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Received: 18 November 2021 | Revised: 25 January 2022 | Accepted: 28 January 2022

DOI: 10.1111/birt.12619

BIRTH ISSUES IN PERINATAL CARE WILEY

ORIGINAL ARTICLE

# Use of pain management in childbirth among migrant women in Iceland: A population-based cohort study

**Embla Ýr Guðmundsdóttir RN, RM, MSc[1] | Marianne Nieuwenhuijze RM, PhD[2,3] | Kristjana Einarsdóttir PhD[4] | Berglind Hálfdánsdóttir RN, RM, PhD[1] | Helga Gottfreðsdóttir RN, RM, PhD[1,5]**

[1]Department of Midwifery, Faculty of Nursing, University of Iceland, Reykjavík, Iceland

[2]Research Centre for Midwifery Science, Academie Verloskunde Maastricht, Zuyd, The Netherlands

[3]CAPHRI School for Public Health and Primary Care, Maastricht University, Maastricht, The Netherlands

[4]Faculty of Medicine, Centre of Public Health Sciences, University of Iceland, Reykjavík, Iceland

[5]Department of Obstetrics and Gynecology, Women's Clinic, Landspítali University Hospital, Reykjavík, Iceland

**Correspondence**
Embla Ýr Guðmundsdóttir, Department of Midwifery, Faculty of Nursing, University of Iceland, Eiríksgata 34, 101 Reykjavík, Iceland.
Email: eyg9@hi.is

**Funding information**
The Icelandic Research Fund, Grant number: 2019 - 196218-051

## Abstract

**Background:** Immigration is rapidly increasing in Iceland with 13.6% of the population holding foreign citizenship in 2020. Earlier findings identified inequities in childbirth care for some women in Iceland. To gain insight into the quality of intrapartum midwifery care, migrant women's use of pain management methods during birth in Iceland was explored.

**Methods:** A population-based cohort study including all women with a singleton birth in Iceland between 2007 and 2018, in total 48 173 births. Logistic regression analyses with odds ratios (ORs) and 95% confidence intervals (CIs) were used to investigate the relationship between migrant backgrounds defined as holding foreign citizenship and the use of pain management during birth. The main outcome measures were use of nonpharmacological and pharmacological pain management methods.

**Results:** Data from 6097 migrant women were included. Migrant women had higher adjusted OR (aORs) for no use of pain management (aOR = 1.23 95% CI [1.12, 1.34]), when compared to Icelandic women. Migrant women also had lower aORs for the use of acupuncture (0.73 [0.64, 0.83]), transcutaneous electrical nerve stimulation (TENS) (0.92 [0.01, 0.67]), shower/bath (0.73 [0.66, 0.82]), aromatherapy (0.59 [0.44, 0.78]), and nitrous oxide inhalation (0.89 [0.83, 0.96]). Human Development Index (HDI) scores of countries of citizenship <0.900 were associated with lower aORs for the use of various pain management methods.

**Conclusions:** Our results suggest that being a migrant in Iceland is an important factor that limits the use of nonpharmacological pain management, especially for migrant women with citizenship from countries with HDI score <0.900.

KEYWORDS

complementary therapies, labor pain, midwifery, migrants, pain management

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## 1 | INTRODUCTION

A swift change in Iceland's population composition during the last decades calls for a health system that nurtures the needs of a more diverse group of childbearing women. The proportion of migrant childbearing women in Iceland increased from 4.1% on average during 1997-2006 to a 12.5% on average during 2007-2018[1] with most women coming from Poland (34.1%), the Philippines (5.8%), and Lithuania (5%).[2] Results of a recent Icelandic research study[1] point toward migrant childbearing women being disadvantaged with respect to a range of maternal and perinatal complications and interventions. The results suggest that factors such as access interfere with quality of midwifery care and might exacerbate inequity in health care.[1]

Intrapartum midwifery care is one of the key factors that contributes to quality of care and a woman's positive childbirth experience.[3] Promoting comfort is an integral part of the "art" of midwifery care.[4] Therefore, all birthing people are entitled to receive evidence-based information on both pharmacological and nonpharmacological methods of pain relief so they can make informed choices about intrapartum care fitting their personal needs. Nonpharmacological pain management methods are beneficial on many levels. They enhance women's satisfaction with care, their feelings of competence and control in labor,[5] their feeling of coping with pain,[6] and reduce the need for obstetric interventions.[5] However, this may not be sufficient for all women who experience suffering because of the pain, increasing the risk of obstetric interventions.[6] Understanding circumstances where pharmacological pain management should be offered is, therefore, also critical.

There are indications about the possible relationship between use of pain management methods in labor such as epidural and the quality of maternity services.[7] Increased use of pharmacological pain management methods among laboring women has been connected to primiparity,[8] macrosomia,[9] higher BMI,[9,10] maternal stature (high birthweight among short women),[10] advanced maternal age[9] and income,[8] permanent employment,[8] being married,[8] not being a migrant,[7,10-16] longer stay in the receiving country,[10] induction of labor,[17] lack of one on one continuous support,[18] participation of antenatal education programs,[19,20] higher number of antenatal care visits,[11] cultural preference,[21] and woman's health, such as anxiety, preeclampsia,[8] and diabetes.[22] Increased use of nonpharmacological pain management methods has been connected to primiparity,[8] higher levels of education,[11] and not being a migrant.[16]

In addition, place of birth[8] is a variable associated with the use of pain management methods. Use of pain management methods varies between groups of women with different cultural backgrounds, but there is inconsistent information indicating that migrant women use either more or less pharmacological[7,10,12-16,23,24] or nonpharmacological methods[11,16,24] than their host population. Despite increased global attention to migrant women's health during childbirth, and to inequities in quality of care and access to maternity services for this group,[25] limited studies have been conducted on the use of various pain management methods in labor among migrant women. Thus, the aim of this study was to describe migrant women´s utilization of pain management methods offered in intrapartum maternity care. We aimed to answer the question: "Does the use of pain management methods in childbirth in Iceland differ by citizenship?" The overall goal is to improve intrapartum care for migrant women in Iceland.

## 2 | METHODS

### 2.1 | Setting

The Icelandic maternity service is publicly funded and free for all residents, except for migrants relocating to Iceland from outside the European Economic Area (EEA), during their first 6 months in the country. Then, they automatically become a member of the Icelandic social insurance system, regardless of nationality. Iceland does not offer a national continuity of care model and women in labor generally do not know their midwife beforehand, however, continuous support from a midwife is promoted in labor. Usually, midwives provide information on pain management methods during antenatal care visits and in antenatal education programs. Women must pay for attending such programs but can apply for reimbursement from their trade union. Migrant women are entitled to free interpreter services in maternity care, although how often these are needed and used is unknown. All birth places in Iceland offer various nonpharmacological pain management methods during labor, some primary birth places additionally offer nitrous oxide inhalation, and some secondary and all tertiary birth settings offer all nonpharmacological and pharmacological pain management methods mentioned in this study. The pain management methods are free for all women with Icelandic health insurance. The Icelandic setting is further described in an earlier publication.[26]

### 2.2 | Participants

The population in this cohort study included all women who gave birth to a singleton newborn in Iceland from January 1, 2007, to December 31, 2018. The data were

prospectively collected via the Icelandic Medical Birth Registry (IMBR), a routinely collected, nationwide, centralized administrative registry. The IMBR includes data on all births in Iceland from $22^{+0}$ weeks' gestation on or for infants weighing ≥500 g, with a total 51 791 singleton births during the study period. We excluded elective cesarean births during the study period (n = 3618), leaving 48 173 births in the study.

## 2.3 | Measures

Data on migration status, maternal characteristics, birth characteristics, and pain management methods were obtained from the IMBR registry. Obstetric interventions, pain management methods, and birth complications were registered using: (a) the recorded variables, diagnostic and surgical codes in the IMBR; (b) International Statistical Classification of Diseases and Related Health Problems, tenth revision (ICD-10); (c) Nursing Interventions Classification (NIC); (d) Anatomical Therapeutic Chemical (ATC) Classification; and (e) Classification of Surgical Procedures (NCSP), according to the recommendation of the Nordic Medico-Statistical Committee (NOMESCO).[18] The ascertainment for all pain management methods is presented in Table S1.

### 2.3.1 | Exposure variable

The exposure variable was both a dichotomous categorical variable and a polytomous categorical variable based on registered citizenship. The dichotomous variable "migrant women" was defined as women holding other citizenship than Icelandic, including refugees and asylum seekers. The polytomous categorical variable was based on the Human Development Index (HDI), described in more details in previous research.[1] HDI scores were categorized by IMBR in 12 groups with increments of 0.050. Because of the small number of migrants in Iceland coming from countries with low HDI, we combined the groups in the lower levels based on the number of migrants in each of the twelve categories. The lowest ten categories, including countries such as Thailand, Philippines, Pakistan, Afghanistan, and Sudan, merged into a group with HDI score ≤0.849. The second group (HDI 0.850-0.899) included countries such as Poland, Lithuania, Latvia, and France, and the third group with HDI ≥0.900 included the Nordic countries, the United Kingdom, Canada, the Netherlands, and other countries with similar health, education, and economy as Iceland. Each HDI group subsequently had at least 1000 migrants. HDI classification on 211 women (3.5% of all migrants) was unavailable because of missing data on citizenship, but they were included in the "all-migrant women" group and were analyzed separately.

### 2.3.2 | Covariates

The following maternal sociodemographic characteristics at the time of giving birth were obtained: age (continuous; ≤19, 20-24, 25-29, 30-34, 35-39, and ≥40), parity (0, 1, 2, and ≥3), marital status (married/cohabiting and single/widowed/divorced), residence (capital area (including the capital and six surrounding municipalities), rural), number of antenatal care visits (continuous; 0, 1-3, 4-8, 9-11, and ≥12), and employment during pregnancy (employed, student, homemaker/on disability/unemployed).

Information was also obtained on birth-related characteristics such as induction of labor (IMBR: onset of labor; ICD-10: O83.8, NCSP: MASC00, MAXC02, and MAXC09) and augmentation of spontaneous onset of labor with oxytocin and amniotomy (NCSP: MASC05 and MAXC00), prolonged first (ICD-10: O63.0) and second stage of labor (ICD-10: O63.1) and high birthweight (IMBR: ≥4000). Information on place of birth, including in primary (small size labor unit with midwives and general practitioners, home birth or birth center with midwives), secondary (medium sized labor unit with midwives, obstetricians, or surgeons with obstetrical training), and tertiary (specialized maternity unit for high-risk pregnancies and births with midwives, obstetricians, anesthesiologists, neonatologists, and neonatal nurses, surgical service, and neonatal intensive care unit (NICU) available at all times) were also obtained from IMBR.

Maternal comorbidity such as diagnoses during pregnancy and birth of chronic or pregnancy-related hypertensive disorders (ICD-10: O10-11, O13-14, O15.0-1, O16, and I10) and diabetes (ICD-10: O24.0-1, O24.4, O24.9, and E10-14) were also included.

Missing variables are presented in Table 1.

### 2.3.3 | Outcome variables

Dichotomous outcome variables included the following nonpharmacological pain management methods, presented in Table S1: relaxation (NIC: 6040), massage (NIC: 1480), acupuncture (NCSP: AXXA00), sterile water injection (NIC: 2317), warm/cold packs (NIC: 1380), transcutaneous electrical nerve stimulation (TENS) (NIC: 1540), shower/bath (NIC: 1340), and aromatherapy (NIC: 1330). The pharmacological pain relief variables were pethidine (Meperidine) (ATC: N02AB02), nitrous oxide inhalation (NCSP: WAA740), pudendal block (NCSP: WAA230),

**TABLE 1** Demographic and birth-related characteristics among birthing women with foreign citizenship and Icelandic citizenship who gave birth to a singleton in Iceland during the study period 2007-2018

| Characteristics | | TOTAL (n = 48 173) | Icelandic women (n = 42 076) | All migrant women (n = 6097) |
|---|---|---|---|---|
| Maternal age at birth | mean (SD) | 29.23 (5.41) | 29.26 (5.47) | 29.08 (4.96) |
| ≤19 | n (%) | 1297 (2.7) | 1200 (2.9) | 97 (1.6) |
| 20-24 | n (%) | 8342 (17.3) | 7343 (17.5) | 999 (16.4) |
| 25-29 | n (%) | 16 181 (33.6) | 13 890 (33) | 2291 (37.6) |
| 30-34 | n (%) | 13 787 (28.6) | 11 951 (28.4) | 1836 (30.1) |
| 35-39 | n (%) | 7057 (14.6) | 6329 (15) | 728 (11.9) |
| ≥40 | n (%) | 1509 (3.1) | 1363 (3.2) | 146 (2.4) |
| Data missing | n (%) | 0 (0) | 0 (0) | 0 (0) |
| Parity | Mean (SD) | 0.87 (0.90) | 0.91 (0.92) | 0.60 (0.77) |
| 0 | n (%) | 20 340 (42.2) | 17 001 (40.4) | 3339 (54.8) |
| 1 | n (%) | 16 377 (34) | 14 319 (34) | 2058 (33.8) |
| 2 | n (%) | 8679 (18) | 8158 (19.4) | 521 (8.5) |
| ≥3 | n (%) | 2777 (5.8) | 2598 (6.2) | 179 (2.9) |
| Data missing | n (%) | 0 (0) | 0 (0) | 0 (0) |
| Married/cohabiting | n (%) | 14 984 (31.9) | 11 755 (28) | 3229 (65) |
| Data missing | n (%) | 1164 (2.4) | 35 (0.1) | 1129 (19.5) |
| Capital area residence | n (%) | 31 767 (65.9) | 27 835 (66.2) | 3932 (64.5) |
| Data missing | n (%) | 0 (0) | 0 (0) | 0 (0) |
| Employed/student | n (%) | 42 879 (89) | 37 950 (90.2) | 4929 (80.8) |
| Antenatal care visits | Mean (SD) | 9.65 (2.72) | 9.73 (2.72) | 9.10 (2.64) |
| 0 | n (%) | 133 (0.3) | 100 (0.2) | 33 (0.5) |
| 1-3 | n (%) | 328 (0.7) | 239 (0.6) | 89 (1.5) |
| 4-8 | n (%) | 15 767 (32.7) | 13 397 (31.8) | 2370 (38.9) |
| 9-11 | n (%) | 22 456 (46.6) | 19 736 (46.9) | 2720 (44.6) |
| ≥12 | n (%) | 9477 (19.7) | 8594 (20.4) | 883 (14.5) |
| Data missing | n (%) | 12 (0) | 10 (0) | 2 (0) |
| Induction of labor | n (%) | 11 207 (25.1) | 10 021 (25.7) | 1186 (20.8) |
| Data missing | n (%) | 3470 (7.2) | 3083 (7.3) | 387 (6.3) |
| Augmentation of labor | n (%) | 13 058 (38.7) | 11 195 (38.4) | 1863 (41) |
| Data missing | n (%) | 14 461 (30) | 12 907 (30.7) | 1554 (25.5) |
| Prolonged first stage of labor | n (%) | 1548 (3.2) | 1311 (3.1) | 237 (3.9) |
| Prolonged second stage of labor | n (%) | 2097 (4.4) | 1708 (4.1) | 389 (6.4) |
| High birthweight (macrosomia) (≥4.000 g) | n (%) | 12 278 (25.5) | 11 289 (26.8) | 989 (16.2) |
| Data missing | n (%) | 0 (0) | 0 (0) | 0 (0) |
| Place of birth | | | | |
| Primary | n (%) | 4229 (8.8) | 3722 (8.8) | 507 (8.3) |
| Secondary | n (%) | 4488 (9.3) | 3929 (9.3) | 559 (9.2) |
| Tertiary | n (%) | 39 456 (81.9) | 34 425 (81.8) | 5031 (82.5) |
| Data missing | n (%) | 0 (0) | 0 (0) | 0 (0) |
| Co-morbidity | | | | |
| Hypertensive disorder | n (%) | 1765 (3.7) | 1629 (3.9) | 136 (2.2) |
| Diabetes | n (%) | 3307 (6.9) | 2861 (6.8) | 446 (7.3) |

*Note: P*-values are for comparison of each group of migrant women with the group of Icelandic women, $x^2$. The bold italics values was to define the significance *P*-values $< .05$.

Denominators vary because of missing values. HDI: 211 migrant women missing.

| *P* value | Migrant women, HDI ≥0.900 (n = 1028) | *P* value | Migrant women, HDI 0.850-0.899 (n = 3482) | *P* value | Migrant women, HDI ≤0.849 (n = 1376) | *P* value |
|---|---|---|---|---|---|---|
| ***0.021*** | 31.32 (4.94) | ***<0.001*** | 28.33 (4.73) | ***<0.001*** | 29.36 (4.98) | 0.504 |
| ***<0.001*** | 6 (0.6) | ***<0.001*** | 68 (2) | ***<0.001*** | 20 (1.5) | ***<0.001*** |
| | 72 (7) | | 673 (19.3) | | 206 (15) | |
| | 304 (29.6) | | 1416 (40.7) | | 504 (36.6) | |
| | 383 (37.3) | | 962 (27.6) | | 429 (31.2) | |
| | 209 (20.3) | | 309 (8.9) | | 183 (13.3) | |
| | 54 (5.3) | | 54 (1.6) | | 34 (2.5) | |
| | 0 (0) | | 0 (0) | | 0 (0) | |
| ***<0.001*** | 0.73 (0.87) | ***<0.001*** | 0.54 (0.72) | ***<0.001*** | 0.63 (0.78) | ***<0.001*** |
| ***<0.001*** | 507 (49.3) | ***<0.001*** | 2002 (57.5) | ***<0.001*** | 731 (53.1) | ***<0.001*** |
| | 344 (33.5) | | 1167 (33.5) | | 465 (33.8) | |
| | 123 (12) | | 236 (6.8) | | 142 (10.3) | |
| | 54 (5.3) | | 77 (2.2) | | 38 (2.8) | |
| | 0 (0) | | 0 (0) | | 0 (0) | |
| ***<0.001*** | 402 (42.4) | ***<0.001*** | 1672 (63.2) | ***<0.001*** | 1003 (83.8) | ***<0.001*** |
| | 79 (7.7) | | 838 (24) | | 179 (13) | |
| ***0.010*** | 629 (61.2) | ***0.001*** | 2147 (61.7) | ***<0.001*** | 998 (72.5) | ***<0.001*** |
| | 0 (0) | | 0 (0) | | 0 (0) | |
| ***<0.001*** | 895 (87.1) | **0.001** | 2928 (84.1) | ***<0.001*** | 980 (71.2) | ***<0.001*** |
| ***<0.001*** | 9.06 (2.61) | ***<0.001*** | 9.31 (2.54) | ***<0.001*** | 8.72 (2.80) | ***<0.001*** |
| ***<0.001*** | 7 (0.7) | ***<0.001*** | 15 (0.4) | ***<0.001*** | 8 (0.6) | ***<0.001*** |
| | 12 (1.2) | | 33 (0.9) | | 37 (2.7) | |
| | 404 (39.3) | | 1268 (36.4) | | 595 (43.3) | |
| | 447 (43.5) | | 1631 (46.9) | | 568 (41.3) | |
| | 158 (15.4) | | 423 (15.3) | | 167 (12.1) | |
| | 0 (0) | | 1 (0) | | 1 (0) | |
| ***<0.001*** | 186 (19.8) | ***<0.001*** | 678 (20.3) | ***<0.001*** | 284 (22.6) | ***0.014*** |
| | 88 (8.6) | | 147 (4.2) | | 120 (8.7) | |
| ***<0.001*** | 278 (36.7) | 0.341 | 1127 (42.3) | ***<0.001*** | 397 (40.7) | 0.140 |
| | 270 (26.3) | | 815 (23.4) | | 401 (29.1) | |
| ***0.001*** | 39 (3.8) | 0.218 | 118 (3.4) | 0.374 | 72 (5.2) | ***<0.001*** |
| ***<0.001*** | 63 (6.1) | ***0.001*** | 221 (6.3) | ***<0.001*** | 94 (6.8) | ***<0.001*** |
| ***<0.001*** | 204 (19.8) | ***<0.001*** | 579 (16.6) | ***<0.001*** | 168 (12.2) | ***<0.001*** |
| | 0 (0) | | 0 (0) | | 0 (0) | |
| | | | | | | |
| 0.335 | 118 (11.5) | ***0.011*** | 294 (8.4) | ***0.025*** | 81 (5.9) | ***<0.001*** |
| | 100 (9.7) | | 373 (10.7) | | 76 (5.5) | |
| | 810 (78.8) | | 2815 (80.8) | | 1219 (88.6) | |
| | 0 (0) | | 0 (0) | | 0 (0) | |
| | | | | | | |
| ***<0.001*** | 21 (2) | ***0.003*** | 94 (2.7) | ***<0.001*** | 17 (1.2) | ***<0.001*** |
| 0.137 | 54 (5.3) | 0.051 | 213 (6.1) | 0.123 | 169 (12.3) | ***<0.001*** |

and epidural anesthesia (NCSP: WAA307 and ZXXX30). These variables were also combined in five composite outcome variables: only nonpharmacological methods used, only pharmacological methods used, a combination of nonpharmacological and pharmacological method used, a combination of nonpharmacological methods and nitrous oxide inhalation used, and no pain management methods used.

The registration on the use of aromatherapy was initiated in 2012; therefore, the cohort was limited to the period 2012-2018 in the analyses for aromatherapy. During the study period, no woman was registered for the use of self-hypnosis, music, acupressure, or morphine in the cohort, and only seven Icelandic women used paracervical block, and therefore, were not analyzed.

## 2.4 | Statistical analyses

Descriptive data were reported as numbers of observations and prevalence (%) in Tables 1 and 2. Chi-square tests were used to compare crude percentages of background variables. Fisher exact test was used if >20% of the cells had an expected count less than 5 (identified in Table 2) and *t*-test were used when comparing variable means. We used logistic regression models, with forced entry and listwise deletion of missing data, to calculate odds ratios and 95% confidence intervals (CI) for the differences in the use of pain management methods between migrant women and Icelandic women, using women with Icelandic citizenship as the reference group. Calculations were made for all women with foreign citizenship and for each of the three HDI groups separately. The models were adjusted for the following variables: Continuous: maternal age at time of giving birth, parity, number of antenatal care visits; Dichotomous: marital status, residency, employment status, induction of labor, augmentation of labor, prolonged first and second stage of labor, high birthweight, hypertensive disorder, and diabetes; and Trichotomous: place of birth.

All analyses were conducted using the statistical software SPSS (version 26).

# 3 | RESULTS

Among all 48 173 births, 42 076 (87.3%) were to Icelandic women and 6097 (12.7%) occurred among migrants. Table 1 presents the covariates by citizenship. Compared with Icelandic women, migrant women were more likely to be younger, married/cohabiting, have lower parity, and have labor augmentation and a prolonged first and second stage of labor. Overall, migrant women were less likely to have a hypertensive disorder diagnosis, have their labor induced, give birth to an infant with macrosomia, be employed/student and live in the capital area, compared with Icelandic women. No differences were observed with respect to the place of birth (for migrant women overall) (Table 1).

In Table 2, the prevalence (%) of pain management methods is presented. In comparison with Icelandic women, migrant women had lower prevalence for the use of any pain management method, acupuncture, TENS, shower/bath, aromatherapy, and nitrous oxide inhalation. However, they had higher prevalence for the use of warm/cold packs and epidural anesthesia.

Table 3 shows the results for multivariate logistic regression analyses. When adjusting for covariates presented in Table 1, more migrant women overall did not use any form of pain relief (aOR = 1.23 95% CI [1.12, 1.34]), compared with Icelandic women. We observed significantly lower odds for the use of nonpharmacological methods such as acupuncture (0.73 [0.64, 0.83]), TENS (0.92 [0.01, 0.67]), shower/bath (0.73 [0.66, 0.82]), and aromatherapy (0.59 [0.44, 0.78]) in migrant women. Migrant women overall also had lower aOR for the use of nitrous oxide inhalation (0.89 [0.83, 0.96]) and a combination of nonpharmacological and pharmacological methods (0.87 [0.79, 0.95]), compared with Icelandic women. The aOR for the use of warm/cold packs (1.21 [1.07, 1.36]) was higher among migrant women. No difference was observed between all migrant groups and Icelandic women, in the use of relaxation, massage, sterile water injection, or pudendal block.

Migrant women from countries with the highest HDI score (≥0.900) had higher aOR in the use of no pain management method (1.27 [1.06, 1.52]) and lower aOR in the use of epidural (0.64 [0.53, 0.78]), compared with Icelandic women. Migrant women from countries with the middle HDI score (0.850-0.899) had lower aOR in the use of acupuncture (0.65 [0.55, 0.78]), shower/bath (0.74 [0.65, 0.86]), aromatherapy (0.40 [0.26, 0.61]), and only nonpharmacological methods (0.82 [0.68, 0.99]), but higher aOR in the use of warm/cold packs (1.31 [1.12, 1.52]), compared with Icelandic women. Migrant women from countries with the lowest HDI score (≤0.849) had lower aOR in the use of acupuncture (0.70 [0.54, 0.90]), shower/bath (0.51 [0.40, 0.64]), and nitrous oxide inhalation (0.74 [0.63, 0.86]), compared with Icelandic women. They also had lower aOR in the use of a combination of nonpharmacological and pharmacological methods (0.72 [0.60, 0.87]), a combination of nonpharmacological methods and nitrous oxide inhalation (0.72 [0.55, 0.92]), and higher aOR in the use of no pain management methods (1.52 [1.29, 1.79]), compared with Icelandic women.

When adjusted for covariates, no differences were observed in the odds of use of any pain management method

**TABLE 2** The prevalence (%) of nonpharmacological and pharmacological pain management methods of birthing women with foreign citizenship (n = 6097) compared to women with Icelandic citizenship (n = 42 076) who gave birth to a singleton in Iceland during the study period 2007-2018

| | TOTAL (n = 48 173) | Icelandic women (n = 42 076) | All migrant women (n = 6097) | | Migrant women, HDI ≥0.900 (n = 1028) | | Migrant women, HDI 0.850-0.899 (n = 3482) | | Migrant women, HDI ≤0.849 (n = 1376) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | n (%) | n (%) | n (%) | *p* value | n (%) | *p* value | n (%) | *p* value | n (%) | *p* value |
| Nonpharmacological methods | | | | | | | | | | |
| Relaxation | 544 (1.1) | 463 (1.1) | 81 (1.3) | 0.115 | 10 (1) | 0.698 | 48 (1.4) | 0.134 | 22 (1.6) | 0.083 |
| Massage | 2163 (4.5) | 1899 (4.5) | 264 (4.3) | 0.518 | 48 (4.7) | 0.812 | 147 (4.2) | 0.425 | 60 (4.4) | 0.788 |
| Acupuncture | 5304 (11) | 4777 (11.4) | 527 (8.6) | ***<0.001*** | 110 (10.7) | 0.514 | 279 (8) | ***<0.001*** | 119 (8.6) | ***0.002*** |
| Sterile water injection | 407 (0.8) | 350 (0.8) | 57 (0.9) | 0.411 | 11 (1.1) | 0.408 | 36 (1) | 0.211 | 9 (0.7) | 0.473 |
| Warm/cold packs | 4910 (10.2) | 4182 (9.9) | 728 (11.9) | ***<0.001*** | 109 (10.6) | 0.482 | 420 (12.1) | ***<0.001*** | 175 (12.7) | ***<0.001*** |
| TENS | 98 (0.2) | 96 (0.2) | 2 (0) | ***0.002*** | 1 (0.1) | 0.732[b] | 1 (0) | ***0.014*** | 0 (0) | 0.076[b] |
| Shower/Bath | 7188 (14.9) | 6449 (15.3) | 739 (12.1) | ***<0.001*** | 158 (15.4) | 0.970 | 425 (12.2) | ***<0.001*** | 136 (9.9) | ***<0.001*** |
| Aromatherapy[a] | 1101 (4.1) | 1007 (4.4) | 94 (2.7) | ***<0.001*** | 28 (5) | 0.472 | 43 (2) | ***<0.001*** | 21 (2.7) | ***0.029*** |
| Pharmacological methods | | | | | | | | | | |
| Pethidine | 729 (1.5) | 618 (1.5) | 111 (1.8) | 0.035 | 13 (1.3) | 0.590 | 68 (2) | ***0.024*** | 25 (1.8) | 0.293 |
| Nitrous oxide inhalation | 22 113 (45.9) | 19 407 (46.1) | 2706 (44.4) | ***0.011*** | 469 (45.6) | 0.750 | 1594 (45.8) | 0.694 | 563 (40.9) | ***<0.001*** |
| Pudendal block | 172 (0.4) | 149 (0.4) | 23 (0.4) | 0.777 | 3 (0.3) | 1000[b] | 14 (0.4) | 0.649 | 6 (0.4) | 0.641[b] |
| Epidural anesthesia | 19 399 (40.3) | 16 858 (40.1) | 2541 (41.7) | ***0.017*** | 344 (33.5) | ***<0.001*** | 1535 (44.1) | ***<0.001*** | 571 (42.1) | 0.134 |
| Combination variables | | | | | | | | | | |
| Only nonpharmacological methods used | 3556 (7.4) | 3163 (7.5) | 393 (6.4) | ***0.003*** | 87 (8.5) | 0.257 | 206 (5.9) | ***<0.001*** | 89 (6.5) | 0.145 |
| Only pharmacological methods used | 21 690 (45) | 18 861 (44.8) | 2829 (46.4) | ***0.021*** | 429 (41.7) | ***0.049*** | 1683 (48.3) | ***<0.001*** | 620 (45.1) | 0.865 |
| A combination of nonpharmacological and pharmacological methods used | 10 697 (22.2) | 9437 (22.4) | 1260 (20.7) | ***0.002*** | 204 (19.8) | ***0.049*** | 735 (21.1) | 0.072 | 281 (20.4) | 0.079 |
| A combination of nonpharmacological methods and nitrous oxide inhalation used | 4915 (10.2) | 4336 (10.3) | 579 (9.5) | 0.051 | 107 (10.4) | 0.914 | 338 (9.7) | 0.264 | 117 (8.5) | ***0.030*** |
| No pain management methods used | 12 230 (25.4) | 10 615 (25.2) | 1615 (26.5) | ***0.035*** | 308 (30) | ***<0.001*** | 858 (24.6) | 0.443 | 386 (28.1) | ***0.018*** |

*Note:* Denominators vary because of missing values and exclusion criteria. The bold italics values was to define the significance *P*-values $< .05$.

[a]First registered 2012. Cohort limited during the period 2012-2018. Total 26 583, migrant 3538, Icelandic 23 045, migrant women HDI ≥0.900 560, HDI 0.850-0.899 2.118, HDI ≤0.849 766.

[b]If Chi-square tests was not valid due to >20% cells have exp.count less than 5, Fisher's exact test was used.

**TABLE 3** Crude odds ratios (ORs) and adjusted odds ratios (aORs) with 95% confidence intervals (CIs) for the use of nonpharmacological and pharmacological pain management methods in birthing women with foreign citizenship (n = 6097) compared to women with Icelandic citizenship (n = 42 076) who gave birth to a singleton in Iceland during the study period 2007-2018

| | All migrant women (n = 6097) | | Migrant women, HDI ≥0.900 (n = 1028) | | Migrant women, HDI 0.850-0.899 (n = 3482) | | Migrant women, HDI ≤0.849 (n = 1376) | |
|---|---|---|---|---|---|---|---|---|
| | OR (CI) | aOR[a] (CI) | OR (CI) | aOR[a] (CI) | OR (CI) | aOR[a] (CI) | OR (CI) | aOR[a] (CI) |
| Nonpharmacological methods | | | | | | | | |
| Relaxation | 1.21 (0.95-1.54) | 1.32 (0.36-1.86) | 0.88 (0.47-1.66) | 1.30 (0.63-2.65) | 1.26 (0.93-1.70) | 1.40 (0.92-2.14) | 1.46 (0.95-2.45) | 1.17 (0.60-2.29) |
| Massage | 0.96 (0.84-1.09) | 1.02 (0.86-1.21) | 1.04 (0.77-1.39) | 1.14 (0.80-1.62) | 0.93 (0.79-1.11) | 1.05 (0.84-1.31) | 0.97 (0.74-1.26) | 0.87 (0.62-1.23) |
| Acupuncture | **0.74 (0.67-0.81)** | **0.73 (0.64-0.83)** | 0.94 (0.77-1.14) | 0.99 (0.77-1.26) | **0.68 (0.60-0.77)** | **0.65 (0.55-0.78)** | **0.74 (0.61-0.89)** | **0.70 (0.54-0.90)** |
| Sterile water injection | 1.13 (0.85-1.49) | 1.03 (0.70-1.52) | 1.29 (0.71-2.36) | 1.48 (0.75-2.93) | 1.25 (0.88-1.76) | 1.00 (0.61-1.66) | 0.79 (0.40-1.52) | 0.80 (0.36-1.77) |
| Warm/cold packs | **1.23 (1.13-1.34)** | **1.21 (1.07-1.36)** | 1.08 (0.88-1.31) | 1.09 (0.84-1.42) | **1.24 (1.12-1.38)** | **1.31 (1.12-1.52)** | **1.32 (1.12-1.55)** | 1.08 (0.86-1.36) |
| TENS | **0.14 (0.04-0.58)** | **0.92 (0.01-0.67)** | 0.43 (0.06-3.06) | - | **0.13 (0.02-0.90)** | 0.18 (0.03-1.31) | - | - |
| Shower/Bath | **0.76 (0.70-0.83)** | **0.73 (0.66-0.82)** | 1.00 (0.85-1.19) | 1.10 (0.88-1.36) | **0.77 (0.69-0.85)** | **0.74 (0.65-0.86)** | **0.61 (0.51-0.73)** | **0.51 (0.40-0.64)** |
| Aromatherapy[b] | **0.60 (0.48-0.74)** | **0.59 (0.44-0.78)** | 1.15 (0.78-1.69) | 1.16 (0.72-1.88) | **0.45 (0.33-0.62)** | **0.40 (0.26-0.61)** | **0.62 (0.40-0.96)** | 0.65 (0.38-1.10) |
| Pharmacological methods | | | | | | | | |
| Pethidine | **1.24 (1.02-1.53)** | 1.17 (0.87-1.56) | 0.86 (0.49-1.49) | 0.65 (0.30-1.40) | **1.34 (1.04-1.72)** | 1.21 (0.84-1.74) | 1.24 (0.83-1.86) | 1.69 (0.99-2.89) |
| Nitrous oxide inhalation | **0.93 (0.88-0.98)** | **0.89 (0.83-0.96)** | 0.98 (0.87-1.11) | 1.00 (0.86-1.17) | 0.99 (0.92-1.06) | 0.94 (0.85-1.03) | **0.81 (0.73-0.90)** | **0.74 (0.63-0.86)** |
| Pudendal block | 1.07 (0.69-1.65) | 0.84 (0.47-1.50) | 0.82 (0.26-2.59) | 0.60 (0.15-2.47) | 1.13 (0.66-1.97) | 1.19 (0.61-2.29) | 1.23 (0.54-2.79) | 0.43 (0.1-1.81) |
| Epidural anesthesia | 1.05 (0.98-1.13) | 0.96 (0.87-1.04) | **0.75 (0.66-0.86)** | **0.64 (0.53-0.78)** | **1.18 (1.10-1.26)** | 1.11 (0.99-1.24) | 1.09 (0.98-1.21) | 0.91 (0.77-1.08) |
| Combination variables | | | | | | | | |
| Only nonpharmacological methods used | **0.85 (0.76-0.95)** | 0.89 (0.77-1.02) | 1.14 (0.91-1.42) | 1.12 (0.85-1.47) | **0.77 (0.67-0.90)** | **0.82 (0.68-0.99)** | 0.85 (0.68-1.06) | 0.88 (0.68-1.16) |
| Only pharmacological methods used | **1.07 (1.01-1.12)** | 0.98 (0.90-1.06) | 0.88 (0.78-1.00) | 0.86 (0.73-1.01) | **1.51 (1.08-1.23)** | 1.03 (0.93-1.13) | 1.01 (0.91-1.12) | 0.95 (0.82-1.10) |
| A combination of nonpharmacological and pharmacological methods used | **0.90 (0.84-0.96)** | **0.87 (0.79-0.95)** | 0.86 (0.73-1.00) | 0.88 (0.72-1.08) | 0.93 (0.85-1.01) | 0.94 (0.83-1.07) | 0.89 (0.78-1.01) | **0.72 (0.60-0.87)** |
| A combination of nonpharmacological methods and nitrous oxide inhalation used | 0.91 (0.83-1.00) | 0.93 (0.82-1.05) | 1.01 (0.83-1.24) | 1.10 (0.86-1.41) | 0.94 (0.83-1.05) | 0.98 (0.84-1.15) | **0.81 (0.67-0.98)** | **0.72 (0.55-0.92)** |
| No pain management methods used | **1.07 (1.01-1.14)** | **1.23 (1.12-1.34)** | **1.27 (1.11-1.45)** | **1.27 (1.06-1.52)** | 0.97 (0.89-1.05) | 1.10 (0.99-1.23) | **1.16 (1.03-1.30)** | **1.52 (1.29-1.79)** |

*Note:* Denominators vary because of missing values and exclusion criteria. The bold italics values was to define the significance *P*-values $< .05$.

[a]Adjustments were made for maternal age at time of giving birth, parity, marital status, residency, number of antenatal care visits, employment status, induction of labor, augmentation of labor, prolonged first and second stage of labor, high birthweight, place of birth, hypertensive disorder, and diabetes.

[b]First registered 2012. Cohort limited during the period 2012-2018. Total n = 26 583, migrant n = 3538, Icelandic n = 23 045, migrant women HDI ≥0.900 n = 560, HDI 0.850-0.899 n = 2118, HDI ≤0.849 n = 766.

among women with missing data on citizenship when compared to women with Icelandic citizenship.

## 4 | DISCUSSION

The results from this nationwide study indicate less use of pain relief among migrant women in Iceland between 2007 and 2018, compared with Icelandic women. Moreover, the results suggest higher odds of no pain relief use among migrant women from countries with the highest and lowest HDI score and lower odds of nonpharmacological pain management methods, such as acupuncture and shower/bath among migrant women from countries with a HDI score <0.900. In addition, lower odds were observed of the use of warm/cold packs, aromatherapy, nitrous oxide inhalation, pethidine, and a combination of nonpharmacological and pharmacological methods among migrant women from countries with the lowest HDI score. Migrant women from countries with the highest HDI score had lower odds of epidural use, compared with Icelandic women. Higher odds were only observed on the use of warm/cold packs for migrant women from countries with the middle HDI score, compared with Icelandic women.

The findings are open to different interpretations. On the one hand, migrant women may have a more natural approach to childbirth and higher levels of confidence and trust in their own body to manage labor pain. Conversely, disparities in access to all options in maternity care and lack of full exposure to quality antenatal and intrapartum midwifery care may be a factor.[11,21] Still, a large group of women in each category (70%-75%) used some type of pain management. Nitrous oxide inhalation was the most used (44%-46%) pain management method within all groups of women, except for migrant women in the lowest HDI group, where epidural anesthesia had the highest prevalence (42% compared with 41% for the use of nitrous oxide inhalation).

Comparison of our results with previous studies on the use of pain management methods during labor among migrant women, compared with women in the respective host countries, is limited due to different study methods and group composition about reason for migration and country of citizenship.[27] In a Finnish study,[24] migrant multiparous women had a slightly higher prevalence of the use of any pain relief in comparison with Finnish women (70% vs 68%, $P < 0.01$). These results do not align with our findings where primi- and multiparous migrant women had lower prevalence of the use of any pain relief in comparison to Icelandic women (73.5% vs 74.8%, $P = 0.035$). Our results on lower odds of the use of nonpharmacological pain management methods among migrant women overall align with a Swedish study,[11] and might indicate difference in cultural preferences, access, and quality of care for migrant women. The overall underutilization of pain management methods among migrant women compared with Icelandic women in our study, especially among women from countries with HDI scores <0.900, is a possible indication of problems with accessibility and disparities in antenatal and intrapartum midwifery care.[22] Shortcomings in the caregiving relationship can be a barrier to quality intrapartum care. Due to cultural and linguistic differences, midwives may not be able to accurately interpret the wishes of migrant women, provide sufficiently individualized care, and/or adequately describe the options available in a manner that is meaningful for the birthing person. Circumstances affecting the use of interpreters in the birth setting could restrict the provision of equitable care.[28] In addition, cultural barriers or an educational gap between a woman and the midwife can affect equitable care, and the response to the woman's pain expression.[21] Expressions of pain are strongly influenced by cultural, emotional, motivational, social, and cognitive factors.[29] Inability to offer respectful care and not wanting to, or not being able to, understand the migrant woman can affect health beliefs among migrant women about when, where, and how to seek help.[30] Given the administrative nature of our data, these factors were not measured in our study.

Our results on lower aORs for epidural use among migrant women in the highest HDI group are similar to other research[7,10,14]; however, there was no difference in epidural use among migrant women with citizenship from countries with HDI <0.900, which is different to other studies.[7,10,15,16] Although less use of nonpharmacological pain relief in the lower HDI groups of migrant women may to some extent be explained by cultural and linguistic barriers and an educational gap, less use of epidural by the highest HDI group may, conversely, be explained by higher education levels and more access to evidence-based information in a woman's language.

For migrant women to be able to access services they need when they need them, such as pain relief, depends on whether the Icelandic maternity service can reach and inform the targeted group, with health education, promotion, and preventive care.[31] Even though financial means may be a practical barrier for the minority of women migrating from outside the EEA, cost of care should not be an issue for the majority of migrant women in Iceland—with the exception of childbirth education. However, language barriers can be an issue for many migrant women. There have been almost no antenatal educational programs in different languages in Iceland, where most of the education on pain management methods take place. Cultural mediators, who can have an important role in reducing

social and cultural barriers to access,[32] are not easily available in Iceland. Our previous study[1] found an increase in instrumental births and episiotomy among migrant women, which strengthens our interpretation that access and quality of care may not be equitable for all women giving birth in Iceland. Nevertheless, further studies are needed to examine whether the effect of having foreign citizenship on the use of pain management methods in labor is mediated through other factors such as education[23] and cultural preferences.

The presence of pain is not necessarily connected to a negative birth experience.[33] However, women need access to effective, simple, and safe ways to help them cope with labor. Their involvement in well-informed decision making and respectful support from midwives may be more important to women than pain relief itself.[34]

## 4.1 | Strengths and limitations

This study is the first of its kind in Iceland. Its main strength is the use of prospectively and independently collected registry-based population data for 11 years, therefore unlikely to have selection and information bias. A limitation of the study is the lack of information on citizenship for 211 migrant women, which can lead to exposure distortion. They were, however, analyzed in the "all-migrant women" group. The lack of information on education, length of residence, continuous support in labor, participation in prenatal classes, language skills, the use of interpreters, and labor pain intensity, due to using administrative data, was a limitation. This would have allowed for a more nuanced interpretation of the results. In addition, the use of morphine and pethidine in labor can be misleading, as we cannot rule out whether it's use was in fact after childbirth or even during emergency cesarean birth, and thus, this can also be considered a limitation to the study.

## 4.2 | Conclusions

The results of this study add important knowledge on use of different pain management methods in labor among migrant women in Iceland compared with Icelandic women. Our results suggest that being a migrant woman in Iceland from a country with a lower HDI score is an important factor that decreases the use of nonpharmacological pain management methods without increasing the use of pharmacological pain relief. On the other end of the spectrum, migrant women who had citizenship from countries with a high HDI score showed similar use as Icelandic women except for lower odds of epidural use.

Furthermore, studies are needed, particularly including migrant women's experience of intrapartum care, their care needs, and cultural preferences with respect to intrapartum midwifery care. Our findings have implications for maternity care practice, including the increased use of interpreters to ensure clear communication, supply of antenatal educational programs in different languages, and culturally sensitive, high-quality, individualized care for all pregnant women, and particularly for migrant women with citizenship from countries with HDI score <0.900.

## DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

## ORCID

*Embla Ýr Guðmundsdóttir* https://orcid.org/0000-0001-9967-1442
*Kristjana Einarsdóttir* https://orcid.org/0000-0003-4931-7650

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## SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

**How to cite this article:** Guðmundsdóttir EÝ, Nieuwenhuijze M, Einarsdóttir K, Hálfdánsdóttir B, Gottfreðsdóttir H. Use of pain management in childbirth among migrant women in Iceland: A population-based cohort study. *Birth*. 2022;00:1–11. doi:10.1111/birt.12619