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CLINICAL ARTICLE

Fetal and infant health outcomes among immigrant mothers in Flanders, Belgium

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ABSTRACT

Objective: To compare fetal and infant mortality between immigrant and native-born mothers in Flanders, Belgium. *Methods:* In a population-based study, data from 326 166 neonatal deliveries, collected by the Study Center for Perinatal Epidemiology and the Belgian Civil Birth Registration system between January 2004 and December 2008, were analyzed. Immigrant mothers were defined as women born in any country other than Belgium, and were grouped by country of origin according to the World Bank Atlas definition of low-, middle-, and high-income countries. Odds ratios (ORs) and 95% confidence intervals (CIs) were estimated to evaluate the association between immigration and fetal/infant outcome. *Results:* In univariate analysis, fetal and infant mortality rates were significantly higher among immigrants than among native-born mothers (fetal: crude OR, 1.50; 95% CI, 1.29–1.75; infant: crude OR, 1.47; 95% CI, 1.29–1.67). Fetal/infant death rates were highest among mothers originating from low-income countries. In multivariate analysis, however, most differences became non-significant: only the early neonatal death rate remained significantly higher (adjusted OR, 1.30; 95% CI, 1.06–1.60), whereas the fetal death rate appeared lower (adjusted OR, 0.67; 95% CI, 0.57–0.80), among immigrant mothers. *Conclusion:* After adjustment for relevant characteristics, fetal/infant mortality was comparable between immigrant women and native-born women in Flanders.

1. Introduction

Human migration is a global occurrence that influences the health of individuals and populations [1]. Research on migrant health shows that migrants, especially women and children in their first year of life, are a vulnerable group of society who face health challenges that differ from those of native populations [2]. Whether or not immigrant status is a risk factor for adverse fetal and infant health is not clear [3]. The heterogeneity in study design and the different definitions of migrants used complicate any broad generalization concerning study outcomes [4,5].

Some immigrant mothers have been shown to have similar or even better perinatal health outcomes than native-born women, a paradoxical pattern explained by the "healthy migrant effect" (i.e. the selection of very healthy women at migration) [6]. Other studies have revealed that immigrant mothers experience worse pregnancy outcomes compared with native women, showing higher rates of prematurity, lower birth weights, and higher rates of perinatal mortality [7–9]. A systematic review of the pregnancy outcome of migrants in Europe has suggested that immigrants in countries with a strong integration policy (i.e. Netherlands, Denmark, Norway, Sweden, and Belgium) fare better than those in countries where immigrants are expected to fit into the receiving society without the support of specific policies (i.e. Spain, UK, Italy, France, Germany, and Austria) [9].

Across Europe, sizeable proportions of pregnant women originate from countries with different cultural, ethnic, educational, and socioeconomic background. Flanders, the northern part of the constitutionally federal state of Belgium, is no exception. This region of 13 522 km^2 has a population of approximately 6.2 million with its own language, government, and parliament. The distance to a hospital is not an issue, because Flanders is one of the most urbanized regions in Europe and has 68 fully equipped maternity units, where 99.8% of all births occur. Four of these units are in university hospitals, 15 in hospitals with training facilities, and 49 in community hospitals. The aim of the present study was to determine whether there are increased risks of fetal and infant mortality among immigrant mothers compared with native-born mothers living in this highly affluent region of Belgium.

2. Materials and methods

The present population-based study was conducted on data from all births occurring between January 1, 2004 and December 31, 2008, in Flanders, Belgium. Study data were obtained from the Study Center for Perinatal Epidemiology (SPE) and the Belgian Civil Birth Registration (CBR) system. Neither ethical approval nor informed consent was required for the study.

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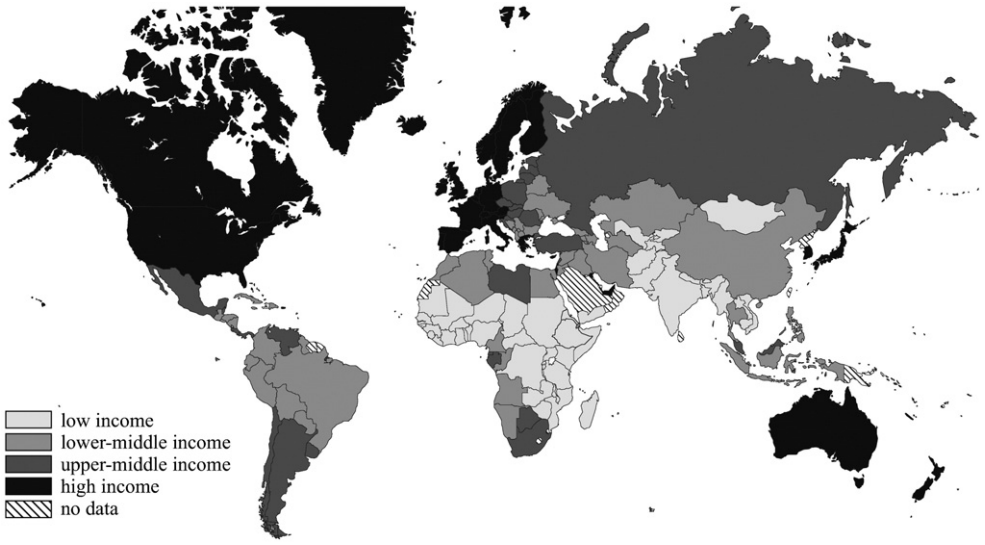

Fig. 1. Map showing countries of origin, shaded according to World Bank ranking, of immigrant mothers who delivered in Flanders.

For newborns weighing 500 g and more in Flanders, a standard perinatal form containing maternal, obstetric, and neonatal items is completed by the maternity unit and sent to the SPE, an independent and regionally funded center. Perinatal data from all maternity units are centrally collected, subjected to an error detection program, checked for accuracy and completeness through feedback with the individual units, and reassessed when needed.

It is a legal requirement to register live births of neonates from 22 completed weeks of gestational age and stillborn neonates from 180 days onward (25 weeks 5 days). Whether a stillborn aged between 22 weeks and 25 weeks 5 days is registered depends on the parents' choice. Gynecologists complete the birth or death certificate, and parents are requested to declare the birth or death at the CBR within 15 days of delivery. District councils perform this registration at a local level, and socioeconomic data concerning the nationality of the mother, her birth nationality, and educational status are recorded.

For the present study, the SPE and the CBR data were used to facilitate an analysis of the association between immigration and pregnancy outcomes in Flanders. The mother's origin was defined on the basis of her nationality at birth, and immigrants were defined as women born in a country other than Belgium. An immigrant's country of origin was further classified according to income group as defined by the World Bank Atlas Method [10]: on the basis of gross national income per capita, a country's economy was categorized as low income (US $1035 or less), middle income (US $1036–$12 615), or high income (US $12 616 or more). This method considers the average income of a country's citizens and is a reflection of the social, economic, and environmental well-being of the country and its people.

For the study, fetal death was defined as a stillborn of at least 500 g at 22 or more weeks of gestation. Infant death was defined as the sum of early neonatal (death at 0–6 days), late neonatal (7–27 days), and postneonatal (28–364 days) deaths. The educational level of the mother was based on the highest degree or diploma obtained (none/primary, low secondary, high secondary, and tertiary).

Statistical analysis was carried out with the statistical software package R (R Foundation, Vienna, Austria). Univariate comparison of categorical variables was done with Pearson χ^2 test. Continuous variables were compared by Wilcoxon rank-sum test. Differences were considered statistically significant for a P value of less 0.05. Crude odds ratios (ORs) were calculated to compare data between the immigrant population and native-born mothers. The 95% confidence interval (95% CI) was calculated on the basis of the standard error. Adjusted ORs were calculated by using a logistic mixed model to take into account potential confounders (i.e. maternal age, self-reported maternal educational level attained, parity, and multiple pregnancies).

3. Results

During the study period, 328 969 neonates weighing at least 500 g were delivered. After discarding data with a missing maternal origin (0.8%), 326 178 deliveries remained. Another 12 births were excluded because of other missing data (maternal age, parity, or gestational age). As a result, the final analysis included data from 326 166 deliveries.

In total, 80.2% of women giving birth in Flanders during the study period were native-born (n = 261 566), whereas 19.8% were not Belgian-born and were defined as immigrant mothers (n = 64 600). The immigrant group was further categorized as originating from low-income (12.5%, n = 8066), middle-income (65.0%, n = 41 985), and high-income (22.5%, n = 14 549) countries.

Fig. 1 gives an overview of all countries with immigrants in Flanders according to this classification. Table 1 summarizes the relative weight of the relevant nations: only countries with at least 100 immigrant mothers have been included. In the high-income group, most mothers originated from the neighboring countries: 54% came from Flanders'

Table 1
Number of deliveries by immigrant women classified by World Bank country income groups.

Income group	Countries (no. of deliveries)[a]
Low income	Afghanistan (275), Bangladesh (147), Burundi (122), Congo Dem. Rep. (1354), Ghana (688), Guinea (235), India (762), Nepal (162), Nigeria (696), Pakistan (621), Rwanda (250), Senegal (164), Somalia (174), Togo (106), Vietnam (146)
Middle income	Albania (222), Algeria (528), Angola (282), Armenia (398), Belarus (142), Herzegovina (162), Brazil (305), Bulgaria (563), Cameroon (275), Chile (120), China (664), Czech Republic (596), Dominican Republic (110), Ecuador (142), Hungary (130), Indonesia (174), Iran Islamic Rep. (259), Iraq (248), Kazakhstan (125), Lebanon (118), Macedonia FYR (185), Morocco (14 075), Philippines (692), Poland (1592), Romania (653), Russian Federation (1857), Serbia and Montenegro (2056), Syrian (286), Thailand (542), Tunisia (625), Turkey (9629), Ukraine (252)
High income	France (1598), Germany (697), Greece (182), Israel (190), Italy (1470), Japan (124), Netherlands (6273), Portugal (452), Spain (612), UK (674), USA (389)

[a] Only countries with 100 or more deliveries by immigrant mothers are listed.