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ORIGINAL RESEARCH ARTICLE

Challenges in migrant women's maternity care in a high-income country: A population-based cohort study of maternal and perinatal outcomes

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Abstract

Introduction: This study aims to explore maternal and perinatal outcomes of migrant women in Iceland.

Material and methods: This prospective population-based cohort study included women who gave birth to a singleton in Iceland between 1997 and 2018, comprising a total of 92 403 births. Migrant women were defined as women with citizenship other than Icelandic, including refugees and asylum seekers, and categorized into three groups, based on their country of citizenship Human Development Index score. The effect of country of citizenship was estimated. The main outcome measures were onset of labor, augmentation, epidural, perineum support, episiotomy, mode of birth, obstetric anal sphincter injury, postpartum hemorrhage, preterm birth, a 5-minute Apgar <7, neonatal intensive care unit admission and perinatal mortality. Odds ratios (ORs) and 95% confidence intervals (CIs) for maternal and perinatal outcomes were calculated using logistic regression models.

Results: A total of 8158 migrant women gave birth during the study period: 4401 primiparous and 3757 multiparous. Overall, migrant women had higher adjusted ORs (aORs) for episiotomy (primiparas: aOR 1.43, 95% CI 1.26–1.61; multiparas: 1.39, 95% CI 1.21–1.60) and instrumental births (primiparas: 1.14, 95% CI 1.02–1.27, multiparas: 1.41, 95% CI 1.16–1.72) and lower aORs of induction of labor (primiparas: 0.88, 95% CI 0.79–0.98; multiparas: 0.74, 95% CI 0.66–0.83), compared with Icelandic women. Migrant women from countries with a high Human Development Index score (≥0.900) had similar or better outcomes compared with Icelandic women, whereas migrant women from countries with a lower Human Development Index score than that of Iceland (<0.900) had additionally increased odds of maternal and perinatal complications and interventions, such as emergency cesarean and postpartum hemorrhage.

Abbreviations: aOR, Adjusted odds ratio; CI, confidence interval; HDI, Human Development Index; IMBR, Icelandic Medical Birth Registry; OASI, obstetrical anal sphincter injury; OR, odds ratio.

Conclusions: Women's citizenship and country of citizenship Human Development Index scores are significantly associated with a range of maternal and perinatal complications and interventions, such as episiotomy and instrumental birth. The results indicate the need for further exploration of whether Icelandic perinatal healthcare services meet the care needs of migrant women.

KEYWORDS
childbirth interventions, maternal outcome, migrant, perinatal complications, perinatal outcome

1 | INTRODUCTION

Immigration is steadily increasing worldwide, with almost one in 10 people in the World Health Organization European Region estimated to be an international migrant.[1] Iceland is no exception, with 14.1% of its population holding foreign citizenship in 2019,[2] which is similar to the percentages in Norway[3] and Denmark.[4] The inequity that migrants face concerning their state of health and access to quality health services has been demonstrated by global researchers and international organizations.[5]

Perinatal outcomes have been previously studied among migrant women in high-income countries. Increased risks of adverse perinatal outcomes have been reported among migrant women in the Nordic countries compared with the host population.[6–14] However, the results of previous studies have been inconsistent regarding mode of birth,[7,8,10,12,13,15] maternal outcomes[8,10,11] and interventions,[7,15] reflecting heterogeneous study populations, designs and exposure group definitions. Theories regarding better/adverse perinatal outcomes include the healthy migrant effect,[12] socioeconomic disadvantage,[7,8,10–12,16] suboptimal use or access to care,[7–9,11,13,16] underlying conditions in the mother[7,10,12,15,16] and the stress of migration.[11,16]

Despite increasing global attention to migrants' health,[17] there is limited knowledge on the perinatal health of migrant women in Iceland.

Immigration in Iceland increased from 4.6% in 2006 to 14.1% in 2019.[18] Migrants in Iceland are mostly 15–49 years of age (75%) and 50% of migrants have fewer than 5 years of median duration of stay in the country.[2] The majority (68%) mention work as their reason for moving to the country.[19] However, they often do not have jobs that suit their education level and have long and non-standard working hours when compared with the Icelandic-born population.[18] Of all migrants, 45% are women,[2] 43.9% of whom work in production jobs.[20] Most migrant women in Iceland come from Poland (34.6%), the Philippines (5.9%), Lithuania (4.9%), other Nordic countries (4.7%), Germany (4.2%), Thailand (3.9%), Latvia (2.6%), Romania (2.2%) and the USA (2.1%),[2] thus, the majority come from countries where health, education and the economy are considered good.[21]

Active integration with the host population and policies promoting social participation have been linked to lower risks of adverse maternal and perinatal outcomes in other countries.[22] However, despite growing numbers and increasing global attention to migrants' health,[4] the integration policy in Iceland has been criticized for its lack of an infrastructure that can identify and respond to the specific health and access needs of migrants.[16]

This primary objective of this study was to explore maternal and perinatal outcomes among migrant women in Iceland.

Key message

This cohort revealed increased odds of several maternal and perinatal complications and interventions among women with foreign citizenship compared with women with Icelandic citizenship. This difference was increased for women from countries with an HDI score lower than the score for Iceland (<0.900).

2 | MATERIAL AND METHODS

The population in this cohort study included women who gave birth to a singleton in Iceland between 1 January 1997 and 31 December 2018. The data were prospectively collected from the Icelandic Medical Birth Registry (IMBR), which is a routinely collected nationwide centralized administrative registry. It includes information on all births in Iceland from 22+0 weeks' gestation or from infants weighing ≥500 g. A total of 92 403 births were included during the study period: 37 456 primiparous women and 54 947 multiparous women. Maternity care in Iceland is part of a publicly funded healthcare system and is therefore mostly free of charge; however, legal migrants must pay for health insurance during their first 6 months in Iceland.[16] The recommended number of antenatal care visits in an uncomplicated singleton pregnancy is 10 for healthy primiparas and seven for multiparas. Migrants are entitled to a free interpreter, either via telephone or a face-to-face meeting.[23]

Data on maternal characteristics, pregnancy complications and birth characteristics were obtained from the IMBR. Obstetric interventions and birth complications were registered using the following:

- The recorded variables and diagnostic and surgical codes in the IMBR,
- The International Statistical Classification of Diseases and Related Health Problems, 10th revision (ICD-10)
- The Nordic Medico-Statistical Committee Classification of Surgical Procedures (NCSP).[24]

The exposure variable was both a binominal variable and a trichotomous categorical variable based on registered citizenship. The binominal variable "migrant women" was defined as women with citizenship other than Icelandic, including refugees and asylum seekers. Migrant women who had received Icelandic citizenship were included in the reference group. The trichotomous categorical variable was based on the Human Development Index (HDI), a statistical composite index of life expectancy at birth, education and per capita income indicators.[21] Due to data protection regulations, we were not able to use the variable country of citizenship. Therefore, HDI scores for year 2018 were categorized by IMBR in 12 groups with increments of 0.050. Due to the small number of migrants coming from countries with a low HDI score, the groups in the lower levels were combined. The lowest 10 categories, including countries such as the Philippines and Pakistan, were merged into a group with an HDI score of ≤0.849. The second group (HDI score = 0.850–0.899) included countries such as Poland and Lithuania, and the third group (HDI score ≥0.900) included the Nordic countries and the UK, among other countries with similar health, education and economy levels to those of Iceland. A total of 350 women (4.3% of all migrants) were missing in the HDI classification due to missing data on citizenship but were included in the "all migrant women" group and were analyzed separately.

The following maternal sociodemographic characteristics at the time of giving birth were obtained from the IMBR: citizenship (Icelandic, other and the three HDI groups), age (continuous; ≤19, 20–24, 25–29, 30–34, 35–39 and ≥40), parity (0, 1, 2 and ≥3), gestational age in full weeks based on routine fetal ultrasound examination in pregnancy weeks 19–21 (continuous; ≤36+6 weeks, 37+0 to 41+6 weeks, ≥42+0 weeks), marital status (married/cohabiting, single/widowed/divorced), residence (capital area, including the capital and six surrounding municipalities, rural), employment during pregnancy (employed, student, homemaker/on disability pension/unemployed), previous cesarean section (ICD-10: O34.2) and year of giving birth (continuous; 1997–2006, 2007–2018). The cut-off year of 2007 was chosen because migrants before that year, made up <2% of the population and their numbers substantially increased after that.[25] Information was also obtained on the number of antenatal care visits (continuous; 0, 1–3, 4–8, 9–11 and ≥12) and level of birth services, primary (small labor units with midwives and general practitioners, homebirths or birth centers with midwives), secondary (medium-sized labor units with midwives, obstetricians or surgeons with obstetrical training) and tertiary (specialized maternity units with facilities for high-risk pregnancy and labor, with midwives, obstetricians, anesthesiologists, neonatologists and neonatal nurses, surgical service and a Neonatal Intensive Care Unit) healthcare settings. Additionally, data were obtained from during pregnancy and birth on maternal diagnoses of chronic and pregnancy-related diabetes (ICD-10: O24.0–1, O24.4, O24.9, E10–14), hypertensive disorders (ICD-10: O10–11, O13–14, O15.0–1, O16, I10), HIV (ICD-10: Z21, B20.8), hepatitis (ICD-10: Z22.5, B18.1–2), thalassemia (ICD-10: D56), symphysis pubis dysfunction (ICD-10: O26.7) and obesity (ICD-10: E66.0–2, E66.8–9). Missing variables are presented in Tables 1 and 2.

Perinatal outcomes included induction of labor (IMBR: onset of labor; ICD-10: O83.8; NCSP: MASC00, MAXC02, MAXC09), augmentation of spontaneous onset of labor with oxytocin (NCSP: MAXC00) and amniotomy (NCSP: MASC05), epidural during labor (NCSP: WAA307, ZXXX30), perineal support (IMBR: yes, no), episiotomy (NCSP: MAXX00), instrumental vaginal birth (ICD-10: O81.0–5), elective cesarean section (IMBR: onset of labor; ICD-10: O82.0) and emergency cesarean section (ICD-10: O82.1). Maternal outcomes included obstetric anal sphincter injury (OASI) (ICD-10: O70.2–3) and postpartum hemorrhage (ICD-10: O72.0–3). Neonatal outcomes included preterm birth (≤36+6 w) (IMBR: continuous), a 5-minute Apgar <7 (IMBR: continuous), Neonatal Intensive Care Unit admission (IMBR: supervision of newborn) and perinatal mortality (IMBR: death of the newborn), which was identified as the intrauterine death of a fetus ≥22 weeks' gestational age, and/or ≥500 g if gestational age is unknown and the death of a newborn in the first week after birth.

2.1 | Statistical analyses

Chi-square and Fisher's exact tests were used to compare crude rates. We used logistic regression models with listwise deletion of missing data to calculate odds ratios (OR) and 95% confidence intervals (CI) for the differences in maternal and perinatal outcomes between migrant women and Icelandic women, using women with Icelandic citizenship as the reference group. The calculation was made for all women with foreign citizenship and for each of the three HDI groups separately. The models were adjusted for the continuous variables (maternal and gestational age at the time of giving birth, number of antenatal care visits and birth year). The models were also adjusted for the binominal variables (hypertensive disorder, diabetes, HIV, hepatitis, obesity, symphysis pubis dysfunction, thalassemia, marital status, residency and employment status) and the trichotomous variable level of birth services. All analyses were performed separately according to parity and the model for multiparous women was additionally adjusted for the continuous variable previous births and the binominal variable previous cesarean section. All analyses were conducted using statistical software SPSS version 26 (IBM Corp., Armonk, NY, USA).

2.2 | Ethical approval

This study received ethical approval from the National Bioethics Committee on 11 June 2019 (VSNb2019050003/03.01).

TABLE 1 Background characteristics of primiparous women with foreign citizenship and Icelandic citizenship who gave birth to a singleton in Iceland between 1997 and 2018[a]

	Primiparous women									
	TOTAL (*n* = 37 456)	Icelandic women (*n* = 33 055)	All migrant women (*n* = 4401)		Migrant women, HDI ≥0, 900 (*n* = 893)		Migrant women HDI 0.850–0.899 (*n* = 2327)		Migrant women, HDI ≤0, 849 (*n* = 1004)	
Characteristics	%	%	%	*p* value	%	*p* value	%	*p* value	%	*p* value
Maternal age at birth, yr				<0.001		<0.001		<0.001		<0.001
≤19	8.4	9.1	2.9		1.9		3		2.9	
20–24	33.2	34.4	24.3		16.6		27.7		22.5	
25–29	36.5	35.8	41.8		35.9		45		41.2	
30–34	15.4	14.3	23		31.8		19.2		24.2	
35–39	5.3	5.1	6.8		11.6		4.5		7.6	
≥40	1.2	1.2	1.3		2.1		0.6		1.6	
Data missing	0	0	0.4		0		0		0	
Married/ cohabiting	27.4	24	60.6	<0.001	35.9	<0.001	60.8	<0.001	80.2	<0.001
Data missing	2.9	0.1	24.0		10.4		33.5		14.3	
Capital area residence	65.9	66.4	62.6	<0.001	53.8	<0.001	61.8	<0.001	71	0.002
Data missing	3.0	2.8	4.1		11.1		1.5		2.9	
Employed/student	92.3	93.5	83.8	<0.001	89.1	<0.001	88.1	<0.001	73.3	<0.001
Year of giving birth				<0.001		<0.001		<0.001		<0.001
1997–2006	43.6	46.6	20.7		40.5		10.2		23.7	
2007–2018	56.4	53.4	79.3		59.5		89.8		76.3	
Data missing	0	0	0		0		0		0	
Antenatal care visits				<0.001		<0.001		<0.001		<0.001
0	0.3	0.2	0.8		1.1		0.4		0.7	
1–3	0.6	0.5	1.2		0.9		0.8		1.9	
4–8	18.5	17.1	29		24.5		28.1		35	
9–11	46.7	46.5	48.4		46.4		50.3		47.8	
≥12	33.9	35.7	20.6		27.1		20.4		14.7	
Data missing	0	0	0		0		0		0.1	
Gestation				<0.001		0.848		0.009		<0.001
≤36+6 w	5.5	5.5	6.2		5.2		6		7	
37+0 to 41+6 w	89.5	89.4	90.2		89.9		90.2		91.1	
≥42+0 w	5	5.1	3.6		4.9		3.8		1.9	
Data missing	3.3	3.2	3.9		4.9		4.1		4.7	
Level of birth services				0.217		0.001		0.001		0.001
Primary	7.5	7.5	7.8		10.8		7.6		5.8	
Secondary	7.9	7.8	8.5		8.7		10		5.4	
Tertiary	84.6	84.7	83.7		80.5		82.3		88.8	
Data missing	0	0	0		0		0		0	
Co-morbidity										

(Continues)

TABLE 1 (Continued)

	Primiparous women									
	TOTAL (*n* = 37 456)	Icelandic women (*n* = 33 055)	All migrant women (*n* = 4401)		Migrant women, HDI ≥0, 900 (*n* = 893)		Migrant women HDI 0.850–0.899 (*n* = 2327)		Migrant women, HDI ≤0, 849 (*n* = 1004)	
Characteristics	%	%	%	*p* value	%	*p* value	%	*p* value	%	*p* value
Hypertensive disorder	4.2	4.4	2.7	<0.001	2.7	0.014	3.3	0.013	1.6	<0.001
Diabetes	4.3	4	5.8	<0.001	3.8	0.719	4.9	0.045	10.2	<0.001
HIV[b]	0	0	0.1	0.497	0	1.000	0.1	0.093	0.3	0.002
Hepatitis[b]	0.2	0.2	0.4	0.001	0	0.411	0.3	0.210	1.1	<0.001
Symphysis pubis dysfunction	1.9	2	1	<0.001	0.7	0.005	0.9	<0.001	1.3	0.128
Thalassemia[b]	0	0	0	0.117	0	—	0	—	0.1	0.029
Obesity	3.2	3.3	1.9	<0.001	1.9	0.018	2.2	0.004	1.2	<0.001

The *p* values for comparison of each group of migrant women with the group of Icelandic women, x^2.

Abbreviation: HDI, Human Development Index.

[a]Denominators vary because of missing values. HDI: 173 migrant women missing.

[b]If Chi-square tests were not valid due to >20% cells having an expected count <5, the Fisher exact test was used.

3 | RESULTS

The total cohort consisted of 37 456 primiparous women and 54 947 multiparous women, 4401 of whom were migrant primiparous women and 3757 migrant multiparous women, respectively. The migrant primiparous and multiparous women were more often married/cohabiting and less often living in the capital area and employed/students compared with the Icelandic women. They had fewer antenatal care visits and lower gestational age than the Icelandic women and were less often diagnosed with hypertensive disorder and symphysis pubis dysfunction. The migrant primiparous women were older than the Icelandic women and less often diagnosed with obesity (Table 1), and the migrant multiparous women had lower parity, less often gave birth in a primary birth facility and more often had undergone a previous cesarean section (Table 2). Overall, the migrant women with missing citizenship were older, more often married/cohabiting and had fewer antenatal care visits than the Icelandic women. The migrant primiparous women with missing citizenship were less often diagnosed with hypertensive disorder, and the migrant multiparous women with missing citizenship less often gave birth in a primary or secondary birth facility and more often gave birth in a tertiary birth facility.

Overall, the migrant women had higher adjusted ORs (aORs) of instrumental birth and episiotomy and lower aORs of induction of labor than the Icelandic women (Tables 3 and 4). Additionally, the migrant multiparous women overall had higher aORs of emergency cesarean section and perineum support, and lower aORs of epidural and elective cesarean section (Table 4).

The migrant primiparous women with missing citizenship had lower aORs of OASI (0.26, 95% CI 0.08–0.81) and preterm birth (0.33, 95% CI 0.13–0.85).

The migrant women in the lowest HDI group had higher aORs of emergency cesarean section and OASI (Tables 3 and 4), compared with Icelandic women, and the multiparous women in the lowest HDI group also had higher aORs of instrumental birth and postpartum hemorrhage (Table 4). Tables 3 and 4 present the prevalence of crude and adjusted ORs with 95% confidence intervals (CI) for maternal and perinatal outcomes of primiparous and multiparous migrant women in HDI groups compared with Icelandic women.

4 | DISCUSSION

The results highlight the heterogeneous nature of migrant groups in Iceland, where migrant women from countries with an HDI score ≥0.900 had similar or better outcomes than women with Icelandic citizenship, whereas migrant women from countries with an HDI score lower than that of Iceland (<0.900) had increased odds for several maternal and perinatal complications and interventions, such as emergency cesarean and postpartum hemorrhage.

This study is the first of its kind in Iceland. Its main strength is the use of registry-based population data over more than two decades. Given the prospectively and independently collected information, our study is likely to have minimal selection and information bias. Potential confounding was in part counteracted by adjusting for background characteristics in regression analysis and stratification by parity. Another strength is the large cohort size and the power to detect differences in rare outcomes.

Due to IMBR data registration on citizenship rather than country of origin, the reference group included migrant women who had received Icelandic citizenship (total 6983 women received Icelandic citizenship during the research period[26]). Thus, the association with the outcome is likely biased towards the null value. Another limitation of the study is the missing data on citizenship and HDI classification for 350 migrant women, leading to a risk of distortion

TABLE 2 Background characteristics of multiparous women with foreign citizenship and Icelandic citizenship who gave birth to a singleton in Iceland between 1997 and 2018[a]

	Multiparous women									
	TOTAL (*n* = 54 947)	Icelandic women (*n* = 51 190)	All migrant women (*n* = 3757)		Migrant women, HDI ≥0,9 (*n* = 954)		Migrant women HDI 0.850–0.899 (*n* = 1748)		Migrant women, HDI ≤0,849 (*n* = 882)	
Characteristics	**%**	**%**	**%**	***p* value**	**%**	***p* value**	**%**	***p* value**	**%**	***p* value**
Maternal age at birth, yr				0.126		<0.001		<0.001		0.525
≤19	0.3	0.3	0.3		0.3		0.3		0.3	
20–24	8.8	8.8	8.2		4		8.8		10.1	
25–29	29.4	29.4	30.4		24.3		3.8		29.1	
30–34	36.4	36.3	37.6		38.2		37.6		37.4	
35–39	20.6	20.7	19.2		26.4		15.7		19.4	
≥40	4.5	4.5	4.3		6.8		3.2		3.6	
Data missing	0	0	0.2		0		0		0	
Married/cohabiting	49.9	49	63.1	<0.001	54.7	0.001	66.4	<0.001	82.8	<0.001
Data missing	0.5	0.0	7.2		5.0		6.5		9.8	
Capital area residence	60.2	60.4	58.2	0.008	49	<0.001	57.8	0.035	67	<0.001
Data missing	2.1	2.1	3.6		8.5		0.7		2.7	
Employed/student	84.4	85.1	74.7	<0.001	77.3	<0.001	78.7	<0.001	67.3	<0.001
Year of giving birth				<0.001		0.001		<0.001		<0.001
1997–2006	44.2	46	20.1		40.8		8.1		19.4	
2007–2018	55.8	54	79.9		59.2		91.9		80.6	
Data missing	0	0	0		0		0		0	
Parity				<0.001		<0.001		<0.001		<0.001
1	57.2	56.2	71.8		62.3		78.1		70.3	
2	31.5	32.3	20.6		25.9		16.5		23.4	
≥3	11.2	11.5	7.6		11.8		5.4		6.3	
Data missing	0	0	0		0		0		0	
Previous cesarean section	15.6	15.3	18.3	<0.001	16.4		18.5	<0.001	21.8	<0.001
Antenatal care visits				<0.001		<0.001		<0.001		<0.001
0	0.2	0.2	0.8		1.2		0.6		0.8	
1–3	0.6	0.5	2		1.3		1.5		3.6	
4–8	27.3	26.3	41.9		25.4		43.9		43.9	
9–11	44.2	44.6	39.3		41.3		40.6		35.4	
≥12	27.6	28.5	16.1		20.9		13.4		16.3	

(Continues)

TABLE 2 (Continued)

	Multiparous women								
	TOTAL (*n* = 54 947)	Icelandic women (*n* = 51 190)	All migrant women (*n* = 3757)		Migrant women, HDI ≥0,9 (*n* = 954)		Migrant women HDI 0.850–0.899 (*n* = 1748)		Migrant women, HDI ≤0,849 (*n* = 882)	
Characteristics	%	%	%	*p* value	%	*p* value	%	*p* value	%	*p* value
Data missing	0.3	0.3	0.3		0		0.1		0	
Gestation				<0.001		0.116		<0.001		<0.001
≤36+6 w	3.8	3.7	4.9		4.2		4.9		5.7	
37+0 to 41+6 w	93.3	93.3	93.6		93.6		93.9		93	
≥42+0 w	2.9	3	1.5		2.2		1.2		1.3	
Data missing	3.3	3.3	3.2		3.4		2.9		4.9	
Level of birth services				0.012		0.001		<0.001		<0.001
Primary	12.1	12.2	11.1		16.4		10.5		7.4	
Secondary	9	8.9	10.1		9		12.9		6.2	
Tertiary	78.9	78.8	78.9		74.6		76.6		86.4	
Data missing	0	0	0		0		0		0	
Comorbidity										
Hypertensive disorder	2.2	2.3	1.6	0.004	1.2	0.020	2.1	0.530	1	0.012
Diabetes	5.5	5.3	7.9	<0.001	5.1	0.775	7.6	<0.001	12.1	<0.001
HIV[b]	0	0	0.1	0.800	0	1.000	0.1	0.067	0.2	0.020
Hepatitis[b]	0.2	0.2	0.5	<0.001	0.1	1.000	0.5	0.028	1	<0.001
Symphysis pubis dysfunction	3.1	3.2	2	<0.001	1.9	0.025	1.8	0.001	2.4	0.188
Thalassemia[b]	0	0	0.1	0.005	0	—	0	—	0.2	<0.001
Obesity	3.6	3.7	3.2	0.144	2.9	0.240	3.8	0.791	2.4	0.045

The *p* values for comparison of each group of migrant women with the group of Icelandic women, x^2.

Abbreviation: HDI, Human Development Index.

[a]Denominators vary because of missing values. HDI: 173 migrant women missing.

[b]If Chi-square tests were not valid due to >20% cells having an expected count <5, the Fisher exact test was used.

TABLE 3 Prevalence (%) of, crude odds ratios (ORs) and adjusted odds ratios (aORs) with 95% confidence intervals (CI) for maternal and perinatal outcomes of primiparous women with foreign citizenship compared with women with Icelandic citizenship who gave birth to a singleton in Iceland between 1997 and 2018[a]

		Primipara												
	TOTAL (*n* = 37 456)	Icelandic women (*n* = 33 055)	All migrant women (*n* = 4401)			Migrant women, HDI ≥0, 900 (*n* = 893)			Migrant women, HDI 0.850–0.899 (*n* = 2327)			Migrant women, 4.401 (*n* = 1004)		
	%	%	%	OR (CI)	aOR[i] (CI)	%	OR (CI)	aOR[i] (CI)	%	OR (CI)	aOR[i] (CI)	%	OR (CI)	aOR[i] (CI)
Childbirth intervention														
Induction of labor[b]	20.9	20.9	21.4	1.03 (0.95–1.12)	**0.88 (0.79–0.98)**	18.4	0.86 (0.71–1.04)	**0.73 (0.58–0.90)**	22	1.07 (0.96–1.19)	0.86 (0.75–1.00)	22.8	1.12 (0.95–1.32)	1.02 (0.84–1.25)
Amniotomy[c,d]	31	31	30.5	0.97 (0.89–1.07)	1.09 (0.95–1.24)	25.8	0.81 (0.64–1.03)	0.91 (0.69–1.19)	31.8	1.04 (0.92–1.17)	1.16 (0.98–1.36)	28.6	0.89 (0.73–1.09)	1.09 (0.85–1.39)
Oxytocin augmentation[c,d]	33.6	33.2	35.6	**1.11 (1.02–1.22)**	1.07 (0.94–1.22)	29	0.82 (0.65–1.04)	0.81 (0.62–1.06)	36.2	**1.14 (1.02–1.28)**	1.11 (0.94–1.30)	39.5	**1.31 (1.09–1.58)**	**1.31 (1.04–1.66)**
Epidural[b]	50.6	50.6	50.3	0.99 (0.92–1.06)	0.94 (0.86–1.02)	40.7	**0.67 (0.58–0.78)**	**0.71 (0.60–0.84)**	52.8	1.09 (1.00–1.19)	1.00 (0.89–1.12)	52.5	1.08 (0.94–1.24)	1.10 (0.93–1.29)
Perineum support[e,f]	63.8	63.6	64.9	1.06 (0.95–1.19)	1.10 (0.93–1.30)	56.7	**0.75 (0.58–0.97)**	0.78 (0.56–1.07)	66.4	1.13 (0.98–1.30)	**0.79 (0.64–0.98)**	67.8	1.21 (0.95–1.53)	1.15 (0.83–1.61)
Episiotomy[d,f]	18.3	17.7	21.3	**1.26 (1.14–1.39)**	**1.20 (1.06–1.36)**	22	**1.31 (1.06–1.63)**	1.16 (0.90–1.47)	21.9	**1.30 (1.16–1.47)**	**1.29 (1.10–1.52)**	19.9	1.16 (0.95–1.41)	1.09 (0.86–1.39)
Instrumental birth[b]	15.1	14.8	17.1	**1.19 (1.08–1.30)**	**1.14 (1.02–1.27)**	16.8	1.16 (0.96–1.42)	1.02 (0.82–1.26)	16.6	**1.15 (1.02–1.29)**	1.15 (0.98–1.34)	18.2	**1.29 (1.08–1.54)**	1.23 (1.00–1.51)
Elective cesarean section	3.6	3.5	4.2	**1.22 (1.04–1.43)**	1.09 (0.89–1.33)	4.9	**1.43 (1.05–1.95)**	1.14 (0.80–1.62)	4.1	1.18 (0.95–1.46)	1.18 (0.90–1.55)	4.1	1.18 (0.86–1.62)	0.87 (0.60–1.28)
Emergency cesarean section	13.5	13.5	13.6	1.00 (0.91–1.11)	1.04 (0.92–1.17)	13.5	1.00 (0.81–1.24)	0.87 (0.68–1.10)	12.1	0.88 (0.77–1.01)	0.96 (0.81–1.14)	17.3	**1.34 (1.11–1.60)**	**1.43 (1.16–1.76)**
Maternal outcomes														
OASI[f]	8.9	9.1	7.4	**0.81 (0.71–0.92)**	0.86 (0.74–1.01)	8.8	0.97 (0.75–1.26)	0.88 (0.67–1.17)	6	**0.64 (0.53–0.77)**	**0.70 (0.55–0.89)**	10.7	1.20 (0.96–1.51)	**1.33 (1.02–1.72)**
Postpartum hemorrhage	7.0	6.8	8.5	**1.28 (1.14–1.43)**	0.98 (0.85–1.14)	7.6	1.13 (0.88–1.46)	1.05 (0.79–1.38)	8.6	**1.30 (1.12–1.51)**	0.90 (0.74–1.09)	9.2	**1.39 (1.12–1.73)**	1.14 (0.88–1.47)
Neonatal Outcomes														
Preterm	5.5	5.5	6.2	1.14 (0.99–1.30)	**0.56 (0.46–0.68)**	5.2	0.94 (0.69–1.28)	**0.44 (0.29–0.67)**	6	1.10 (0.92–1.32)	**0.75 (0.58–0.97)**	7	**1.30 (1.01–1.67)**	**0.44 (0.32–0.62)**
5-min Apgar <7[g]	3.1	3.2	2.5	**0.77 (0.63–0.93)**	0.86 (0.68–1.09)	2.2	0.69 (0.44–1.08)	0.67 (0.40–1.11)	2.5	0.78 (0.60–1.02)	1.01 (0.73–1.39)	2.6	0.80 (0.54–1.19)	0.86 (0.55–1.35)
NICU admission[d,g]	9	9	9	1.00 (0.86–1.17)	1.08 (0.87–1.35)	9.3	1.03 (0.72–1.49)	1.34 (0.89–2.02)	8.5	0.94 (0.77–1.14)	1.03 (0.77–1.37)	10.5	1.18 (0.87–1.58)	1.07 (0.72–1.58)

(Continues)

TABLE 3 (Continued)

		Primipara												
	TOTAL (*n* = 37 456)	Icelandic women (*n* = 33 055)	All migrant women (*n* = 4401)			Migrant women, HDI ≥0, 900 (*n* = 893)			Migrant women, HDI 0.850–0.899 (*n* = 2327)			Migrant women, 4.401 (*n* = 1004)		
	%	%	%	OR (CI)	aOR[i] (CI)	%	OR (CI)	aOR[i] (CI)	%	OR (CI)	aOR[i] (CI)	%	OR (CI)	aOR[i] (CI)
Perinatal mortality[h]	0.5	0.5	0.6	1.26 (0.82–1.93)	0.81 (0.41–1.61)	0.3	0.74 (0.24–2.34)	0.29 (0.04–2.30)	0.5	1.15 (0.64–2.06)	0.71 (0.25–2.05)	1	**2.22 (1.17–4.23)**	1.80 (0.68–4.77)

Statistically significant findings for crude and adjusted ORs are marked in bold.

Abbreviations: aOR, adjusted odds ratio; CI, confidence interval; HDI, Human Development Index; NICU, Neonatal Intensive Care Unit; OASI, obstetric anal sphincter injury; OR, odds ratio.

[a]Denominators vary because of missing values and exclusion criteria.

[b]Among women with planned vaginal birth (women excluded if they had an elective cesarean section).

[c]Among women with spontaneous onset of labor (women excluded if they had an elective cesarean section and an induction of labor).

[d]Registration began in the year 2006, total numbers 22 873 (Icelandic women: 19 206; all migrant women: 3665; highest HDI: 590; middle HDI: 2137; lowest HDI: 825).

[e]Registration began in the year 2012, total numbers 11 853 (Icelandic women: 9953; all migrant women: 1910; highest HDI: 295; middle: 1155; lowest HDI: 410).

[f]Among women with vaginal birth (women excluded if they had a cesarean section).

[g]Among live births (newborn excluded if stillborn).

[h]If Chi-square tests were not valid due to >20% cells having an expected count <5, the Fisher exact test was used.

[i]Adjustments were made for age, gestational age (except for the variable preterm), number of antenatal visits, occupation, birth year, residence, marital status, level of birth services, hypertensive disorder, diabetes, HIV, hepatitis, obesity, thalassemia and symphysis pubis dysfunction.

TABLE 4 Prevalence (%) of, and crude odds ratios (ORs) and adjusted odds ratios (aORs) with 95% confidence intervals (CI) for maternal and perinatal outcome of multiparous women with foreign citizenship compared with women with Icelandic citizenship who gave birth to a singleton in Iceland between 1997 and 2018[a]

	Multipara													
	TOTAL (*n* = 54 947)	Icelandic women (*n* = 51 190)	All migrant women (*n* = 3757)			Migrant women, HDI ≥0, 9 (*n* = 954)			Migrant women, HDI 0.850–0.899 (*n* = 1748)			Migrant women, HDI ≤0, 849 (*n* = 882)		
	%	%	%	OR (CI)	aOR[i] (CI)	%	OR (CI)	aOR[i] (CI)	%	OR (CI)	aOR[i] (CI)	%	OR (CI)	aOR[i] (CI)
Childbirth intervention														
Induction of labor[b]	18	18.2	15.9	**0.85 (0.77–0.94)**	**0.74 (0.66–0.83)**	14.5	**0.77 (0.63–0.94)**	0.82 (0.66–1.02)	16.5	0.89 (0.78–1.02)	**0.71 (0.61–0.83)**	16.2	0.87 (0.71–1.07)	**0.69 (0.55–0.87)**
Amniotomy[c,d]	23.3	23.4	22.3	0.94 (0.84–1.04)	1.05 (0.93–1.18)	23.1	0.98 (0.78–1.24)	1.10 (0.86–1.40)	21.6	0.90 (0.78–1.04)	0.99 (0.85–1.16)	22.4	0.94 (0.76–1.17)	1.11 (0.88–1.41)
Oxytocin augmentation[c,d]	12.9	12.8	14	1.11 (0.97–1.26)	1.14 (0.99–1.32)	14.4	1.14 (0.86–1.52)	1.03 (0.79–1.48)	13.9	1.10 (0.93–1.30)	1.16 (0.96–1.41)	13.1	1.03 (0.79–1.34)	1.05 (0.78–1.41)
Epidural[b]	25.4	25.3	27.4	**1.12 (1.03–1.21)**	**0.91 (0.83–1.00)**	23.1	0.89 (0.75–1.05)	0.88 (0.73–1.06)	30.2	**1.28 (1.15–1.43)**	0.98 (0.86–1.11)	26.8	1.08 (0.92–1.28)	**0.78 (0.64–0.95)**
Perineum support[e,f]	56.9	56.4	61.6	**1.24 (1.12–1.38)**	**1.39 (1.21–1.60)**	50.6	0.79 (0.62–1.01)	0.97 (0.72–1.32)	59.6	1.14 (1.00–1.31)	**0.73 (0.61–0.87)**	74	**2.20 (1.73–2.81)**	**1.95 (1.43–2.66)**
Episiotomy [d,f]	3.9	3.7	5.2	**1.41 (1.18–1.70)**	**1.29 (1.05–1.59)**	5.3	1.45 (1.00–2.14)	1.16 (0.76–1.77)	5.4	**1.47 (1.15–1.87)**	**1.35 (1.03–1.76)**	5.4	**1.49 (1.04–2.12)**	1.46 (0.99–2.17)
Instrumental birth[b]	3.3	3.2	4.5	**1.45 (1.22–1.73)**	**1.41 (1.16–1.72)**	4.6	**1.46 (1.04–2.05)**	1.30 (0.90–1.88)	4.7	**1.51 (1.19–1.93)**	**1.48 (1.14–1.94)**	4.8	**1.54 (1.09–2.18)**	**1.53 (1.05–2.23)**
Elective cesarean section	8.8	8.9	8.2	0.91 (0.81–1.03)	**0.67 (0.57–0.78)**	7.9	0.88 (0.69–1.11)	**0.69 (0.51–0.92)**	7.8	0.87 (0.73–1.04)	**0.68 (0.55–0.84)**	9.5	1.08 (0.86–1.35)	**0.60 (0.45–0.81)**
Emergency cesarean section	6.4	6.2	8.3	**1.36 (1.19–1.56)**	**1.32 (1.12–1.55)**	7	1.13 (0.85–1.49)	1.05 (0.76–1.44)	7.9	**1.30 (1.07–1.57)**	**1.31 (1.04–1.64)**	11.1	**1.89 (1.49–2.40)**	**1.67 (1.25–2.24)**
Maternal outcomes														
OASI[f]	2.4	2.4	2.5	1.07 (0.85–1.34)	0.92 (0.70–1.20)	2	0.83 (0.51–1.37)	0.61 (0.34–1.08)	2.2	0.92 (0.64–1.31)	0.83 (0.56–1.23)	4.1	**1.78 (1.22–2.60)**	**1.55 (1.00–2.40)**
Postpartum hemorrhage	4.7	4.5	6.3	**1.41 (1.23–1.62)**	1.09 (0.94–1.27)	4.4	0.97 (0.71–1.32)	0.94 (0.68–1.32)	6.3	**1.41 (1.16–1.72)**	0.97 (0.79–1.19)	7.9	**1.81 (1.42–2.32)**	**1.41 (1.07–1.85)**
Neonatal outcomes														
Preterm	3.8	3.7	4.9	**1.36 (1.16–1.59)**	1.04 (0.87–1.25)	4.2	1.15 (0.83–1.59)	0.82 (0.57–1.19)	4.9	**1.36 (1.08–1.70)**	1.19 (0.92–1.53)	5.7	**1.58 (1.18–2.12)**	1.11 (0.79–1.56)
5-min Apgar <7[g]	1.7	1.7	1.2	**0.70 (0.52–0.94)**	0.75 (0.54–1.04)	1.1	0.61 (0.33–1.14)	0.64 (0.33–1.24)	1.3	0.73 (0.48–1.12)	0.82 (0.52–1.31)	1	0.59 (0.31–1.15)	0.69 (0.35–1.36)

(Continues)

TABLE 4 (Continued)

	Multipara													
	TOTAL (*n* = 54 947)	Icelandic women (*n* = 51 190)	All migrant women (*n* = 3757)			Migrant women, HDI ≥0, 9 (*n* = 954)			Migrant women, HDI 0.850–0.899 (*n* = 1748)			Migrant women, HDI ≤0, 849 (*n* = 882)		
	%	%	%	OR (CI)	aOR[i] (CI)	%	OR (CI)	aOR[i] (CI)	%	OR (CI)	aOR[i] (CI)	%	OR (CI)	aOR[i] (CI)
NICU admission[d,g]	4.5	4.5	4.5	1.02 (0.82–1.26)	0.90 (0.70–1.16)	3.5	0.77 (0.45–1.32)	0.87 (0.49–1.53)	4.3	0.95 (0.71–1.27)	0.85 (0.60–1.21)	6.2	1.40 (0.96–2.04))	1.05 (0.69–1.62)
Perinatal mortality[h]	0.4	0.4	0.4	1.03 (0.60–1.77)	1.05 (0.54–2.04)	0.5	1.45 (0.59–3.52)	1.54 (0.55–4.34)	0.2	0.63 (0.23–1.70)	0.47 (0.13–1.73)	0.5	1.25 (0.46–3.37)	1.56 (0.53–4.64)

Statistically significant findings for crude and adjusted ORs are marked in bold.

Abbreviations: aOR, adjusted odds ratio; CI, confidence interval; HDI, Human Development Index; NICU, Neonatal Intensive Care Unit; OASI, obstetric anal sphincter injury; OR, odds ratio.

[a] Denominators vary because of missing values and exclusion criteria.

[b]Among women with planned vaginal birth (women excluded if they had an elective cesarean section).

[c]Among women with spontaneous onset of labor (women excluded if they had an elective cesarean section and an induction of labor).

[d]Registration begun in 2006, total numbers 33 167 (Icelandic women: 30 034; all migrant women: 3133; highest HDI: 608; middle HDI: 1650; lowest HDI: 748).

[e]Registration begun in 2012, total numbers 16 828 (Icelandic women: 14 952; all migrant women: 1876; highest HDI: 304; middle HDI: 1106; lowest HDI: 416).

[f]Among women with vaginal birth (women excluded if they had a cesarean section).

[g]Among live births (newborn excluded if stillborn).

[h]If Chi-square tests were not valid due to >20% cells having an expected count <5, the Fisher exact test was used.

[i]Adjustments were made for age, parity, gestational age (except for the variable preterm), number of antenatal visits, occupation, birth year, residence, marital status, level of birth services, hypertensive disorder, diabetes, HIV, hepatitis, thalassemia, obesity, symphysis pubis dysfunction and previous cesarean section.

related to exposure. It is unknown to which group they belong or the reason for the missing data. Combining different origins within the HDI groups may obscure the differences among the ethnic groups. Additionally, we based part of the analysis on the 2018 HDI, but the evolution of the index over the research period could have impacted the migrant women's classification. This limitation, the lack of information on their reason for migrating and socioeconomic variables, such as education, length of residence and onset of first antenatal visit, prevent a more accurate identification of women likely to be the most vulnerable and the ability to discover insights into their associated outcomes. These weaknesses in the data registration provide an opportunity for improvement in ways to benefit maternity care.

Previous studies on the risk of adverse maternal and perinatal outcomes in migrant women compared with women in the host country have shown inconsistent results, with heterogeneity in study designs and definitions of exposure groups. The Icelandic migrant group of women differs from those of other Nordic countries regarding country of origin/citizenship and reason for migration.[27] This allows a limited comparison of results with previous studies from other Nordic countries, despite other similarities in culture and health.

Comparing the most prominent results, we saw a great variety of similarities and differences. For example, for instrumental birth, similar results were found in a Norwegian study.[10] However, a Finnish study[7] showed different results with similar prevalence among migrant and Finnish women. Our findings of a higher aOR for emergency cesarean section aligned with Swedish,[13] Norwegian[8] and Finnish studies[12] regarding migrant women in our lowest HDI group. Another Norwegian study[28] showed a higher risk of emergency and elective cesarean section for all groups of migrant women except Vietnamese, which partially aligned with our result.

The reasons for an instrumental birth can vary, from maternal exhaustion or medical indications to a prolonged second stage of labor or fetal compromise.[29] We analyzed the prevalence of fetal compromise (ICD-10: O68.0–3), which was higher among all primiparous migrant women, the middle HDI group and the lowest HDI group. This may partially explain higher instrumental birth rates among primiparous migrant women overall but not among multiparous migrant women.

One could speculate that differences in mode of birth may be due to feto-pelvic disproportion,[30] but when measuring its prevalence in this study (ICD-10: O65.4), only migrant women in the lowest HDI group had a higher prevalence of feto-pelvic disproportion than Icelandic women, which does not explain the higher aOR for instrumental birth and emergency cesarean section among multiparous migrant women in the middle HDI group. Body mass index, problems in communication/language or other known risk factors[30] could explain our results but these were not measured in our study.

Our findings on higher odds of episiotomy for overall and middle HDI group migrant women were not aligned with a Norwegian study.[10] We did a sub-analysis to determine whether instrumental birth explains the higher episiotomy and OASI odds among migrant women and found that it did affect the outcome for the migrant women in the lowest HDI group, for both primi- and multiparous women but had no effect on the odds for the other migrant groups. Our results on postpartum hemorrhage were partially aligned with two Norwegian studies[8,10] but not with a Swedish study.[11]

Our results on neonatal outcomes among migrant primiparous women overall possibly suggest a later start of antenatal care among migrant women; however, despite their lower gestational age and fewer antenatal care visits compared with Icelandic women, we do not know when their first visit took place or how long they stayed in the country. Additionally, by using the HDI index as a social determinant of perinatal and maternal health, the differences in outcomes between exposed and unexposed women demonstrate underlying inequalities that might interfere with antenatal and perinatal care. The regulation on health insurance for migrants during their first 6 months in Iceland can furthermore affect access to care (eg fewer antenatal visits, less use of epidurals and fewer labor inductions). Notably, we have no information on the need for or the use of interpreters in maternity care.

There is a certain disadvantage to comparing migrants with a host population because it is difficult to ascertain whether migration itself improves or worsens health.[17] In our study, the effect of socioeconomic status could only be partially modeled, but when adjusted for the available variables of social status and underlying health conditions of the mother, the result indicated persistent disadvantages for most groups of migrant women, suggesting that other factors (eg access[6,22] to and quality of care[6]) might also be significant factors.

5 | CONCLUSION

Our results demonstrate that after adjusting for potential confounding variables, a significant association persisted between a range of maternal and perinatal complications/interventions and women's citizenship as well as the HDI score of their country of citizenship. Migrant women overall had higher aORs of episiotomy and instrumental births and lower aORs of induction of labor compared with Icelandic women. The findings encourage a further look into inequality in healthcare in Iceland, a country that emphasizes equal access to healthcare as a key aim in its healthcare policy. Furthermore, this study indicates an urgent need to improve data collection on maternity care by including migrant health outcomes that are more closely aligned with their needs. Future research needs to focus on the possible predictors of different outcomes, the provision of perinatal care and its effect on perinatal outcomes and the experiences of migrant women in Iceland in order to develop personalized and culturally sensitive antenatal and perinatal care for all women in the country.

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CONFLICT OF INTEREST

None.

AUTHOR CONTRIBUTIONS

EÝG drafted the manuscript and analyzed the data, and each all authors substantially contributed to the study design, data interpretation and revising of this manuscript.

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