Variability of birth weight based on maternal country of origin

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Abstract

Objective: to determine the differences in weight at birth in term newborns of Spanish mothers and mothers of South American and North African origin, born in Rafael Méndez Hospital (Murcia, Spain).

Subjects and methods: the study includes only newborns at term, with single, normal and controlled gestation of healthy, without toxic habits mothers. Sample of 240 women of Spanish, North African and South American origin, consisting of 80 women in each group. Preterm, multiple pregnancy or high-risk pregnancy newborns were excluded, as well as those dead at peripartum period. The results are presented using graphs and frequency tables, mean values and standard deviation for each participating group, and the analysis of the differences by Anova test.

Results: birth weight by mother origin: for Bolivia/Ecuador was 3481 g, for Morocco was 3505 g and for Spain was 3331 g which is lower than the rest of nationalities (p = 0.0474).

Conclusions: the weight of newborns of Spanish mothers is lower than the weight of children of mothers from other origins.

Key words: Migration, Pregnancy, Birth weight

Resumen

Objetivo: establecer las diferencias de peso al nacer en recién nacidos a término de mujeres españolas, sudamericanas y magrebies en el Hospital Universitario Rafael Méndez, en Lorca (Murcia), España.

Material y métodos: el estudio incluye a recién nacidos de gestación única y controlada a término, en madres sanas, sin hábitos tóxicos y origen español, magrebí o sudamericano, con una muestra de 240 mujeres, 80 en cada grupo. Se excluyen los recién nacidos pretérmino, gestación múltiple, muerto anteparto o al nacer, y nacidos de gestación de alto riesgo. Los resultados se presentan mediante gráficos y tablas de frecuencia, con los valores de la media y la desviación típica para cada grupo participante, y el análisis de las diferencias mediante Anova.

Resultados: peso medio al nacer según el origen de la madre: de Bolivia y Ecuador fue de 3481 g, de Marruecos de 3505 g, mientras que de España fue de 3331 g, siendo inferior a los otros orígenes (p = 0.0474).

Conclusiones: el peso de recién nacidos de madres españolas es inferior a otros orígenes.

Palabras clave: Migración, Embarazo, Peso al nacer

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INTRODUCTION

Before individuals reach reproductive age, birth and the neonatal period are the points in time when the risk of mortality is highest. Since the body size of newborns (NBs) is associated with survival in the first months of life, it is a determinant of evolutionary success at both the individual and population levels. It also reflects the quality of the intrauterine environment and can be used as a predictor of future growth and development. Birth weight is the most commonly used measure of body size.\(^1\)

Birth weight variability has been studied extensively due to the association between low birth weight and increased risk of morbidity and mortality both in the neonatal period and adulthood.\(^2,3\) Also, studies conducted between the 1960s and the present have found differences in birth weight based on race and ethnicity.\(^4\)

Immigration is one of the phenomena with the greatest social, economic and demographic impact in recent decades. A significant feature of this phenomenon is that most of the foreign population currently residing in Spain comes from developing countries, with a high proportion of young women that arrive with the intent to settle down and start a family.

The proportion of foreign nationals reached 10.7% of the total population of Spain by January 1, 2014 according to data from the National Institute of Statistics (Instituto Nacional de Estadística [INE]). In recent years, there have been significant demographic changes in Spain, with the absolute frequency of resident aliens amounting to 4,454,353 in January 1, 2015 and 4,426,811 in July 1, 2015, corresponding to a reduction of 27,543 (0.6%).\(^5\) This reduction is accounted for by naturalization. When we break these data down by country of origin, we find that the greatest increases corresponded to individuals from Italy (4,636 people), Ukraine (3,152) and China (1,905). On the other hand, the greatest decreases corresponded to Ecuador (-9,568 people), Morocco (-8,573) and Bolivia (-7,266).\(^5\)

The purpose of this study was to determine the differences in birth weight of children born to term to Spanish, South American and Maghrebi mothers at the Hospital General Universitario Rafael Méndez (HRM) of Lorca (Murcia, Spain).

Considering that maternal country of origin is one of the factors that contribute to this variability, our study focused on children born to Spanish mothers compared to children born to mothers of Maghrebi and South American origin, the predominant groups in the immigrant population in our region. Our secondary objective was to determine the distribution in percentages of different maternal origins and to compare it with the results of previous years.

MATERIALS AND METHODS

Design: we conducted a retrospective observational study.

Sample size calculation: we estimated the sample size needed to obtain a power of 80% in the testing of the null hypothesis (there is no difference in the birth weight of newborns based on maternal country of origin) using Student’s t test for two independent samples (two-tailed), taking into account that the level of significance was set at 5% and assuming that the mean weight of the experimental group was 3800 g and the standard deviation of both groups 450 g, with the conclusion that we needed to include 80 patients in each group, for a total of 240 experimental units in the study.

We included a total of 240 term NBs (male and female) with the following distribution based on maternal country of origin: 80 Spanish, 80 Maghrebi, 80 South American, with male and female NBs included in all groups.

Patients: there were three groups under study—mothers of Maghrebi, South American and Spanish origin, all of whom received prenatal care or gave birth at the Hospital Rafael Méndez (HRM) in 2014. The mothers included in the study gave birth at between 37 and 41 weeks of gestation at the HRM.
**Data collection:** using the registry of births in the hospital under study, and starting from August 1, 2015, we selected the children born healthy at 37 to 41 weeks of gestation from singleton pregnancies in healthy mothers that had received prenatal care and with no chronic disease in the past or during pregnancy (categorised as low-risk pregnancies in the maternal discharge report obtained from the Selene® database), that were of Spanish, Maghrebi or South American descent. We excluded children born preterm, that died during pregnancy or delivery, or product of multiple pregnancies or of pregnancies categorised as high or very high risk.

**Study variables:** 1) the dependent variable was birth weight and the independent variable was maternal origin; 2) qualitative variables: the dichotomous variable of NB sex and the non-dichotomous variable of maternal origin (Spanish, Maghrebi and South American), and 3) continuous quantitative variables: gestational age, maternal age, and birth weight.

Birth weight was measured in the delivery room within 30 minutes of birth by floor nurses using a Seca® scale with a weight range of 0.1 to 15 kg and accurate to 10 grams.

Gestational age was calculated based on the date of the mother’s last menstrual period (LMP) and/or the crown-rump length (CRL) of the foetus measured during ultrasound examination.

We obtained the maternal country of origin (regardless of current nationality) from the demographic data recorded in the Selene® electronic database. We designed a customised data collection form that included all the variables of interest: maternal origin and age, and NB gestational age, sex and birth weight.

**Statistical analysis:** we conducted the statistical analysis using the GSTAT® software. The descriptive analysis involved the calculation of means and standard deviations for each quantitative variable for each group. We also performed one-way ANOVA with multiple comparisons.

**RESULTS**

We have expressed quantitative variables (maternal age, gestational age and birth weight) as mean ± SD, and qualitative variables (maternal origin and sex of the NB) as absolute frequency and percentage.

Of the 240 NBs, 46.67% were male and 53.33% female. The mean maternal age was 31 years (SD, 6.34) for the total sample, 30.47 years for Maghrebi mothers, 30.97 years for South American mothers and 31.70 years for Spanish mothers. The mean birth weight for the total sample was 3439 g, and was greater for the male sex: 3410 g in female NBs and 3465 g in male NBs (SD, 469 and 489, respectively). The mean gestational age was 39.45 weeks (SD, 1.10).

In 2014, of all children born to immigrant mothers in our hospital, 527 were born to Maghrebi mothers, 346 to mothers from Ecuador and Bolivia (Figure 1), and the rest to mothers from other countries such as Romania, Russia, Algeria, Bulgaria, France, Paraguay and Nigeria (Figure 2). Between 2007 and 2015, we observed a decline in the number of births by mothers of South American descent while the births by mothers of Maghrebi descent increased (Figure 3).

We proceed to present the results of the calculation and comparison of two sample means (Student’s t):

- **Weight by sex:** male, 3465 g and female, 3410 g (SD, 485 and 469, respectively); the difference was not statistically significant (Student’s t, \(P = .3764\)).

- **Weeks of gestation by sex:** the mean was 39.48 weeks in males and 39.42 weeks in females (SD, 1.14 and 1.06, respectively); the difference was not statistically significant (Student’s t, \(P = .6741\)).

- **Maternal age by sex:** the mean maternal age was 30.35 years for female NBs and 31.65 years for male NBs. The difference was not statistically significant (Student’s t, \(P = .1127\)).

- **Maternal age by maternal origin:** we found a mean maternal age of 30.47 years for mothers
of Maghrebi descent, 31.70 years for mothers of Spanish descent and 30.97 years for mothers of South American descent (SD, 6.20, 6.84 and 6.28, respectively). The difference was not statistically significant (ANOVA, $P = .4676$).

- **Weeks of gestation by maternal origin:** we found a mean of 39.57 weeks for mothers of Maghrebi descent, 39.41 for mothers of Spanish descent and 39.35 for mothers of South American descent (SD, 1.08, 1.12 and 1.09, respectively). The difference was not statistically significant (ANOVA, $P = .4390$).

- **Birth weight by maternal origin:** the mean birth weight was higher in NBs born to mothers of Maghrebi or South American descent compared to NBs born to Spanish mothers. We found no statistically significant differences in birth weight between the Maghrebi and South American groups (Figure 4, Table 1).

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**Figure 1.** Number of births by mothers from the main immigrant groups at the Hospital Rafael Méndez (Lorca, Murcia, Spain) in 2014

<table>
<thead>
<tr>
<th></th>
<th>Number of Births</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolivia + Ecuador</td>
<td>500</td>
</tr>
<tr>
<td>Morocco</td>
<td>400</td>
</tr>
<tr>
<td>Other</td>
<td>100</td>
</tr>
</tbody>
</table>

**Figure 2.** Number of births by mothers of other origin at the Hospital Rafael Méndez (Lorca, Murcia, Spain), 2014

- Germany
- Argentina
- Bangladesh
- Belarus
- Bulgaria
- China
- Cuba
- United States
- France
- Guatemala
- Honduras
- Jordan
- Nicaragua
- Pakistan
- Peru
- Portugal
- DE Republic
- Romania
- Senegal
DISCUSSION

In this study, we analysed the variability in birth weight based on maternal country of origin (regardless of maternal nationality), controlling for factors that are assessed during prenatal care including gynaecologic, obstetric, toxic, metabolic and other problems that may have an impact on birth weight by selecting mothers with pregnancies classified as “low risk”. A perinatal risk factor is

Figure 3. Comparison of the percentages of births in the immigrant population under study in the past few years and in 2007

Note the increasing trend in birth rate in Maghrebi mothers, combined with a decreasing percentage of births by South American mothers.

Figure 4. Differences in the mean birth weights of the newborns in the three groups under study

Greater birth weight in children born to Maghrebi and South American mothers.
a social, medical, obstetric or any other type of characteristic or circumstance that has an impact on pregnancy and is associated with an increased risk of maternal or perinatal morbidity and mortality compared to the general population. There is no such thing as a total absence of risk, as there is always the chance that an unpredictable factor complicates a pregnancy that seemed normal at the outset. Approximately 25% of complications develop in pregnancies in which no risk factors could have been identified. For this reason, we speak of low-risk pregnancies, as opposed to risk-free.

During the first semester of 2015, the population grew in five of the seventeen autonomous communities of Spain, including the Region of Murcia (0.09%). The resident population was 1,463,773 in January 1, 2015 and had grown to 1,465,103 by July 1, 2015, with an absolute increase of 1330 in inhabitants and a relative increase of 0.9%. The total immigrant population in the Region of Murcia in 2014 was of 7461, with a predominance of immigrants from the European Union (2644), Africa (2008) and South America (1324); the predominant age group was 19 to 49 years, and in that age band and within the female sex, the predominant group by region of origin was Africa, followed by the European Union and South America (flow of foreign immigration by province, year, sex, age group and country [INE]).

This situation seems to have influenced the increased birth rate observed in Spanish provinces, where 17.8% of births in 2014 were in mothers that were foreign nationals (INE). To gain more detailed knowledge on the diverse immigrant populations that have given birth at the Hospital Rafael Méndez de Lorca, we consulted the delivery room registry for years 2014 and 2015 using the Selene® software, and found that 16.5% of deliveries corresponded to Maghrebi mothers and 11.2% to South American mothers, followed in lesser numbers by mothers of Romanian descent and other origins.

A comparison to the figures obtained in 2007 shows a near transposition of these percentages, with a considerable increase in the number of deliveries by Maghrebi mothers and a decrease in the group of South American mothers (mostly from Bolivia and Ecuador), as in 2007, nine percent of deliveries corresponded to Maghrebi mothers and twenty percent to South American mothers.

The variability in birth weight associated with ethnic and racial differences has been demonstrated in different studies, a few of which we would like to highlight here:

- Copil concluded that the values of anthropometric measurements in NBs of Moroccan and South American descent are greater than those in the Spanish descent population. The anthropometric values of black NBs were similar to those of NBs of Spanish descent.
- Restrepo-Mesa concluded that the prevalence of low birth weight and inadequate weight was lower in children born to Colombian mothers.
- Bernis described that overall, children born to immigrant mothers have significantly higher birth weights than children born to Spanish mothers, and analysed different factors associated with differences in birth weight: biological, socioeconomic, reproductive and health care-related factors. He found that biological factors (gestational age, sex and plurality of birth) were the greatest contributors to birth weight variability, while the studied socioeconomic, reproductive and health care variables contributed less to the variability, but were also statistically significant.

### Table 1. Birth weight and differences by maternal origin

<table>
<thead>
<tr>
<th>Maternal origin</th>
<th>Morocco N = 80; mean = 3505 g</th>
<th>Spain N = 80; mean = 3331 g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolivia/Ecuador</td>
<td>23,9506 g</td>
<td>-149.1886 g*</td>
</tr>
<tr>
<td>Marruecos</td>
<td>-</td>
<td>-173.1392 g*</td>
</tr>
</tbody>
</table>

NB: newborn.

* Significant difference, ANOVA with multiple comparisons, $P = .0474$. Birth weight was lower in NBs born to Spanish mothers compared to NBs of mothers of Maghrebi or South American (Bolivia/Ecuador) descent.
Marqueta and Romagosa\(^{12}\) studied a sample of 115 children born to Maghrebi women and another 115 born to Spanish women, and observed that the average birth weight was 3318.58 g for the group with Spanish mothers and 3503.51 g for the group with Maghrebi mothers (184.93 g more), similar to the difference found in our study (an additional 173.13 g in the Maghrebi group). When it came to the mean maternal age, we found a slight increase (Maghrebi, 30.47 years and Spanish, 31.70 years) in our study compared to their findings, a difference that we think may be due to the delay in childbearing that has taken place in the past few years.

García García\(^{13}\) concluded that the epidemiological pattern of obstetric and neonatal outcomes in immigrant mothers was similar to that in Spanish mothers, and found no statistically significant differences in neonatal outcomes (birth weight, umbilical artery pH and Apgar score).

**CONCLUSIONS**

The findings of our study suggest that maternal country of origin has a significant impact on birth weight, as has been described in previous publications. This is evinced by the significant difference in birth weight between children born to Maghrebi and South American mothers compared to children born to Spanish mothers. However, the birth weights of NBs born to Maghrebi and South American mothers were similar, with no statistically significant differences between the groups.

Among the limitations of our study, we must highlight not having taken into consideration factors such as the duration of residence in Spain or having Spanish citizenship, the country of origin of the spouse, cultural patterns, dietary habits and lifestyle, which may be relevant to our results due to their potential impact on birth weight.

Performing this study has opened up new areas for future research: to learn how this difference in the birth weights of children based on maternal origin unfolds in the future, with a subsequent assessment of their growth curves, and to determine whether there are differences between different groups of mothers based on their ethnic origin in the upcoming years.

**CONFLICTS OF INTEREST**

The authors have no conflicts of interest to declare in relation to the preparation and publication of this article.

**ABBREVIATIONS**

CRL: crown-rump length • HRM: Hospital Rafael Méndez • INE: Instituto Nacional de Estadística • LMP: last menstrual period • NB: newborn • SD: standard deviation.

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**REFERENCES**


