following categories: refugee, family reunion or establishment, work, education, 'Nordic', other and missing. Nordic citizens from Sweden, Denmark, Iceland and Finland may move freely or take up residency within the Nordic countries without reporting reason for migration [21]. They also mostly understand each other's language fairly well and in-labour care is similar between the countries. These countries were therefore categorised into a separate Nordic group.

From the MBRN we also retrieved data on maternal age at birth, marital status (married/cohabitant or single), period of birth (1990–1993, 1994–1998, 1999–2003, 2004–2008, 2009–2013), health region in Norway (South East, West, Middle, North) and size of labour ward (number of births per year;  $< 500$ , 500–1499, 1500–2999,  $\geq 3000$  and births outside an institution). From Statistics Norway we retrieved data on maternal gross income (quartiles calculated for the whole study period) and maternal educational level updated for each birth year (primary school/no education, secondary school, and college/university). To describe the study population the following data from the MBRN were retrieved: infant birthweight ( $\leq 2500$ , 2501–3000, 3001–4500,  $> 4500$  g), baby's head circumference (cm), gestational age (weeks), chronic hypertension (yes, no), pre-pregnancy diabetes, induction of labour and pre-pregnancy body mass index (BMI;  $\text{kg}/\text{m}^2$ ).

### Data analyses

Associations of migration related factors with the use of epidural analgesia were estimated by odds ratios (ORs) with 95% confidence intervals (CIs) using logistic regression analyses. Maternal country of birth, reason for migration, the combination of maternal and paternal country of birth, and length of residence were included in the regression models as categorical variables. For each of the four variables, we used non-migrants as the reference category.

We calculated both crude and adjusted ORs with 95% CIs. Adjustment variables were chosen a priori based on information from previous studies on this topic [7,8,10,13]. Specifically, we adjusted for year of birth as this variable was strongly associated with both epidural analgesia and migrant-related factors. We also adjusted for health region as epidural analgesia practice varies between hospitals in Norway. We also made adjustments for maternal age, marital status, education and gross income.

Missing data on maternal gross income and education were assumed to be missing at random and were replaced using a multiple imputation

method. Ten imputed datasets were created using the predictive mean matching algorithm [22]. We constructed one imputation model for each of the migrant related variables. Each model included the specific migrant related variable, maternal country of birth, the above-mentioned adjustment variables and use of epidural analgesia. To obtain ORs with 95% CIs across all the imputed datasets, Rubin's combination rules were used, adjusted for the variability between imputation sets.

All analyses were performed using R 3.4.2 [23] and Stata/IC 15 for Windows (StataCorp, Texas, USA).

### Ethical considerations

The study was approved by the appropriate Regional Committee for Ethics in Medical research, 2014/09/14, 2014/1278/REK South-East.

### Results

The initial population of births in Norway between 1990 and 2013 and the final study sample of 520,418 nulliparous women, of whom 75,922 were migrants and 444,496 non-migrants, is shown in Fig. 1.

Compared with non-migrants, the migrant women were slightly older, less often single and they had a lower level of income and education (Table 1). Furthermore, migrant women had a lower mean pre-pregnancy BMI and smaller babies. A higher proportion of migrant women had given birth in the later time periods and in the South East region of Norway (where the capital Oslo is situated) and in the larger labour wards.

The prevalence of epidural analgesia increased over the study years and the increase was similar for both migrant and non-migrant women (Supplementary Table 1). Overall, migrant women had higher rates of epidural analgesia than non-migrant women (38% vs 31%,  $p < 0.001$ ) (Fig. 2). However, the rate of use varied considerably by maternal country of birth. Women from Vietnam, Denmark, Sri Lanka, Somalia and Pakistan had the lowest rates, ranging from 24% to 32%, while women from Lithuania, Iran and Poland and "other countries" had the highest rates, 43–47%.

After the adjustments for maternal age, marital status, maternal education, gross income, year of birth, size of hospital and health region (Fig. 3), women from the following countries had lower odds of epidural analgesia compared to non-migrants: women from Vietnam (adjOR 0.54; CI 0.50–0.59), Somalia (adjOR 0.63; CI 0.58–0.68), Germany (adjOR 0.77; CI 0.70–0.85), Thailand (adjOR 0.78; CI 0.71–0.84), Pakistan (adjOR 0.82; CI 0.76–0.88), Denmark (adjOR 0.86; CI 0.78–0.95), Sri Lanka (adjOR 0.89; CI 0.81–0.98), Turkey (adjOR 0.89; CI 0.81–0.98) and the Philippines (adjOR 0.90; CI 0.83–0.97). Women from Iran (adjOR 1.32; CI 1.19–1.46), India (adjOR 1.19; CI 1.06–1.33), Sweden (adjOR 1.17; 95% CI 1.10–1.23) and from other countries (adjOR 1.12 1.09–1.16) had higher odds, while women from seven countries (35% of all migrants) had similar rates of epidural analgesia compared with the Norwegian-born women: Iraq, Russia, Former Yugoslavia, Morocco, Poland, Lithuania and China.

Table 2 shows the associations between reason for migration, the combination of maternal and paternal country of birth and length of residence, and epidural analgesia. Migrant women in general had slightly lower odds for having epidural after covariate adjustments. Compared with non-migrants, women who had migrated as refugees and for family reunion (of whom many are also refugees), had lower odds for epidural analgesia (refugees; adjOR 0.83; CI 0.79–0.87, family reunion; adjOR 0.94; CI 0.92–0.96). There were no differences in odds for epidural analgesia between non-migrant women and women who had immigrated for education, while migrants from the Nordic countries had higher odds for epidural analgesia (adjOR 1.08; CI 1.03–1.14). Migrant women with a migrant partner had lower odds of epidural analgesia (adjOR 0.91; CI 0.89–0.93) compared with non-migrant women with a non-migrant partner. Migrant women with a non-

**Table 1**  
Maternal and infant characteristics of migrant and non-migrant women giving birth in Norway, 1990–2013 (n = 520,418).

	Migrant women (n = 75,9229) n (%)	Non-migrant women (n = 444,496) n (%)
Age, mean (SD)	27.3 (4.97)	26.5 (4.84)
Single status	6319 (8.3)	55,515 (12.5)
Mother's gross income		
< 25.0 percentile	13,475 (17.7)	102,508 (23.1)
25.0–49.9 percentile	8717 (11.5)	107,350 (24.2)
50.0–74.9 percentile	11,457 (15.1)	104,667 (23.5)
≥ 75.0 percentile	12,872 (17.0)	103,192 (23.2)
Missing	29,401 (38.7)	26,779 (6.0)
Mother's education		
Primary school/no education	15,589 (20.5)	92,382 (20.8)
Secondary school	17,1371 (38.6)	15,055 (19.8)
College/university	24,415 (32.2)	179,971 (40.5)
Missing	20,863 (27.5)	772 (0.2)
Pre-pregnancy BMI: kg/m2, mean (SD)*	22.7 (3.9)	24.3 (4.8)
Hypertension	229 (0.3)	1799 (0.4)
Diabetes	265 (0.3)	1721 (0.4)
Induction of labour	12,959 (17.1)	79,178 (17.8)
Gestational age (full weeks, mean (SD))	39.4 (2.13)	39.6 (2.2)
Birth weight, grams (mean)	3351	3476
≤ 2500	4134 (5.4)	19,960 (4.5)
2501–3000	12,824 (16.9)	52,408 (11.8)
3001–4500	57,779 (76.1)	360,454 (81.1)
> 4500	1112 (1.5)	11,285 (2.5)
Babies head circumference, cm (mean)	35.0	35.5
Period of birth		
1990–1993	6422 (8.5)	85,376 (19.2)
1994–1998	9556 (12.6)	97,837 (22.0)
1999–2003	13,733 (18.1)	87,875 (19.8)
2004–2008	18,643 (24.6)	87,950 (19.8)
2009–2013	27,568 (36.3)	85,458 (19.2)
Health region in Norway		
South East	50,266 (66.2)	237,234 (53.4)
West	13,712 (18.1)	97,620 (22.0)
Middle	7036 (9.3)	63,615 (14.3)
North	4796 (6.3)	45,274 (10.2)
Size of birth institution (births per year)		
< 500	5009 (6.6)	42,903 (9.7)
500–1499	10,632 (14.0)	105,474 (23.7)
1500–2999	23,707 (31.2)	129,321 (29.1)
≥ 3000	36,360 (47.9)	165,687 (37.3)
Outside institution	214 (0.3)	1111 (0.2)

Abbreviations: SD, standard deviation; NOK, Norwegian kroner; BMI, body mass index.

\* Data on BMI (2008–2013) was missing for 52.8% of non-migrants and 51.4% in migrants.

migrant partner had slightly higher odds of having epidural analgesia (adjOR 1.14; 95% CI 1.11–1.17). The lowest odds were in migrant women with missing information on the country of birth of the baby's father (adjOR 0.81; CI 0.75–0.86). Migrant women who had arrived in Norway less than two years before giving birth had lower odds of epidural analgesia than non-migrant women (adjOR 0.92; 95% CI 0.89–0.94) and those who had been resident in Norway ten years or more had slightly higher odds (adjOR 1.06; 95% CI 1.02–1.10).

## Discussion

### Key results

The rates of epidural analgesia for labour pain varied by maternal country of birth; 31% in non-migrant women and 24–47% in migrant

women. Compared with non-migrants, the odds of having epidural analgesia were lowest in women from Vietnam and Somalia, and highest in women from Iran, India and Sweden. Refugees and women who had arrived in Norway less than two years before giving birth had lower odds of epidural analgesia than non-migrant women and migrant women with a non-migrant partner or who had stayed in Norway for ≥ 10 years had higher odds of epidural analgesia.

### Strengths and limitations

This large population-based study of nulliparous women was based on standardised routinely collected data, which allowed for analyses of migration related factors that have not been investigated before in relation to epidural analgesia for labour pain. To reduce the heterogeneity within the groups, we excluded women born abroad to Norwegian-born parents and Norwegian-born women with foreign born parents. The results, therefore, may be generalised to first-generation migrant women (with foreign-born parents), and also to countries with similar in-labour care as in Norway with migrant groups with similar backgrounds. Unfortunately, the sample was not large enough to investigate epidural analgesia in relation to health region in combination with country of birth which may have been valuable for informing local measures to enhance intrapartum care for migrant women.

### Interpretation

Women's use of epidural analgesia varied considerably by country of birth, in this, as in previous studies from Scandinavia, Europe and Australia [13,14,24,25]. The findings may mirror migrant women's actual needs, but also differences in their views about labour pain, how to manage pain and when to use pharmacological pain relief [3,12]. However, the finding may also indicate disparities in care for migrant women during labour and birth. Midwives may not respond adequately to women's individual needs due to communication difficulties [26] and/or midwives' preconceived ideas regarding cultural differences in women's preferences may play a role [27]. The particularly low use of epidural analgesia in Vietnamese women was also reported in two Australian studies [28,29]. The study authors' interpretation of the findings was that the Vietnamese women were affected by cultural beliefs that promote endurance of pain and self-control, and therefore they did not request pharmacological pain relief. Further, the authors also speculated that women were not offered epidural analgesia by midwives, despite possibly very high pain intensity, because the midwives found it hard to gauge Vietnamese women's levels of pain [29]. Lower use of epidural analgesia in women from Somalia was also reported in a smaller Norwegian study [14] and from a large Swedish population-based study [13] in a care context very similar to that in Norway [13]. From qualitative studies conducted with women themselves, the low rates of epidural analgesia in Somali-migrants have been explained by a general fear of interventions, lack of information about access to, and safety of epidural analgesia, and/or by their misunderstanding about women's own part in the decision to have epidural analgesia [30]. A recurring stereotype that may interfere with adequate pain treatment was expressed by midwives in a recent Swedish study; that Somali-born women have a natural approach to pregnancy and childbirth and high levels of trust and confidence in their capabilities to manage labour pain and to give birth [27].

However, whether the rates of epidural analgesia use reflect women's cultures of origin, attitudes to epidural analgesia, or availability, is complex. On the one hand, the large difference between the Swedish and the Danish women in this study may reflect high and low rates of epidural analgesia for nulliparous women in their respective countries: in 2015 52% in Sweden [31] and 33% in Denmark ([www.esundhed.dk/](http://www.esundhed.dk/)). On the other hand, migrant women from Iran and India had higher use of epidural analgesia compared to Norwegian-born women, similar to the Swedish study [13], yet the availability of epidural analgesia in



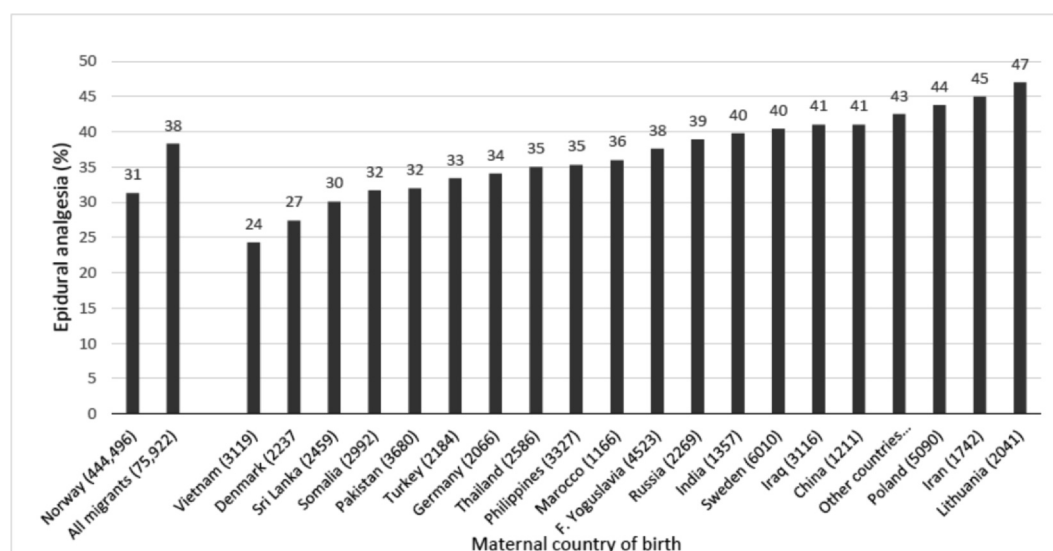


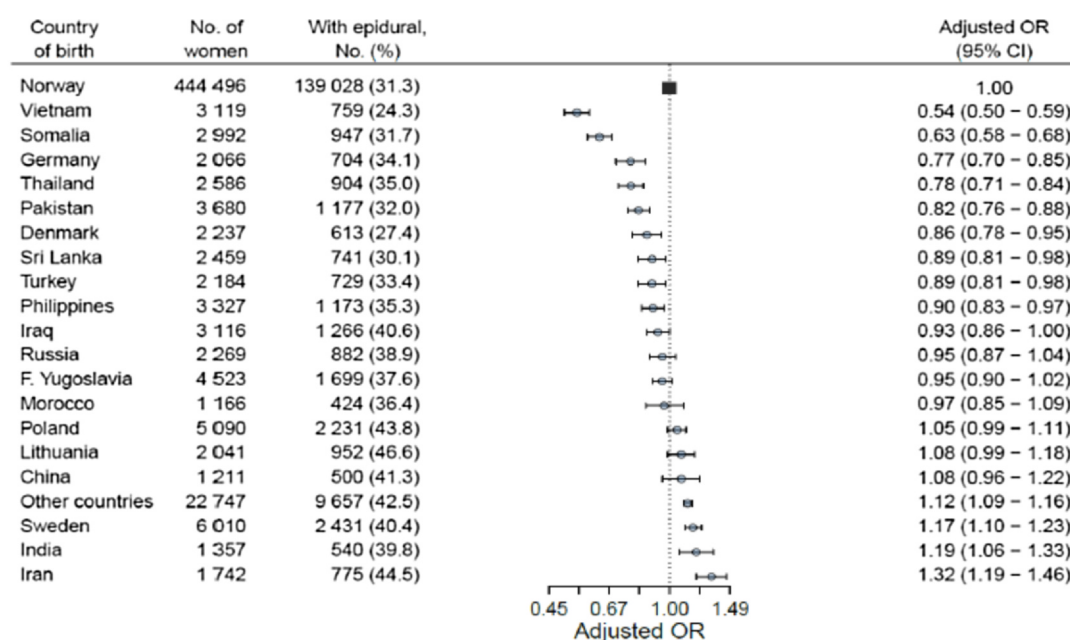
Fig. 2. Frequency of epidural analgesia in relation to maternal country of birth in nulliparous women giving birth in Norway 1990–2013 (n = 520,418).

both Iran and India is in general low [32], except for private centres [33]. Women may request epidural analgesia in Norway when they have the opportunity and it is free of charge. However, the finding may also suggest that migrant women do not receive adequate support to manage labour pain [3]. Migrants comprise a heterogeneous group and the question of how women adapt to the labour and birth culture in the receiving country, the support that is given to them and the new possibilities for pain relief needs further investigation in order to develop equitable care for all.

Migration related factors played a part in whether women received epidural analgesia for pain relief or not and the most apparently vulnerable women had the lowest rates: refugees, women with a migrant partner and the newly arrived. In addition, we also found that in cases where no data were registered on the baby's father's country of birth, this was associated with particularly low odds of epidural analgesia. In

contrast, in the Swedish study mentioned above, migrant women with a non-migrant partner, as well as migrant women with shorter length of residence in Sweden (< 5 years) were less likely to have epidural analgesia than those with a migrant partner and longer length of residence respectively [13]. Whether a woman receives epidural analgesia during labour may be a result of negotiation between the mother (and her partner) and the midwife or the obstetrician [13]. A non-migrant partner may facilitate such communication and empower a woman to ask for epidural analgesia if she needs it.

All migration related factors might be proxies for being uninformed about the availability of epidural analgesia for pain relief, or for not being able to negotiate for one, in particular due to language barriers [2]. Access to interpreters is essential for non-Norwegian-speaking women to communicate during labour and birth, and unfortunately routine interpretation is currently restricted for economic reasons [34].



\* Adjusted for maternal age, marital status, education, income, year of birth, size of hospital and health region

Fig. 3. Associations between maternal country of birth and epidural analgesia in migrant and non-migrant nulliparous women in Norway (n = 520,418).

**Table 2**

Associations between migrant related factors and epidural analgesia in nulliparous migrant women in Norway (n = 520,418).

	No. of women	Epidural analgesia			95% CI	Adjusted* OR	95% CI
		n	%	Crude OR			
<i>Migrants overall</i>							
Non-migrants	444,496	139,266	31.3	1		1	
Migrants	75,922	29,104	38.3	1.4	(1.34–1.39)	0.98	(0.96–0.99)
<i>Reason for migration</i>							
Non-migrants	445,124	139,266	31.3	1		1	
Refugee	8913	3260	36.6	1.3	(1.21–1.32)	0.83	(0.79–0.87)
Family reunion	35,681	13,653	38.3	1.4	(1.33–1.39)	0.94	(0.92–0.96)
Work	7935	3650	46	1.9	(1.79–1.96)	1.02	(0.98–1.07)
Education	4692	2054	43.8	1.7	(1.61–1.81)	1.03	(0.97–1.09)
Nordic**	8222	3036	36.9	1.3	(1.23–1.35)	1.08	(1.03–1.14)
Other	1940	829	42.7	1.6	(1.50–1.79)	1.25	(1.14–1.38)
Missing***	8539	2622	30.7	1	(0.93–1.02)	1.09	(1.03–1.14)
<i>Maternal and paternal country of origin</i>							
Both non-migrants	409,263	126,548	30.9	1		1	
Mother non-migrant- father migrant	27,956	9795	35.0	1.20	(1.17–1.24)	1.04	(1.01–1.07)
Mother non-migrant - father missing	7277	2685	36.9	1.3	(1.24–1.37)	1.08	(1.02–1.14)
Both migrants	44,416	16,478	37.1	1.3	(1.29–1.34)	0.91	(0.89–0.93)
Mother migrant - father non-migrant	27,706	11,129	40.2	1.50	(1.46–1.54)	1.14	(1.11–1.17)
Mother migrant - father missing	3800	1497	39.4	1.5	(1.36–1.55)	0.81	(0.75–0.86)
<i>Length of residence (years)</i>							
Non-migrants	445,124	139,266	31.3	1		1	
0–2	28,526	10,153	35.6	1.2	(1.18–1.24)	0.92	(0.89–0.94)
2–6	26,273	10,302	39.2	1.4	(1.38–1.45)	1.00	(0.98–1.03)
6–10	9429	3727	39.5	1.4	(1.38–1.50)	1.00	(0.96–1.05)
10–50	11,066	4684	42.3	1.6	(1.55–1.67)	1.06	(1.02–1.10)

\* Adjusted for maternal age, marital status, education, gross income, year of birth, size of hospital and health region.

\*\* Migrants from the Nordic countries (i.e. Sweden, Denmark, Finland, and Iceland). There are no data on reason for migration on these migrants.

\*\*\* These migrants arrived before 1990. Data on migration reasons were only available from 1990 onwards.

The fact that migrants coming to Norway for work or education did not differ from non-migrants in rates of epidural analgesia supports this interpretation, as they likely understand Norwegian or have better skills in English and may be able to communicate better with their caregivers about their pain.

Based on the finding of lower use of epidural analgesia among migrants from low-income countries and the particularly vulnerable women, the question arises: Is pain being adequately treated [13]? Whether low use of epidural analgesia reflects the woman's wish to give birth without pharmacological pain relief or reflects an under-treatment of pain needs to be elucidated in studies of other designs than ours. However, our findings suggest that measures should be taken to ensure adequate, language appropriate information to migrant women about how intrapartum care is provided in Norway and about available pain relief options, in order to increase migrant women's knowledge of all the support and treatment available to manage labour pain, and to empower them to make informed choices.

## Conclusion

The use of epidural analgesia varied substantially by country of birth, length of residence, reason for migration and paternal origin. Refugees, recently arrived migrants and those who had a migrant partner were less likely to receive epidural analgesia than non-migrant women. Midwives and doctors should pay particular attention to ensure that newly arrived women and refugees – those currently with the lowest use of epidural analgesia – are adequately informed about their pain relief options.

## Contribution to authorship

ES and VAA have made substantial contributions to conception, design and planning of the study; VAA, ES and RMN made substantial contributions to drafting the first version of the manuscript and revising

the manuscript critically for important intellectual content; RMN, ES and VAA made substantial contributions to data management, statistical analysis and interpretation of data; ESV and RS made their contribution in drafting and revising the manuscript. All authors read and approved the final manuscript.

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## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Tweetable Abstract

A Norwegian population-based study of 520,000 women showed that the use of epidural analgesia for labour pain differs between migrants and non-migrants.

## Appendix A. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.srhc.2020.100553>.

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