Country of origin, social support and the risk of small for gestational age birth

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Aims: This study investigates the risk of small for gestational age (SGA) in relation to country of origin of the mother. The role of psychosocial resources, socioeconomic and lifestyle factors was examined in different causal models. Methods: Among all pregnant nulliparous women in the city of Malmö, Sweden, who gave birth in 1991–92, 872 (87.7%) women completed a questionnaire during their first antenatal visit. The study was carried out among women whose pregnancies resulted in a singleton live birth (n = 826); 22% (n = 182) of these women were foreign-born. Results: Fifty-five (6.7%) of the infants were classified as SGA, 37 (5.7%) of mothers of Swedish origin and 18 (9.7%) of foreign origin. SGA deliveries were much more prevalent among Middle East- and North Africa-born women (22%) and sub-Saharan-born women (15%). In all, women of foreign origin had increased odds for delivering SGA babies (OR = 1.8, 95% CI = 1.0, 3.2). In a multivariate analysis psychosocial and socioeconomic factors explained 30% and 40%, respectively, of the increased SGA risk. Psychosocial factors seemed to be more prominent risk factors for SGA among mothers of foreign origin. A possible synergistic relation was demonstrated between foreign origin of the mother and low social anchorage. Conclusions: This study showed that psychosocial factors, most probably linked to a disadvantaged social situation, could be the theoretically most important focus for preventing SGA in immigrant women. This could also further support a hypothesis of a link between psychosocial stress and SGA in general. However, this should not exclude the need for intervention in the antenatal care system in terms of specially tailored support and education.

Key words: country of origin, lifestyle factors, psychosocial resources, small for gestational age, socioeconomic factors.

INTRODUCTION

A number of studies have investigated country of origin and psychosocial factors as risk factors for antenatal complications (1–3). Adequate psychosocial resources, such as social network and social support, have been shown to be of importance for a person in order to cope with different potentially stressful situations in daily life (4–6). Pregnancy is a period in life when most women experience physical as well as psychological, social, and relational changes. Psychosocial stress and its effect on pregnancy outcome have therefore received increased attention over the last decade (7). The ability of social support to predict birth weight was found to be as strong as that of traditional risk factors such as obstetric risk (8). Psychosocial stress is likely to be even greater for pregnant women of foreign origin since in addition they have to adapt to a new country with a different culture. Also, disparities in pregnancy outcome according to ethnic origin are often closely paralleled by disparities according to socioeconomic factors (9).

A 10-year specification from the Swedish Medical Birth Register showed that women from Denmark and sub-Saharan Africa had an increased risk of delivering low birth weight (LBW) and small for gestational age (SGA) children (10). Recently, a six-year follow-up study from Malmö pointed out that women of foreign origin, especially from sub-Saharan Africa, have a higher risk of SGA deliveries and perinatal mortality than a comparable group of Swedish women (11). The Swedish studies consisted of data from local and national registers but lacked information about psychosocial and socioeconomic variables. These factors, however, can be of importance to explain differences in perinatal outcomes between women.

We have previously reported that psychosocial factors seem to influence intrauterine growth and increase the risk of giving birth to SGA infants (12). The specific aim of this study was to investigate...
differences in SGA in relation to country of origin. The role of psychosocial resources, socioeconomic and lifestyle factors, and nationality were examined in terms of possible explanatory factors.

SUBJECTS AND METHODS

Study population

The cohort was based on all pregnant nulliparous living in the city of Malmö, Sweden. Malmö is an urban center of 240,000 inhabitants located in the southwest corner of the country. Women were recruited among those successively booking for their first antenatal care. A total of 872 (87.7%) of the 994 invited women agreed to participate. Participants (n = 872) and non-participants (n = 122) were characterized using data on age, country of origin, and marital status from the population register in the city of Malmö, and birth weight and gestational age from the pregnancy outcome database at the Department of Obstetrics and Gynecology at Malmö University Hospital. Analysis of the data revealed some minor differences between participants and non-participants. While there were no differences between the two groups regarding birth weight and gestational age, the non-participants were somewhat younger and more frequently born abroad (13).

The population of this study included all pregnancies resulting in a singleton live birth (n = 826). Women with multiple pregnancies (n = 12; 1.4%), those with subsequent miscarriages (n = 17; 1.9%), and finally those lost to follow-up at delivery (n = 17; 1.9%), were excluded. Some 22% (n = 182) of the women were not born in Sweden. Of these foreign-born women 3.9% (n = 32) were from Western Europe, North America and Australia, 6.0% (n = 50) from Eastern Europe, 5.9% (n = 49) from the Middle East and North Africa, 1.7% (n = 14) from Central and South America, 2.9% (n = 24) from Asia and 1.6% (n = 13) from sub-Saharan Africa (Table 1).

All women were asked to complete a self-administered questionnaire at their first antenatal visit (on average, in their 12th postmenstrual week). The questionnaire was used to obtain background factors (age, country of origin, educational level, vocational status, marital and cohabiting status), whether the pregnancy was planned or not, psychosocial factors (e.g. social network and social support), and lifestyle factors (such as smoking habits and alcohol consumption). Data on maternal pre-pregnancy weight and height were collected from the medical records at the Department of Obstetrics and Gynecology at Malmö University Hospital. All pregnant women at the Department of Obstetrics and Gynecology at Malmö University Hospital are routinely examined by ultrasound fetometry twice during the pregnancy, at 16–18 and at 32 weeks’ gestation. In this study group 806 (97.6%) women were examined twice. Data on the outcome of pregnancy, such as birth weight and gestational age, were collected from the perinatal database of the Department of Obstetrics and Gynecology at Malmö University Hospital, and from medical records at other Swedish hospitals where 83 (10.0%) of the women gave birth.

DEFINITIONS

Birth outcomes

SGA was defined as having a birth weight of more than 2 SD below the mean on a gender-specific intrauterine growth reference curve (14). This reference curve was based on longitudinal ultrasound estimations of fetal weights in uncomplicated pregnancies. The SGA variable was analyzed as a dichotomous variable. Low birth weight was defined as less than 2,500 grams and preterm birth was based on a gestational age of less than 37 weeks.

Background variables

Country of origin was dichotomized according to whether the woman was born in Sweden or not. Maternal weight was divided into ‘non-low’ (> 50 kg) or low pre-pregnancy weight (≤ 50 kg) and maternal height into above (> 157 cm) or below average height (≤ 157 cm). Pre-pregnancy weight and height were reported by the woman at her first antenatal visit. Body mass index (BMI) was calculated from maternal weight and height and classified as low (< 20) or ‘non-low’ (≥ 20). Years of school education were divided into two groups: 12 years or less, or more than 12 years. Vocational status was classified according to whether the woman was active or not (housewife, student or seeking work).

Psychosocial variables

A model based on a perspective of social resources, which has been validated and described elsewhere, was used (6, 15). The model consists of two main concepts, social network and social support.

A person’s social network is considered as a structural concept and was here defined using two sub-concepts:

- Social anchorage describes the degree to which people attach themselves to formal or informal groups.
- Social participation describes how actively a person...
takes part in activities of formal and informal
groups in society.

Social support is regarded as a function of the person’s
interactions with her social network and was divided
into five sub-concepts:

- **Emotional support** reflects the person’s experience of
  receiving care, encouragement of personal value,
  and feelings of confidence and trust from relatives,
  friends, neighbors, and colleagues.

- **Instrumental support** measures a person’s access to
  advice, information, and practical service.

- **Support from the child’s father** refers to the degree
  of perceived support from the child’s father.

- **Maternal support** refers to the degree of support a
  woman receives from her own mother.

Based on the items of these concepts, seven social
network and social support indices were created. The
scores from each index were dichotomized into high/
low, as close to the lowest tertile as possible. The
lowest third of the distribution was defined as low.
However, because of the distributions of the score of
some of the indices, it was not possible to dichotomize
all indices exactly at the tertile.

### Lifestyle variables

Two maternal smoking categories were used. Non-
smokers were women who, at their first antenatal visit,
reported that they did not smoke; smokers were
women who reported that they smoked regularly or
irregularly. Maternal smoking was also classified as
number of cigarettes per day ($<10$, $10–19$ and $20+$).
With regard to alcohol consumption women were
defined as non-consumers (those who, at the first
antenatal visit, reported that they did not drink
alcohol at all) or consumers (those who reported
alcohol consumption).

### Statistical methods

The chi-squared analysis was used to investigate the
differences between Swedish-born women and foreign-
born women. The calculation of odds ratios (OR) and
95% confidence intervals (95% CI) was used to
analyze the association between different psychosocial
characteristics and lifestyle factors. Multiple logistic
regression analysis was performed in order to assess
the influence of variables such as maternal age,
BMI, educational level, and smoking. To identify
susceptibility among subgroups of pregnant women
the interaction effect was analyzed as proposed by
Rothman (16). The variables assessing country of
birth and psychosocial resources were combined into
dummy variables, so that women born in Sweden who
were not exposed to low psychosocial resources
constituted the reference category. Then women of
foreign origin who were not exposed to low

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**Table I. Number and percentage of the women’s country of origin**

<table>
<thead>
<tr>
<th>Categorization of country groups</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sweden</strong></td>
<td>644</td>
<td>78.0</td>
</tr>
<tr>
<td><strong>Western Europe, North America and Australia</strong></td>
<td>32</td>
<td>3.9</td>
</tr>
<tr>
<td>Nordic countries&lt;sup&gt;a&lt;/sup&gt;</td>
<td>23</td>
<td>2.8</td>
</tr>
<tr>
<td>Other Western European countries&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5</td>
<td>0.6</td>
</tr>
<tr>
<td>USA and Australia</td>
<td>4</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Eastern Europe</strong></td>
<td>50</td>
<td>6.0</td>
</tr>
<tr>
<td>Poland</td>
<td>15</td>
<td>1.8</td>
</tr>
<tr>
<td>Yugoslavia (before civil war)&lt;sup&gt;c&lt;/sup&gt;</td>
<td>15</td>
<td>1.8</td>
</tr>
<tr>
<td>Other Eastern European countries&lt;sup&gt;d&lt;/sup&gt;</td>
<td>20</td>
<td>2.4</td>
</tr>
<tr>
<td><strong>Middle East and North Africa</strong></td>
<td>49</td>
<td>5.9</td>
</tr>
<tr>
<td>Lebanon</td>
<td>20</td>
<td>2.4</td>
</tr>
<tr>
<td>North Africa&lt;sup&gt;e&lt;/sup&gt;</td>
<td>4</td>
<td>0.5</td>
</tr>
<tr>
<td>Other Middle East countries&lt;sup&gt;f&lt;/sup&gt;</td>
<td>25</td>
<td>3.0</td>
</tr>
<tr>
<td><strong>Central and South America</strong></td>
<td>14</td>
<td>1.7</td>
</tr>
<tr>
<td>Asia</td>
<td>24</td>
<td>2.9</td>
</tr>
<tr>
<td>Republic of Vietnam</td>
<td>11</td>
<td>1.3</td>
</tr>
<tr>
<td>Other Asian countries&lt;sup&gt;h&lt;/sup&gt;</td>
<td>13</td>
<td>1.6</td>
</tr>
<tr>
<td><strong>Sub-Saharan Africa</strong></td>
<td>13</td>
<td>1.6</td>
</tr>
<tr>
<td>West Africa&lt;sup&gt;i&lt;/sup&gt;</td>
<td>5</td>
<td>0.6</td>
</tr>
<tr>
<td>East Africa&lt;sup&gt;j&lt;/sup&gt;</td>
<td>8</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>826</td>
<td>100</td>
</tr>
</tbody>
</table>

**Notes:**

- <sup>a</sup>Denmark, Norway, Finland, Iceland;
- <sup>b</sup>United Kingdom, Italy, Germany, Israel;
- <sup>c</sup>Bosnia, Yugoslavia, Serbia;
- <sup>d</sup>Albania, Bulgaria, Macedonia, Romania, Czechoslovakia, Hungary, USSR;
- <sup>e</sup>Algeria, Tunisia;
- <sup>f</sup>Iraq, Iran, Kuwait, Saudi Arabia, Syria, Turkey;
- <sup>g</sup>Argentina, Bolivia, Chile, El Salvador, Nicaragua, Peru, Uruguay;
- <sup>h</sup>India, Japan, Pakistan, Peoples Republic of China, Philippines, Singapore, South Korea, Thailand;
- <sup>i</sup>Gambia, Ghana;
- <sup>j</sup>Ethiopia, Somalia, Sudan, Uganda.
psychosocial resources, women of Swedish origin who were exposed to low psychosocial resources, and women who were both of foreign origin and were exposed to low psychosocial resources formed the other exposure categories. The same procedure was made for lifestyle factors and socioeconomic status. We used the synergy index measure (SI), where $> 1$ signifies a synergistic effect and $SI < 1$ an antagonistic effect, to assess a possible effect modification (16).

Odds ratios were used as estimates of relative risk. Maternal age was introduced in the analyses as a continuous variable since there was a linear association between age and the log (odds) of the SGA risk. All other factors were dichotomized. Differences at $p > 0.05$ level were considered statistically significant. Statistical analyses were performed with the SPSS program.

The study was approved by the Ethics Committee of Lund University and by the Swedish Data Inspection Board.

RESULTS

The study included 826 women with single pregnancies of which 644 (78%) women were born in Sweden and 182 (22%) were foreign-born. The mean age of the Swedish women was 27.3 (SD £ 4.3) years compared with 26.3 (SD £ 4.8) years for the immigrant women.

Of the 182 foreign-born women, 91 (52.6%) women had lived in Sweden one year or less and 108 (58.4%) of them spoke only little Swedish, or none at all.

Swedish women had 11.5 (SD ± 2.6) antenatal visits at the maternity health center and the first visit occurred on average in 12.6 (SD ± 1.9) postmenstrual weeks. The immigrant women had 10.6 (SD ± 2.5) antenatal visits and their first visit was in 14.1 (SD ± 4.1) postmenstrual weeks. Significantly more foreign-born women (16.8%) made their first antenatal visit late (> 15 postmenstrual week) compared with Swedish-born women (4.8%). Additionally, fewer immigrants (57.3%) than Swedish women (82.9%) attended parent classes.

The mean birth weight was 3,427 (SD £ 577) grams for Swedish-born infants and 3,284 (SD £ 543) grams for newborns of foreign-born women. Of all these infants, 55 (6.7%) were classified as SGA, 37 (5.7%) of Swedish nativity and 18 (9.7%) of foreign nativity. Prevalence of different risk factors and SGA are given for seven geographical regions of origin in Table II. SGA deliveries were significantly more prevalent among Middle East- and North Africa-born women (22%) and sub-Saharan-born women (15%) compared with the average level of SGA deliveries in the total sample (6.7%). No women who originated from Western Europe, North America, Australia, or Asia delivered SGA babies. Some 50% of Asia-born women had short height, 63% low weight, and 58% had a low BMI. More than 50% of women from the Middle East, from North Africa, and from sub-Saharan Africa reported low access to social network and social support resources such as social anchorage, social participation, emotional support, and support from their grandmother. Swedish-born women

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Western Europe</th>
<th>North America</th>
<th>Eastern Europe</th>
<th>Middle East North Africa</th>
<th>Central and South America</th>
<th>Asia (%)</th>
<th>Sub-Saharan Africa (%)</th>
<th>Total (%)</th>
<th>Total number</th>
</tr>
</thead>
<tbody>
<tr>
<td>SGA</td>
<td>5.7</td>
<td>0.0</td>
<td>8.0</td>
<td>22</td>
<td>7.1</td>
<td>0.0</td>
<td>15</td>
<td>6.7</td>
<td>55</td>
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<tr>
<td>Low maternal weight (≤ 50 kg)</td>
<td>10</td>
<td>13</td>
<td>16</td>
<td>15</td>
<td>31</td>
<td>63</td>
<td>39</td>
<td>13</td>
<td>107</td>
</tr>
<tr>
<td>Low maternal height (≤ 157 cm)</td>
<td>6.3</td>
<td>9.7</td>
<td>6.0</td>
<td>20</td>
<td>39</td>
<td>50</td>
<td>0.0</td>
<td>8.9</td>
<td>72</td>
</tr>
<tr>
<td>Low BMI (&lt; 20)</td>
<td>24</td>
<td>16</td>
<td>27</td>
<td>20</td>
<td>39</td>
<td>58</td>
<td>46</td>
<td>25</td>
<td>201</td>
</tr>
<tr>
<td>Low educational level (≤ 12 years)</td>
<td>59</td>
<td>59</td>
<td>65</td>
<td>77</td>
<td>57</td>
<td>79</td>
<td>75</td>
<td>61</td>
<td>495</td>
</tr>
<tr>
<td>Low social anchorage</td>
<td>23</td>
<td>33</td>
<td>32</td>
<td>59</td>
<td>17</td>
<td>29</td>
<td>69</td>
<td>27</td>
<td>207</td>
</tr>
<tr>
<td>Low social participation</td>
<td>35</td>
<td>41</td>
<td>51</td>
<td>84</td>
<td>50</td>
<td>57</td>
<td>83</td>
<td>41</td>
<td>327</td>
</tr>
<tr>
<td>Low instrumental support</td>
<td>8.6</td>
<td>25</td>
<td>25</td>
<td>47</td>
<td>29</td>
<td>33</td>
<td>39</td>
<td>14</td>
<td>114</td>
</tr>
<tr>
<td>Low emotional support</td>
<td>24</td>
<td>31</td>
<td>52</td>
<td>61</td>
<td>36</td>
<td>54</td>
<td>92</td>
<td>30</td>
<td>248</td>
</tr>
<tr>
<td>Low support from the child’s father</td>
<td>16</td>
<td>16</td>
<td>21</td>
<td>19</td>
<td>36</td>
<td>14</td>
<td>33</td>
<td>17</td>
<td>117</td>
</tr>
<tr>
<td>Low support from grandmother</td>
<td>24</td>
<td>47</td>
<td>35</td>
<td>73</td>
<td>39</td>
<td>42</td>
<td>75</td>
<td>29</td>
<td>235</td>
</tr>
<tr>
<td>Smoking</td>
<td>33</td>
<td>25</td>
<td>22</td>
<td>8.3</td>
<td>14</td>
<td>13</td>
<td>9.1</td>
<td>30</td>
<td>243</td>
</tr>
<tr>
<td>Alcohol consumption</td>
<td>31</td>
<td>16</td>
<td>23</td>
<td>0.0</td>
<td>7.1</td>
<td>18</td>
<td>10</td>
<td>27</td>
<td>214</td>
</tr>
<tr>
<td>Vocationally inactive</td>
<td>18</td>
<td>17</td>
<td>54</td>
<td>96</td>
<td>62</td>
<td>58</td>
<td>58</td>
<td>27</td>
<td>209</td>
</tr>
<tr>
<td>Residence in Sweden ≤ 1 year</td>
<td>0.0</td>
<td>32</td>
<td>40</td>
<td>79</td>
<td>43</td>
<td>52</td>
<td>69</td>
<td>11</td>
<td>92</td>
</tr>
<tr>
<td>Not Swedish speaking</td>
<td>0.2</td>
<td>6.3</td>
<td>18</td>
<td>53</td>
<td>14</td>
<td>21</td>
<td>23</td>
<td>5.9</td>
<td>48</td>
</tr>
<tr>
<td>Total number</td>
<td>644</td>
<td>32</td>
<td>50</td>
<td>49</td>
<td>14</td>
<td>24</td>
<td>13</td>
<td>826</td>
<td></td>
</tr>
</tbody>
</table>
reported the highest prevalence of smoking and drinking during early pregnancy, 33% and 31%, respectively. Most women from the Middle East and North Africa had been living in Sweden ≤ 1 year (79%) and were vocationally inactive (96%).

Table III shows the associations between different risk factors in Swedish-born and foreign-born women and the risk for giving birth to SGA infants in terms of crude odds ratios. Swedish-born women with short height (OR = 2.8; CI = 1.0 – 7.7), smoking (OR = 2.5; CI = 1.3 – 4.8), and alcohol consumption during early pregnancy (OR = 2.0; CI = 1.0 – 3.9) had a significantly increased SGA risk. Foreign-born women who reported low access to social anchorage and emotional support had an increased risk of delivering small for gestational age babies (OR = 4.4; CI = 1.5 – 13.2 and OR = 5.2; CI = 1.5 – 18.9), respectively.

Immigrant status was significantly related to SGA (OR = 1.8; CI = 1.0 – 3.2). However, there were no statistically significant associations between LBW (< 2500 grams) (OR = 1.3; CI = 0.7 – 2.5) or preterm birth (< 37 gestational weeks) (OR = 0.9; CI = 0.5 – 1.8) and country of origin, respectively, nor between country of origin (Swedish-born versus other country of origin) and pregnancy complications (OR = 0.8; CI = 0.5 – 1.3), nor pre-eclampsia (OR = 0.7; CI = 0.4 – 1.5), nor caesarean section (OR = 0.8; CI = 0.4 – 1.4). Immigrant women who did not speak Swedish at all were at higher SGA risk (OR = 2.6; CI = 1.1 – 6.2) compared with immigrant women who spoke Swedish. However, residence in Sweden of one year or less did not affect the SGA odds.

**Logistic regression analyses**

When examining the impact of the foreign origin variable and the concurrent influence of other variables, such as different biological factors (maternal age and BMI), psychosocial resources (social anchorage, social participation, emotional support), socioeconomic factors (educational level and vocational status), and, finally, lifestyle factors (maternal smoking) by means of a multivariate analysis, we found that the SGA odds ratios decreased and became statistically non-significant (Table IV).

In order to investigate possible synergy between some of the exposures we performed analyses, using Swedish women with high access to social anchorage as a reference group, which showed that women of foreign origin with low social anchorage had an increased odds ratio for giving birth to SGA infants (OR = 4.4; CI = 1.9 – 10.1) after adjustment for age, BMI, educational level, and smoking (Table V). Furthermore, foreign-born women who were smokers had a significantly increased risk for delivering SGA babies (OR = 4.1; CI = 1.3 – 13.3) as did foreign-born women with a low educational level (OR = 3.3; CI = 1.3 – 8.8).

To test for the magnitude of synergy we calculated a synergy index (SI), which showed a likely synergy between the variables foreign origin and low social anchorage (SI = 19.4), while indication of synergy was modest regarding foreign origin and smoking and low education.

**DISCUSSION**

This prospective study of all pregnant nulliparous, in the city of Malmö, Sweden, showed that foreign-born women and especially those with low social anchorage and low emotional support had a higher risk of delivering SGA infants compared with native-born women. By entering a number of potentially explanatory factors step by step in a multivariate analysis...
the increased odds for SGA among the mothers of foreign origin disappeared almost completely. This implies that they either could be inter-linked in a common causal chain, or could represent confounding factors.

The results of this study might be biased by selection, misclassification, or confounding. The target population in our study consisted of all pregnant nulliparous women in a defined geographical area: the city of Malmö, Sweden. Some 85–90% of all women having their first child were invited to participate. The 10–15% of women not approached were those attending two private clinics. There were good reasons to believe that almost all foreign-born women were approached, since women who saw private obstetricians (1991–92) were usually of Swedish origin (13). The participation rate in the study was high (87.7%). An analysis of the non-responders revealed some minor differences regarding age and country of origin but not regarding pregnancy outcomes such as birth weight and gestational age (13). Therefore, we do not find any obvious reason to believe that selection was an important source of bias.

The instrument for measuring social network and social support has been validated in a Swedish general population (15), which was less heterogeneous than this sample regarding country of origin and could be a limiting factor regarding the interpretation of our results. However, a previous study of determinants of self-rated health, social network, and social support measured with the instruments in question showed that these measures had a very similar predictive

<table>
<thead>
<tr>
<th>Characteristics and nationality</th>
<th>SGA infants/all infants</th>
<th>SGA %</th>
<th>Crude OR</th>
<th>95% CI</th>
<th>Adjusted OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>High social anchorage and Swedish born</td>
<td>26/243</td>
<td>5.6</td>
<td>1.0</td>
<td></td>
<td></td>
<td>1.0</td>
</tr>
<tr>
<td>High social anchorage and foreign born</td>
<td>5/102</td>
<td>4.9</td>
<td>0.9</td>
<td>0.3–2.3</td>
<td>1.2</td>
<td>0.4–3.2</td>
</tr>
<tr>
<td>Low social anchorage and Swedish born</td>
<td>8/137</td>
<td>5.8</td>
<td>1.0</td>
<td>0.5–2.4</td>
<td>1.0</td>
<td>0.5–2.4</td>
</tr>
<tr>
<td>Low social anchorage and foreign born</td>
<td>13/69</td>
<td>18.8</td>
<td>3.9</td>
<td>1.9–8.0</td>
<td>4.5</td>
<td>1.9–10.5</td>
</tr>
<tr>
<td>No maternal smoking and Swedish born</td>
<td>17/423</td>
<td>4.0</td>
<td>1.0</td>
<td></td>
<td></td>
<td>1.0</td>
</tr>
<tr>
<td>No maternal smoking and Foreign born</td>
<td>13/151</td>
<td>8.6</td>
<td>2.3</td>
<td>1.1–4.8</td>
<td>1.9</td>
<td>0.8–4.2</td>
</tr>
<tr>
<td>Maternal smoking and Swedish born</td>
<td>20/214</td>
<td>9.3</td>
<td>2.5</td>
<td>1.3–4.8</td>
<td>2.0</td>
<td>1.0–4.1</td>
</tr>
<tr>
<td>Maternal smoking and foreign born</td>
<td>4/29</td>
<td>13.8</td>
<td>3.8</td>
<td>1.2–12.2</td>
<td>4.0</td>
<td>1.2–13.1</td>
</tr>
<tr>
<td>High educational level and Swedish born</td>
<td>10/261</td>
<td>3.8</td>
<td>1.0</td>
<td></td>
<td></td>
<td>1.0</td>
</tr>
<tr>
<td>High educational level and foreign born</td>
<td>5/55</td>
<td>9.1</td>
<td>2.5</td>
<td>0.8–7.7</td>
<td>2.7</td>
<td>0.8–8.6</td>
</tr>
<tr>
<td>Low educational level and Swedish born</td>
<td>27/372</td>
<td>7.3</td>
<td>2.0</td>
<td>0.9–4.1</td>
<td>2.2</td>
<td>0.9–5.1</td>
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<tr>
<td>Low educational level and foreign born</td>
<td>11/22</td>
<td>9.0</td>
<td>2.5</td>
<td>1.0–6.0</td>
<td>2.5</td>
<td>0.9–7.1</td>
</tr>
</tbody>
</table>

Notes: aAdjusted for maternal age, BMI, educational level, and smoking; breference group.
power regardless of country of origin (17). Our assessment of the SGA variable was based on an estimation of the birth weight in relation to the gestational age. Most of the women (97.6%) in this study were dated according to ultrasound examination twice during pregnancy. This method is regarded as the most valid one in measuring gestational age. A newborn was classified as SGA if its birth weight was more than 2 SD below the expected mean of birth weight. This classification is based on new sex-specific growth curves that are considered better at revealing the true distribution of SGA fetuses than previous methods, especially during the preterm period (14). We therefore believe that precision was also high in the outcome variable.

Confounding might be another problem. In this study, adjustments were made in the logistic regression analyses for maternal age and BMI, psychosocial factors (social anchorage, social participation, and emotional support), educational level, vocational factors, and maternal smoking (see Table IV). By entering these variables step by step the odds for SGA among those of foreign origin disappeared almost completely. Entering psychosocial factors (social anchorage, social participation, and emotional support) decreased the increased risk by 30%, and socioeconomic factors by 40%. Biological factors (maternal age and BMI) and lifestyle factors (smoking) both increased the SGA risk by 10%. Many of these variables are probably more likely to be parts of a causal chain between foreign origin and certain living circumstances and SGA than true confounding factors. In our testing of a possible effect modification we found indications of a synergistic relationship between being foreign origin and low social anchorage but not between foreign origin and being a smoker early in pregnancy. However, our study sample was rather small and these results need to be tested in a larger study.

One of several possible determinants that have to be observed regarding birth weight is genetic differences (18). In this study, 50% of the Asian women (from Asia and the Pacific Islands) were classified as having a low height, low pre-pregnancy weight and a low BMI. None of these women gave birth to small for gestational age babies. However, Swedish women of short height had a 180% increased SGA risk, which could reflect important genetic factors linked to country of origin.

In this study, a larger proportion of women who originated from the Middle East, North Africa, and sub-Saharan Africa reported lower levels of social network and social support from families and friends, compared with the total study group. The SGA prevalence was 22% and 15% in these groups, respectively, compared with 5.7% for Swedish-born women and 6.7% for all women in the one-year cohort. However, almost all women received high social support from their partners. Many investigators have studied psychosocial factors and country of origin related to SGA, but findings in this area have not been consistent and comparisons across studies are difficult to make because of discrepancies both in the studied ethnic groups and in the methods measuring psychosocial factors (1–3, 8, 19, 20).

We noted the interesting pattern that the psychosocial variables seemed to be the most prominent risk factors for SGA among the women of foreign origin in our sample, while they were not associated with a higher risk among the Swedish women. This was further explored by a specific analysis for synergy regarding country of origin and social anchorage, which indicated synergy between foreign origin and low social anchorage, also when adjusting for age, BMI, and smoking habits. This is particularly interesting since it is not likely to be explained by residual confounding but could be a susceptibility phenomenon, implying that immigrant status is linked with a state of increased stress (depending on a number of adverse socioenvironmental factors) and that social anchorage could buffer for adverse effects on fetal growth in this situation. This interpretation would lend further support to the hypothesis of a causal relation between exposure to psychosocial stress and SGA, which we have suggested in our previous work (12).

CONCLUSIONS

Identification of fetal growth restriction is a major goal of antenatal healthcare today, not only because it is a predictor of infant ill health but also because it may affect subsequent adult disease (21). In an earlier study our findings supported a stress hypothesis, suggesting that the lack of psychosocial resources influences the risk of delivering SGA infants. There were also reasons to believe that the effect of an inadequate social network and weak social support on intrauterine growth might be greater among women who were already subjected to some sort of social deprivation (i.e. immigrant women and women with little education) (12). This study showed that the cumulative stress associated with migration to a new country and culture during the personal transition of pregnancy seems to be associated with an accumulation of adverse factors like low access to social network and social support, low education, and being vocationally inactive.

In our opinion it is not possible to analyze the precise causes behind potentially adverse factors to
which many mothers of foreign origin seem exposed due to the migration process and difficulties in becoming successful socially and economically integrated into Swedish society. However, we believe it is a very relevant public health research issue to find out whether adverse socioeconomic and psychosocial factors to some extent could explain the observed higher risk of giving birth to an SGA child among immigrant mothers. If this were the case, it would imply that intervention in such factors could not only enhance the material conditions for young immigrant families but also improve the health of newborns in this group.

However, this should not postpone required interventions in the antenatal period, which are most likely to be effective in the area of antenatal services provision and specifically include educational efforts in this context. Midwives and doctors at maternity health centers must therefore also become more effective in identifying the specific risk factors in immigrant women. Offering antenatal classes in the women’s own language could help the women and their parents to integrate new information and knowledge and also to create new social links and thus increase their social network.

REFERENCES


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