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Prenatal care adequacy of migrants born in conflict-affected countries and country-born parturients in Finland

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ABSTRACT

Background: The 2015 refugee crisis led into a forced migration of millions of people globally. As a consequence, many countries experienced a quick change in the proportion of conflict-area born migrants. This group being stated as an especially vulnerable group for suboptimal maternal health, a timely inspection of preventive maternity care was required. This study investigated prenatal care in terms of gestation trimester at the first prenatal visit, number of check-ups prior to birth, and prepartum hospitalization in conflict-country born migrants and Finnish parturients in Finland.

Material and methods: Cross-sectional study included all pregnancies of migrants born in conflict-affected countries (n = 3 155) and country-born parturients (n = 93 600) in Finland in 2015–16. The data were obtained through Medical Birth Registry and Population Information System. Statistical analysis employed T-test, Chi-square test, and logistic regression analysis. Odds ratios with 95% Confidence Intervals (CI) were adjusted for sociodemographic and health-related background variables.

Results: Migrant parturients had a higher probability for delayed enter in prenatal care compared with Finnish-born parturients (adjusted odds ratio aOR = 3.46; 95% Confidence Interval CI 3.06, 3.91). Recommended minimum number of check-ups was participated by 95.3% of the migrant, and 96.4% of the Finnish-born group (P <0.000). Migrants' probability for more than ten visits prior to term birth was significantly lower (aOR = 0.58; 95% CI 0.51, 0.66). No significant differences in prepartum hospitalization yielded between the groups.

Conclusions: Migrant parturients had significantly smaller number of check-ups and later entry in care compared with the country-born parturients. These findings add to earlier reported challenges in the organizing of conflict-affected country born migrants' prenatal care in a high-income setting, in which the proportion of conflict-area born migrants has risen rapidly and unexpectedly.

1. Introduction

Migrants are reported to have more delays or incompliance of prenatal care (Downe et al., 2009; Wahlberg et al., 2013), and are more vulnerable for maternal health complications compared with receiving country-born parturients in settings with high quality and free of charge maternity care services (Dahlen et al., 2013; Urquia et al., 2014; Essex et al., 2013). Being a migrant *per se* or alone, however, does not necessarily indicate poor maternal health outcomes. Some migrant groups are significantly better-off than the population born in the receiving country, whereas some have a notably higher risk for complications (Almeida et al., 2013). Several studies utilizing standardized prenatal care indexes or official national protocols reveal that being a migrant from certain areas predicts increased odds for inadequate prenatal care (Castelló et al., 2012; Santibáñez et al., 2015; Paz-Zulueta, Llorca and Santibáñez, 2015; Gonthier et al., 2017). Mutual to the reported risk-indicating areas of origin are the countries' geographical location, less prosperous income level, and oftentimes, recent or current exposure

Abbreviations: aOR, adjusted odds ratio; BiCAC, born in a conflict-affected country; BMI, body mass index; CD, caesarean delivery; CI, confidence interval; cOR, crude odds ratio; GDM, gestational diabetes mellitus; GW, gestation week; MBR, medical birth registry; OR, odds ratio; SD, standard deviation; SES, socio-economic status.

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to a prolonged violent instability or a generalised conflict.

These kinds of conflict circumstances resulted in forced migration of millions of people globally in the 2015 refugee crisis, switching rapidly the proportion of migrants born in conflict-affected countries in the study setting's migrant population (Finnish Immigration Service, 2020). According to earlier studies from neighbouring countries with rather similar health system to Finland's, this group may face a number of complications in accessing prenatal care (Barkensjö et al., 2018). Health providers' interviews (Leppälä et al., 2020) also signal that delays and obstacles in conflict area born migrants' maternity care process occur in Finland, even though the legislation entitles them to such care free of charge, regardless of one's residential status (Finnish Immigration Service, 2011). This, and the earlier reports on migrants' higher prevalence of pregnancy and birth complications in comparison with country-born parturients in low-risk settings (Bastola et al., 2020; Bastola et al., 2019; Liu et al., 2019; Liu et al., 2020; Juárez et al., 2017; Bakken et al., 2015; Mæland et al., 2019) enforce the need to investigate, what is the status of Finnish prenatal care supply for this recently-grown user group. The present study, therefore, investigated timing and quantity of prenatal care among conflict-affected country born migrants who gave birth in Finland in 2015–2016; compared these findings with those of country-born parturients; and, analysed whether being born in a conflict-affected country indicates a higher probability for delayed prenatal care initiation, fewer numbers of check-ups, and prepartum hospitalization.

2. Materials and methods

2.1. Study design

This cross-sectional study utilized population-based Medical Birth Registry (MBR) data, including all the live births and stillbirths at 22 or later gestation weeks, or with a birth weight of 500 grams or more in Finland in 2015–2016. The parturient's each contact and its timing to any maternity care clinic, hospital out-patient clinic, and referral-level hospital was recorded in the national MBR by the Finnish Institute for Health and Welfare. These data were merged with population register data from the Finnish Digital and Population Data Service Agency (The Digital and Population Data Services Agency, 2020; Government Decree on the Population Information System, 2010) to identify the parturients' country of birth.

2.2. Setting

Finland follows the European Asylum Support Office's (EUROPEAN ASYLUM SUPPORT OFFICE, 2020) guideline and treats pregnant asylum seekers and refugees as population groups that have the right to all public maternity care services free of charge in the municipality they reside at (Finnish Immigration Service, 2011, Ministry of Social Affairs and Health, 2020). The Finnish Institute for Health and Welfare guides the municipalities at providing primiparae a minimum of nine, and multiparae of eight prenatal check-ups prior to a full-term birth. The recommended initiation of prenatal care is between the 8th and 10th Gestation Week (GW). In addition to the routine check-ups, the public sector in Finland provides the expecting families with a possibility to participate in two ultrasounds and one serum test in prenatal screenings. Chorionvillusbiopsy and amniocentesis can be conducted in the public health care based on certain specifically determined medical reasons (Klemetti and Hakulinen-Viitanen, 2013). Fig. 1 illustrates the basic prenatal care process, its recommended visits and their timing in the setting.

2.3. Participants

We formed two samples from all the births reported in the 2015–2016 MBR data: the parturients Born in a Conflict-Affected Country (BiCAC), and the parturients born in Finland. To define the inclusion criteria for the first-mentioned group, we listed all the countries from which Finland received either asylum seekers or quota refugees in five years starting from 01/01/2015 (Finnish Immigration Service, 2020; Finnish Immigration Service, 2020). This list we compared with four independent global conflict or humanitarian catastrophe reporting systems: Global Conflict Tracker (Council on Foreign Relations, 2020), The Heidelberg Institute for International Conflict Research (2018), Control Risks Risk Map [Internet] (2015), Control Risks Risk Map (2015), and the United Nations Office for the

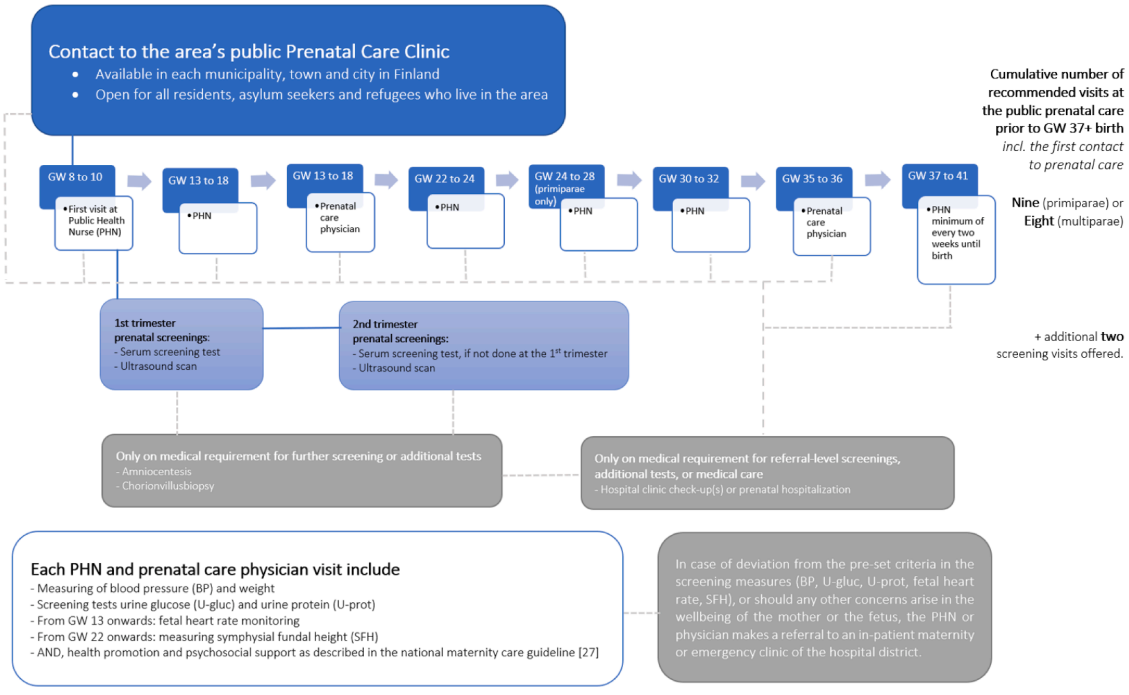

Fig. 1. Prenatal care process in the setting, modified and based on Klemetti & Hakulinen-Viitanen (2013).

Coordination of Humanitarian Affairs Global Humanitarian Overview 2018 report (UN Office for the Coordination of Humanitarian Affairs, 2017). A foreign-born parturient was included in our BiCAC group if Finland had received either quota refugees or asylum seekers in 2015–2019 from the country the parturient was born in, and this country had been reported to sustain *external aggression, events seriously disturbing public order, generalised violence, foreign aggression, or international conflicts* in two out of the four above-mentioned conflict reporting systems.

In 2015–2016, there were altogether 109 373 births in Finland: 85.6% were of Finnish-born and 13.3% of foreign-born parturients. After excluding the parturients with missing birthplace data ($n = 1185$; 1.1%) and the non-BiCAC parturients from the dataset, the final sample consisted of 96 755 parturients. Of them 96.7% ($n = 93\,600$) were born in Finland, and 3.3% ($n = 3\,155$) in the above defined conflict-affected countries (Fig. 1).

2.4. Variables

In addition to the parturient's country of birth, we controlled the following background variables: age, cohabitation, height, pre-pregnancy weight and Body Mass Index (BMI), parity, previous Caesarean Delivery (CD), anaemia, and Gestational Diabetes Mellitus (GDM) according to pathologic oral glucose tolerance test. Too high or low BMI, previous CD, anaemia, and GDM each is to increase the number of medically required check-ups either at the local prenatal clinic or as referrals to hospital clinic (McCauley et al., 2022; Society of Obstetricians and Gynaecologists of Canada 2005; Sacks et al., 2011; Zhang et al., 2019). Therefore, these were controlled as background variables to lessen potential confounding in the regression analyses.

The timing of prenatal care initiation was defined as the full GWs at first prenatal visit. The number of check-ups included all visits at prenatal and hospital clinics, and in inpatient maternity ward prior to birth. Participation in the prenatal screenings included first and second trimester ultrasound examinations, first or second trimester serum screenings, amniocentesis and chorionvillusbiopsy tests. Prepartum hospitalization was analysed separately for four categories: haemorrhage, high blood pressure, risk of premature birth, and other causes for hospitalization.

A cut-off point for delayed prenatal care initiation was GW 12. Ten or more prenatal visits prior to a full-term birth marked compliance of all or most of the offered prenatal visits and screenings as recommended in the local guideline, utilised in all public prenatal clinics throughout the country (Klemetti and Hakulinen-Viitanen, 2013). For measuring deviation from this national guideline (Klemetti and Hakulinen-Viitanen, 2013) in the visit quantity, we used a cut-off point of seven or less prenatal visits prior to full-term birth. For definite inadequate prenatal care, we measured separately the compliance of nil, and only one to three prenatal visits during pregnancy (Delvaux, 1999; McQuide and Delvaux, 1999).

2.5. Statistical methods

For the descriptive statistics, we used T-test and χ^2 test. To compare the Finnish-born and BiCAC parturients' probability for the outcome measures, we conducted binary logistic regression analysis on three different models: (1) crude odds ratio (cOR), (2) adjusted odds ratio (aOR) Model I adjusted for age, cohabitation, parity, height, and pre-pregnancy BMI, and 3) aOR Model II adjusted additionally for smoking, GDM, anaemia, and previous CD. The statistical analyses were carried out on IBM SPSS Statistics© version 25.

2.6. Ethical clearance

An institutional review board Hospital District of Northern Savo Ethics Committee gave an ethical clearance (Decision number 254/2017) for the study prior to registry data application. For the registry data usage, research permits were received from the Finnish Institute for Health and Welfare (THL/1105/5.05.00/2019) and Finnish Digital and Population Data Service Agency (DVV/899/2020-3).

3. Results

3.1. Descriptive data

The mean age among the Finnish-born group was 30.17 (Standard Deviation $SD = 5.31$), and 28.74 ($SD = 5.57$) years in BiCAC group ($P < 0.001$). Of the Finnish-born group, 89.9% lived with a partner during the pregnancy, respective percentage being 85.3 for the BiCAC parturients. The Finnish-born had 1.05 ($SD = 1.89$) and BiCAC parturients 1.69 ($SD = 1.83$) previous births. Of the multiparae in the BiCAC sample, 17.6% had a previous CD, respective percentage was 11.9% for the Finnish-born multiparae. The pre-pregnancy weight did not differ significantly between the two groups. The Finnish-born group's mean height was significantly taller than that of the BiCAC group's (165.68 cm vs. 161.55 cm, $P < 0.001$). Of the BiCAC group 4.1% were underweight and 51.6% overweight. Corresponding percentages were 3.1% and 36.5%, respectively, among the Finnish-born parturients. Difference in the underweight prevalence in the independent samples T-test was considered statistically insignificant ($P = 0.177$), and in overweight significant ($P < 0.001$). GDM prevalence was significantly higher in the BiCAC group: 22.4% vs. 16.3% ($P < 0.001$). Prevalence of anaemia was 16.1% in the BiCAC group vs. 3.3% in the Finnish-born group ($P < 0.001$). Smoking during pregnancy was significantly less prominent in the BiCAC group: 2.3% vs. 15.0% ($P < 0.001$). Table 1 compiles the descriptive statistics on the parturients' background variables.

Table 1
Participants' background characteristics.

	Finnish-born parturientsn = 93 600 (96.7%)	BiCAC parturientsn = 3 155 (3.3%)	Significance (*P*-value)
Age, mean (SD)	30.17 (5.31)	28.74 (5.57)	< 0.001
Cohabitation n (%)	84 143 (89.9%)	2 691 (85.3%)	< 0.001
Parity, mean (SD)	1.05 (1.89)	1.69 (1.83)	< 0.001
Primipara n (%)	39 208 (41.9%)	921 (29.2%)	< 0.001
Multipara n (%)	54 376 (58.1%)	2 232 (70.8%)	< 0.001
Previous caesarean delivery n (%)	10 265 (11.9%)	555 (17.6%)	< 0.001
Pre-pregnancy weight, kg mean (SD)	67.98 (14.75)	67.60 (14.28)	0.177
Height, cm mean (SD)	165.68 (6.00)	161.55 (6.31)	< 0.001
Pre-pregnancy BMI mean (SD)	24.74 (5.08)	25.87 (5.10)	< 0.001
Underweight (BMI ≤ 18.5) n (%)	2 767 (3.1%)	126 (4.1%)	< 0.001
Overweight (BMI ≥ 25.0) n (%)	33 135 (36.5%)	1 553 (51.6%)	< 0.001
GDM n (%)	15 280 (16.3%)	706 (22.4%)	< 0.001
Anaemia during pregnancy n (%)	3 110 (3.3%)	507 (16.1%)	< 0.001
Smoking during pregnancy n (%)	13 994 (15.0%)	71 (2.3%)	< 0.001

BiCAC = Born in Conflict-Affected Country
SD = Standard Deviation
BMI = Body Mass Index
GDM = Gestational Diabetes Mellitus

3.2. Prenatal care initiation

Data analysis showed significantly later enrolment in care for parturients in the BiCAC group. Among them, the mean gestation week at the first prenatal care visit was 10.36 ($SD = 5.14$) whereas the Finnish-born group enrolled in the care on average at the GW 8.82 ($SD = 3.25$, $P < 0.001$). The BiCAC parturients' Odds Ratio (OR) for having the first prenatal visit during the first trimester was 0.24 (95% Confidence Interval CI 0.22, 0.27) against the Finnish-born parturients' OR 1.00. In comparison to the Finnish-born group, BiCAC parturients' cOR for enrolling first time in the prenatal care at the second trimester was 4.33 (95% CI 3.87, 4.85), and at third trimester 2.82 (95% CI 2.20, 3.63). The ORs for these delays remained statistically significant in the adjusted models I and II.

3.2. Prenatal care participation

Mean number of prenatal visits was 14.36 for the Finnish-born, and 13.39 for BiCAC parturients ($P < 0.001$). Of all these check-ups, the Finnish-born group had less visits in hospital policlinic (3.46 vs. 3.66, $P < 0.001$). Sub-analysis including only parturients with term birth (GW 37 to 43) showed that BiCAC parturients' OR for compliance of ten or more prenatal check-ups was 0.53 (95% CI 0.47, 0.60) in comparison to the Finnish-born reference group, difference remaining significant in both of the adjusted models. Risk for sub-optimal number of check-ups (seven or fewer) was slightly higher in the BiCAC group (cOR = 1.34, 95% CI 1.11, 1.63), but after adjusting for the model I and II background variables, the difference curved into insignificant. Of the Finnish-born, 0.4% and of BiCAC group 0.7% had no prenatal visits ($P = 0.016$). BiCAC group's cOR for no visits was 1.69 (95% CI 1.10, 2.60), difference appearing insignificant after adjustments. One to three visits were completed by 2% of the Finnish-born and 1.3% of the BiCAC parturients ($P = 0.010$). BiCAC group had significantly lower probability for this quantity of visits (aOR = 0.53, 95% CI 0.36, 0.77).

Of all the Finnish-born parturients, 45.4%, and of the BiCAC parturients 52.0% participated in the first trimester serum screening ($P < 0.001$). The first trimester ultrasound examination was carried out in 44.0% of the Finnish-born, and 40.7% of the BiCAC parturients ($P < 0.001$). The serum screening percentage at the second trimester was higher in the BiCAC group: 3.4% vs. 1.7% in the Finnish-born group ($P < 0.001$). Participation in the second trimester ultrasound examination did not differ significantly between the groups: 86.1% of the Finnish-born, and 87.0% of the BiCAC group did participate in the screening ($P = 0.149$). In the logistic regression analysis, difference in cOR probability to participate in the second trimester ultrasound examination was insignificant. In the adjusted models, the participation probability turned however significantly higher for the BiCAC group (model I aOR = 1.39, 95% CI 1.24, 1.56; model II aOR = 1.28, 95% CI 1.14, 1.45) in comparison to the Finnish-born reference group.

Due to the BiCAC parturients' significantly later enrolment in care, we conducted an additional sub-analysis on the screening examination participation adjusted for the timing of care enrolment. Among the parturients enrolled in prenatal care during the first trimester, the BiCAC group had significantly higher probability (aOR = 1.25, 95% CI 1.14, 1.37) to participate in the first trimester serum screening than the Finnish-born group. A similar pattern emerged in the participation in second trimester serum screening. Participation probability in the first trimester ultrasound examination did not differ between the groups among those parturients enrolled in prenatal care at the first trimester. Both chorionvillusbiopsy and amniocentesis examinations were rare, and no significant differences in them yielded between the Finnish-born and BiCAC group.

3.3. Prepartum hospitalization

No significant differences in prepartum hospitalization from any of the reported causes appeared. The prevalence of hospitalization due to gestational haemorrhage was 0.2% in the Finnish-born vs. 0.3% in the BiCAC group ($P = 0.965$); 1.7% vs. 1.6% due to high blood pressure ($P = 0.604$); 0.8% vs. 1.0% due to risk of premature birth ($P = 0.145$), and 3.5% vs. 3.5% due to other causes ($P = 0.998$).

Table 2 compiles the descriptive statistics results of the presented prenatal care variables. Table 3 presents the respective results of the logistic regression analysis.

4. Discussion

The main findings revealed that a conflict-affected country as a parturient's place of birth significantly increased their risk to enrol in prenatal care later than recommended, and to have fewer check-ups than the country-born parturients. Prepartum hospitalization did not, however, differ between the comparison groups.

Table 2
Descriptive statistics on the main outcome measures.

	Finnish-born parturients	BiCAC parturients	Significance (P-value)
Gestation weeks at the first prenatal visit mean (SD)	8.82 (3.25)	10.36 (5.14)	< 0.001
Prenatal visits started at the			
1st trimester n (%)	78 695	2 297	< 0.001
2nd trimester n (%)	(95.5%)	(83.5%)	< 0.001
3rd trimester n (%)	2 992 (3.6%)	386 (14.0%)	< 0.001
	733 (0.9%)	68 (2.5%)	
Total number of PNC visits prior to birth mean (SD)	14.36 (4.71)	13.39 (4.66)	< 0.001
Number of visits at hospital policlinic, mean (SD)	3.46 (2.75)	3.66 (2.68)	< 0.001
Number of PNC visits seven or less before term birth n (%)	2 690 (3.6%)	114 (4.7 %)	< 0.001
Number of PNC visits ten or more before term birth n (%)	70 355 (92.9%)	2 117 (87.5%)	< 0.001
Inadequate prenatal care			
n (%)	387 (0.4%)	22 (0.7%)	0.016
0 visits	1 852 (2.0 %)	42 (1.3%)	0.010
1 to 3 visits			
First trimester serum screening n (%)	42 526 (45.4%)	1 640 (52.0%)	< 0.001
Second trimester serum screening n (%)	1 546 (1.7%)	106 (3.4%)	< 0.001
First trimester ultrasound examination n (%)	41 167 (44.0%)	1 284 (40.7%)	< 0.001
Second trimester ultrasound examination n (%)	80 565 (86.1%)	2 744 (87.0%)	0.149
Chorionvillusbiopsy n (%)	488 (0.5%)	17 (0.5%)	0.895
Amniocentesis n (%)	733 (0.8%)	26 (0.9%)	0.797
Prepartum hospitalisation			
due to	233 (0.2%)	8 (0.3%)	0.965
Gestational haemorrhage n (%)	1 627 (1.7%)	51 (1.6%)	0.604
High blood pressure n (%)	758 (0.8%)	33 (1.0%)	0.145
Risk of premature birth n (%)	3 242 (3.5%)	109 (3.5%)	0.988
Other cause n (%)			

BiCAC = Born in Conflict-Affected Country
SD = Standard Deviation
PNC = Prenatal Care

Table 3
Binary logistic regression analysis on the main outcome measures.

	Finnish-born group *(reference group)*	BiCAC groupcOR (95% CI)	BiCAC groupaOR model I (95% CI)	BiCAC groupaOR model II (95% CI)
Prenatal care initiation				
at the	1.0	**0.24**	**0.30 (0.26,**	**0.27 (0.24,**
1st trimester	1.0	**(0.22,**	**0.33)**	**0.31)**
2nd trimester	1.0	**0.27)**	**3.46 (3.06,**	**3.68 (3.24,**
3rd trimester		**4.33**	**3.91)**	**4.20)**
		(3.87,	**2.54 (1.92,**	**2.98 (2.20,**
		4.85)	**3.36)**	**4.02)**
		2.82		
		(2.20,		
		3.63)		
Number of prenatal				
visits before term	1.0	**0.53**	**0.58 (0.51,**	**0.54 (0.47,**
birth (GW at birth	1.0	**(0.47,**	**0.66)**	**0.62)**
≥37)		**0.60)**	1.08 (0.87,	1.16 (0.93,
≥10 visits		**1.34**	1.33)	1.44
≤ 7 visits		**(1.11,**		
		1.63)		
Inadequate prenatal				
care	1.0	**1.69**	0.40 (0.06,	0.70 (0.09,
0 visits	1.0	**(1.10,**	2.94)	5.20)
1-3 visits		**2.60)**	0.48 (0.33,	0.53 (0.36,
		0.67	0.68)	0.77)
		(0.49,		
		0.91)		
Ultrasound				
examination	1.0	**0.87**	0.94 (0.87,	**0.92 (0.85,**
1st trimester	1.0	**(0.81,**	1.01)	**0.99)**
*1st trimester	1.0	**0.94)**	*1.07	*1.06
2nd trimester		*1.02	(0.98,	(0.97,
		(0.94,	1.17)	1.15)
		1.11)	**1.39 (1.24,**	**1.28 (1.14,**
		1.08 (0.97,	**1.56)**	**1.45)**
		1.20)		
Serum screening test				
1st trimester	1.0	0.77 (0.72,	1.03 (0.95,	0.98 (0.91,
*1st trimester	1.0	083)	1.11)	1.06)
2nd trimester	1.0	*0.96	***1.25**	***1.20**
		(0.88,	**(1.14,**	**(1.10,**
		1.04)	**1.37)**	**1.32)**
		2.07	**2.30 (1.86,**	**2.57 (2.07,**
		(1.70,	**2.84)**	**3.20)**
		2.53)		
Other screening tests				
Chorionvillusbiopsy	1.0	1.03 (0.64,	1.33 (0.80,	1.15 (0.68,
Amniocentesis	1.0	1.68)	2.21)	1.96)
		1.05 (0.71,	1.41 (0.94,	1.39 (0.92,
		1.56)	2.11)	2.09)
Prenatal				
hospitalization due	1.0	1.02 (0.50,	0.82 (0.36,	0.74 (0.32,
to	1.0	2.06)	1.86)	1.72)
Gestational	1.0	0.93 (0.70,	1.27 (0.94,	1.23 (0.91,
haemorrhage	1.0	1.23)	1.72)	1.68)
High blood pressure		1.30 (0.91,	1.08 (0.75,	1.16 (0.80,
Risk of premature		1.84)	1.57)	1.69)
birth		1.00 (0.82,	0.98 (0.80,	1.00 (0.81,
Other cause		1.21)	1.20)	1.24)

BiCAC = Born in Conflict-Affected Country
cOR = crude odds ratio
aOR Model I = adjusted for age, cohabitation, parity, height, pre-pregnancy Body Mass Index (BMI)
aOR Model II = adjusted for age, cohabiting, parity, height, pre-pregnancy BMI, smoking during pregnancy, gestational diabetes mellitus, anaemia, previous caesarean delivery
*Analysis included only parturients who had enrolled in prenatal care at the 1st trimester
Statistically significant ($P < 0.05$) findings in **bolded font**

4.1. Implications of the findings

Recent migrant maternal health studies call for paying attention especially "*to pregnant asylum seekers to make sure quality maternity care is provided*" (Verschuuren et al., 2020), and state that "*increased attention should be given to multiparous migrant women with a first child born outside* (of the receiving country)" (Vik et al., 2019). This need for special attention is justified also according to our results. Conflict country-born migrants' prenatal care initiation in our study setting did occur significantly later, following the pattern described also elsewhere in high-income countries (Castelló et al., 2012; Liu et al., 2020; Reeske et al., 2011; Almeida et al., 2014). The mean number of prenatal check-ups in both our comparison groups was as the national guidelines (Klemetti and Hakulinen-Viitanen, 2013) recommend in 96.4% of the country-born and 95.3% of the BiCAC parturients. Further analyses revealed that even though BiCAC parturients' probability for a suboptimal number of check-ups was not statistically significant in the adjusted models, their number of visits still was significantly smaller than of the country-born parturients. Here, our results are more aligned with earlier studies reporting on the number of prenatal check-ups in migrant populations similar to our study (Liu et al., 2019; Liu et al., 2020; Reeske et al., 2011; Mumtaz et al., 2014).

Prepartum hospitalization was rare in both population groups under investigation in our study, and did not differ significantly between the groups in any of the reason categories. In the eyes of previous reports from similar contexts, this finding was surprising. Among migrant group quite similar to our sample, significantly higher prepartum hospitalization or emergency department visit prevalence during pregnancy has been reported in Sweden (Liu et al., 2020), France (Saurel-Cubizolles et al., 2012), Spain (Cots et al., 2007) and Italy (Buja et al., 2014). This contradiction between earlier study results and our findings could speak of rather a sufficient seeking of, and accessibility to prenatal care in Finland among those migrants included in the dataset. Nevertheless, on the base of these data, it is neither exclusively confirmable or excludable if this is the reason behind the similarities of our comparison groups' hospitalization percentages, or their difference to study reports from other similar contexts. It is important to consider the earlier reported obstacles in conflict-area born migrants access to care (Barkensjö et al., 2018; Bains et al., 2021; Leppälä et al., 2020), and recognise the possibility that BiCAC group could have had less access to health care and thus, lower chance of being hospitalized. This could consequently result in the two comparison groups' similar risk of prepartum hospitalization detected in our results. Our current analysis did not include any birth outcome variables. Therefore, the hospitalization percentages alone are not interpretable as a confirmation on successful or equal prenatal care, but only indicate the absolute number of hospital referrals during the prenatal care.

4.2. Strengths and limitations

The MBR data utilized in this study are collected systematically by specially trained professionals with a standard instrument. The dataset has an excellent coverage, its evidence-based validity is acknowledged (Teperi, 1993; Gissler et al., 1997; Gissler and Shelley, 2002), and it has low level of missing information (Quansah et al., 2009). Nevertheless, the study has some limitations to discuss. Our sampling procedure aimed to include parturients whose major cause for migration could be fleeing from a conflict-affected country. It remains, however, somewhat obscure if this was the true cause for migration for all the included individuals. Therefore, it is debatable whether our inclusion criteria and sampling process were accurate enough for identifying all potential asylum seekers and refugees who gave birth in Finland during the follow-up time. These problematics in defining of a parturient's refugee background based on their place of birth has been earlier described in Bakken and colleagues' (Bakken et al., 2015) study that also utilised conflict country-based sampling in maternal health research. Also, our

methodology was not able to include irregular migrants in the sample due to lacking information on their background in the utilized dataset. In the light of recent findings by Liu and colleagues (Liu et al., 2020), an insecure residency status can increase migrants' already elevated risk for severe maternal morbidity in a study setting alike to ours.

Despite the mentioned lacks of covering all potential asylum seekers, refugees and undocumented migrants from conflict-affected countries, and the unavailability of more versatile background variables, the choice of MBR data was the best option considering the sensitive nature of the study topic, and the potentially vulnerable position of the BiCAC migrants. Inclusion of participants retrospectively through an existing registry caused no harm to the individuals and enabled avoiding risks of re-traumatisation or inconvenience that study participation could cause to someone with a recent birth experience or irregular position in the country

Adjustability of the findings between our two comparison groups was limited due to inability to control the Socio-Economic Status (SES), education level, and the timing of migration. In earlier studies, both SES and education (Bakken et al., 2015; Choté et al., 2011; Ludwig et al., 2020; Henriksson et al., 2020), as well as length of stay, level of acculturation (Ludwig et al., 2020; Henderson et al., 2018; Kingston et al., 2011; Waldum et al., 2020), and language skills (Navodani et al., 2019; Esscher et al., 2014) have been found as essential confounders when comparing maternal health of migrants and country-born parturients. Therefore, these factors remain a potential topic for further research. As for background variables, our overweight prevalence analysis included all parturients whose BMI is 25 or higher, resulting into 51.6% of overweight or obesity in our BiCAC group. The pre-pregnancy BMI was self-reported and confirmed only at the first prenatal visit. Given the finding that BiCAC group initiated the care significantly later than country-born parturients, it is possible that we run a risk of systematic error in the reporting of this result. However, a recent, nearly 0.5 million parturients' Swedish birth registry study by Henriksson et al. (2020) detected very similar numbers when both overweight (BMI 25.0 to 29.9) and obese (BMI $\geq$30.0) parturients were combined: 51.6% of overweight among Sub-Saharan African migrants, and 47.9% among North Africa and Middle East migrants. Rather similar percentages or overweight among these migrant groups are presented in a large (n = 725 482 parturients) Danish birth registry study by Kragelund Nielsen et al. (2020). The BiCAC group in our study formed fully on migrants from these regions, and the similarity in the overweight prevalence indicates therefore concise measures with other large registry sample prevalence analyses.

4.3. Conclusion

The health-related risk factors, smaller number of check-ups, and later entry in care confirm and add on to earlier reported challenges in organizing prenatal care for conflict-affected country born migrants. Clinicians and researchers are recommended to take into account the reason, length, and origin of migration when evaluating the adequacy of migrants' prenatal care.

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Declaration of Competing Interest

Declarations of interest: none.

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