



High weight gain during pregnancy increases the risk for emergency caesarean section – Population-based data from the Swedish Maternal Health Care Register 2011–2012



Carin Nilnes^{a,*}, Margareta Persson^b, Marie Lindkvist^{c,1}, Kerstin Petersson^{d,1,2}, Ingrid Mogren^{d,1}

^a Department of Research and Development, Västernorrland County Council, Sundsvall, Sweden

^b Department for Nursing, Umeå University, Umeå, Sweden

^c Department of Public Health and Clinical Medicine, Epidemiology and Global Health, Department of Statistics, Umeå School of Business and Economics, Umeå University, Umeå, Sweden

^d Department of Clinical Sciences, Obstetrics and Gynecology, Umeå University, Umeå, Sweden

ARTICLE INFO

Article history:

Received 4 May 2016

Revised 27 August 2016

Accepted 29 August 2016

Keywords:

BMI

Caesarean section

Pregnancy

Socioeconomic factors

Weight gain

ABSTRACT

Objective: The aim was to investigate maternal background factors' significance in relation to risk of elective and emergency caesarean sections (CS) in Sweden.

Study design: Population-based, retrospective, cross-sectional study. The Swedish Maternal Health Care Register (MHCR) is a national quality register that collects data on pregnancy, delivery and postpartum period. All women registered in MHCR 2011 to 2012 were included in the study sample (N = 178,716). **Main outcomes:** The risk of elective and emergency caesarean section in relation to age, parity, education, country of origin, weight in early pregnancy and weight gain during pregnancy was calculated in logistic regression models.

Results: Multiparous women demonstrated a doubled risk of elective CS compared to primiparous women, but their risk for emergency CS was halved. Overweight and obesity at enrolment in antenatal care increased the risk for emergency CS, irrespective of parity. Weight gain above recommended international levels (Institute of Medicine, IOM) during pregnancy increased the risk for emergency CS for women with normal weight, overweight or obesity.

Conclusion: There is a need of national guidelines on recommended weight gain during pregnancy in Sweden. We suggest that the usefulness of the IOM guidelines for weight gain during pregnancy should be evaluated in the Swedish context.

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Introduction

Caesarean section rates have been increasing rapidly in many countries in the last decades. Almost all industrial countries have experienced consistently increasing caesarean section rates for the last 20 years. In 2007, a large number of industrialized countries reported CS rates of more than 25%. However, currently the rates seem to be slowing down and in several countries have levelled off [1]. Sweden demonstrates a relatively low prevalence of caesarean sections (CS) in an international perspective [2]. In the beginning

of the 1970s, 5% of pregnant women were delivered by CS. During the last ten years, the rate of CS has been around 17%. Since 1991, the Swedish Medical Birth Register (MBR) reports annually the distribution between elective and emergency CS [3], and the prevalence of elective and emergency CS have shown a parallel increase, but with more rapid increase for elective CS [3]. About one third of the increase in CS can be explained by increasing age and body mass index (BMI) of pregnant women [4]. Caesarean section performed without a medical indication should be avoided, as the potential risk of damage is higher than the potential advantage [5]. Accordingly it is important to investigate risk factors for CS in order to enhance the preventive work to decrease the CS rate.

The medical consequences of caesarean sections

There are well-known adverse outcomes related to CS, such as increased risks for severe haemorrhage, infections and thrombosis. The long-term consequences after repeated caesarean sections

* Corresponding author. Department of Research and Development, Västernorrland County Council, Sundsvall, Sweden.

E-mail address: karin.nilnes@lvn.se (C. Nilnes).

¹ Member of the Working Group of the Swedish Pregnancy Register/Maternal Health Care.

² Member of the Board of the Swedish Pregnancy Register; Chairman of the Working Group of the Swedish Pregnancy Register/Maternal Health Care.

are significant and the risk of uterine rupture, placenta praevia and placenta accreta increase with the number of CS [6,7]. Children born by elective CS have an increased risk for neonatal respiratory morbidity [8], as well as asthma during childhood [9].

Antenatal care in Sweden and the Swedish Maternal Health Care Register

The Swedish antenatal care is mainly organized within the primary health care system and is provided by the County Councils (60.4%) or private primary health care (27.5%), while a smaller part of antenatal care (ANC) is affiliated with Departments of Obstetrics and Gynaecology in hospitals (15.6%) [10]. Antenatal care visits are voluntary, free of charge and nearly 100% of pregnant women attend. There are national guidelines stating frequency and contents of check-ups for normal pregnancies.

The Swedish Maternal Health Care Register (MHCR) is a national quality register established in 1999. The intention is that every pregnant woman is informed about the existence of the register, its purpose and content and that providing data to the MHCR is voluntary. At the first visit at ANC, with the permission of the pregnant woman, the midwives register background characteristics such as educational level, country of origin, body weight, height and smoking habits in the MHCR. The second set of data is entered in the MHCR, by the midwife at 4–16 weeks postpartum, when the postpartum check-up is provided. At this occasion information on outcomes of pregnancy and delivery is registered. If the woman does not attend the postpartum visit, information from the woman's medical record is collected and registered in MHCR. Almost all antenatal care clinics participate in the register, and in 2012, 85.2% of all births were included in MHCR. A study of the internal validity of the register shows a high agreement between register data and data in the medical journal [11]. Hence the MHCR provides high quality data of pregnancy and birth outcomes in Sweden.

The determinants of the increasing caesarean section rates are multifactorial. Obesity is a growing problem in Sweden, 25% of pregnant women are overweight and 13% are obese [3]. This increases the risk of pregnancy complications including delivery with CS [12]. Even if we know that obesity adds to the risk for both elective and emergency caesarean sections we still have a limited knowledge whether low weight gain during pregnancy can decrease the risk [13]. Previous Swedish studies have shown that a low weight gain, i.e. less than 8 kg weight increase, can lower the risk for CS for overweight and obese women [14], and that women with BMI ≥ 40.0 kg/m² who lost weight had a decreased risk for CS [15]. However, these studies did not separate between elective and emergency CS. The aim of the study was to examine how socioeconomic and obstetric background factors, and weight gain during pregnancy influenced the risk of delivery with elective or emergency caesarean section for women giving birth during 2011–2012 in Sweden.

Method

Study design

This study is a population-based, retrospective, cross-sectional study using national data from the Maternal Health Care Register.

Participants

From January 2011 to December 2012, data from 185,027 women who gave birth were registered in the MHCR. Women with multiple pregnancies, gestational age shorter than 22 + 0 weeks or longer than 43 + 0 weeks, no reported gestational age or mode of delivery were excluded from the sample. The final dataset comprised 178,716 women. Anonymized data were excerpted from the MHCR

on the following variables: woman's age at delivery (i.e. maternal age), number of previous births, country of origin, level of education, maternal height and weight at first visit in ANC, smoking at 32 weeks in pregnancy, last registered maternal weight after 35 weeks, gestational age, mode of delivery and birth weight. The Regional Ethical Board at Umeå University approved the study (Dno 2012-44-31 M).

Definitions of variables

Elective caesarean section. In this register study it was defined as CS before onset of labour.

Premature delivery was defined as <37 gestational weeks and *post term delivery* as ≥ 42 gestational weeks according to World Health Organization (WHO) classification 1977.

Body mass index (BMI) was calculated as: weight in kilograms/height in metre squared. BMI was categorized according to the WHO classification: underweight (<18.5 kg/m²), normal weight (18.5–24.9 kg/m²), overweight (25.0–29.9 kg/m²), obesity grade 1 (30.0–34.9 kg/m²), obesity grade 2 (35.0–39.9 kg/m²) and obesity grade 3 (≥ 40.0 kg/m²). Small for gestational age (SGA) was defined as infants whose birth weight was <10th percentile, adequate for gestational age (AGA) was birth weight >10th percentile up to the 90th percentile and large for gestational age (LGA) was infants >90th percentile. We used the guidelines from the Institute of Medicine (IOM) to estimate *weight gain during pregnancy*, where the recommendations relate to prepregnancy BMI [16]. The recommended weight gain for underweight pregnant women is 12.5–18 kg, for normal weight 11.5–16 kg, overweight 7–11.5 kg and for obese women 5–9 kg. *Country of origin* was categorized in the following groups: Nordic countries, Europe except the Nordic countries, Africa, Asia and the rest of the world.

Smoking in pregnancy. Women were asked at 32 weeks of gestational age whether they were smoking. They could respond yes/no.

Level of education was categorized into the following groups of highest level of education: elementary school, secondary school and college/university education.

Statistical analysis

Continuous variables were presented with mean and 95% confidence interval (CI). Categorical variables were presented in numbers and percentages. The probability of elective or emergency caesarean sections in relation to socioeconomic and obstetric background variables was analysed with simple logistic regression and the results are presented with odds ratios (OR) and their 95% CI. When analysing country of origin, women born in the Nordic countries were used as a reference. Multiple logistic regression analysis was used in order to analyse the association between background variables and emergency caesarean section in primiparous women. In the multiple logistic regression analyses we included the variables that were significantly associated with emergency caesarean section in the simple logistic regression analysis. Level of significance was set at 0.05.

Results

Socioeconomic status, parity and country of origin

Socioeconomic and obstetric background data of participants are presented in Table 1. The probability to be delivered by an elective caesarean section was nearly doubled (OR 1.88; 95% CI: 1.81–1.96), and to have an emergency CS was reduced to less than half (OR 0.44; 95% CI: 0.42–0.45) for multiparous compared to primiparous women. African women had a lower risk of having an elective CS (OR 0.81; 95% CI: 0.73–0.91). Women born in Europe, with exception of the Nordic countries, demonstrated a lower risk for

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