

Short Report

Increased risk of maternal deaths associated with foreign origin in Spain: a population based case–control study

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Received 5 September 2009, accepted 29 December 2009

In Europe, different studies have identified immigrant women coming from developing countries as a risk group for maternal death. In Spain, an ecological study showed higher maternal mortality rates among foreign mothers compared with Spanish mothers during 2003–04. To examine whether the maternal death risk among foreign mothers in Spain is increased, we performed a population-based matched case–control study. Each case of maternal death during 1999–2006 was matched with four mothers who had given birth during the same year the case occurred. The National Statistics Institute provided the data. The variables in the study were maternal age and country of origin. We used a conditional logistic regression analysis. Adjusted by age, the risk of maternal death was 87% higher among foreign mothers. This study confirms that there is an increased risk of maternal death among foreign mothers in Spain. It would be desirable to analyse the socio-economic and healthcare circumstances surrounding the deaths.

Keywords: epidemiology, ethnic groups, maternal age, maternal mortality

Introduction

From 1930 through the 1980s, the maternal mortality ratio registered a clear decline in most European countries, with it then remaining stable in the following years.^{1,2} In the 1990s, different authors forecasted a rise in the maternal mortality ratio by the beginning of the 21st century, specifically in Europe and related to maternal age and immigration.^{3,4} A recent ecological study confirmed a change in the maternal mortality pattern in Spain over the decade, 1996–2005, marked by a rising trend and an increased risk at advanced maternal ages.⁵ This study detected a cluster of maternal mortality from 2003 to 2004, where 32% of maternal deaths occurred among foreign mothers during the 2-year period.⁵ In this respect, other studies have identified women at advanced reproductive age and immigrants coming from developing countries as risk groups for maternal death.^{4,6} However, the data yielded in that study do not enable us to specify what percentage of the 32% recorded for deaths among foreign mothers is attributable to mothers from developing countries. Finally, interpreting aggregated data can result in an ecological fallacy.

To test whether there was an increased risk of maternal death among foreign mothers, this study aimed to compare the risk of maternal death between foreign and Spanish mothers from 1999 to 2006 in Spain.

Methods

We performed a population-based matched case–control study. Cases and controls were taken from a source population of mothers who were pregnant or had given birth during the study period. All maternal deaths (cases) were drawn from the National Register of Death Statistics and broken down by cause of death, based on the death certificate. Codes (O00–O99) of the International Classification of Diseases, 10th Revision (ICD-10), were used to identify all of the maternal deaths that occurred during the study period. The definition of maternal death used was the one proposed by the ICD-10. Controls were drawn from the National Register of Live Births portion of the Natural Population Movement Statistics, for which the official data source is the birth

Table 1 Data from a conditional logistic regression of maternal deaths among cases and controls according to maternal age and country of origin, Spain 1999–2006 (*n* = 665, 133 matched sets)

Variables	Cases, <i>n</i> (%)	Controls, <i>n</i> (%)	OR (95% CI)
Maternal age (years)			
≥40	18 (13.5)	21 (4.0)	4.38 (0.82–23.51)
30–39	77 (58.0)	303 (57.0)	1.24 (0.26–5.88)
20–29	36 (27.0)	199 (37.4)	0.81 (0.16–3.87)
≤19	2 (1.5)	9 (1.7)	1
Maternal country of origin			
Foreign countries	21 (15.8)	52 (9.7)	1.87 (1.04–3.34)
Spain	112 (84.2)	480 (90.2)	1

registration form. Both registers are managed by the National Statistics Institute of Spain.⁷

The variables in the study were maternal age at the moment of birth and maternal country of origin, defined as the mother's country of birth.⁸ Maternal age was categorized in four groups (≤19, 20–29, 30–39 and ≥40 years), and the maternal country of origin was dichotomized as Spain and foreign country.

To increase the power of the study, four controls were matched to each case (1:4). The controls were randomly selected among the mothers who had given birth during the same year the case had occurred.

For statistical analysis, we conducted a description of cases and controls. Results are expressed as mean ± SD. We then performed a univariate analysis, introducing age as a continuous variable to test the effect of age on the risk of maternal death. Finally, we performed a conditional logistic regression of maternal deaths among cases and controls according to maternal age and country of origin. The reference categories were mothers ≤19 years for maternal age and Spain for maternal country of origin. Adjusted matched odds ratios (ORs) were derived from the model with their respective 95% confidence intervals (CIs), and the attributable risk of maternal death was calculated using the following formula⁹: $100 \times (OR - 1) / OR$.

The statistical software programme used was Stata v.10 (StataCorp, College Station, TX, USA).

Results

We compared 133 cases with 532 controls matched by year (133 matched sets). The mean ages were 33.1 ± 6.3 and 30.8 ± 5.1 years for cases and controls, respectively.

A total of 15.8% (*n* = 21) of cases and 9.7% (*n* = 52) of controls were of foreign nationality. Among the cases (mothers who had died), 12 (57%) originated from Central and South America and 5 (24%) from sub-Saharan Africa. The remaining four (19%) were Ukrainian, English, Moroccan and Chinese.

In the univariate analysis for each year of increased age, the OR for maternal death increased by 8%, and the matched OR was 1.08 (95% CI 1.04–1.12).

Table 1 presents the analysis of maternal death risk adjusted for age and country of origin. In Spain, between 1999 and 2006, the OR of maternal death was 87% higher for foreign mothers compared with Spanish mothers, independent of the mother's age. Finally, the attributable risk of maternal death for foreign mothers was 45.3% (95% CI 2.0–88.8).

Conclusions

The results of this study confirm that there is a higher maternal death risk among foreign mothers in Spain. To our knowledge, this is the first study reporting a higher risk of maternal death among foreign mothers in Spain at an individual level. This result coincides with different studies from other countries that have identified women of advanced reproductive age and immigrants from developing countries as risk groups for maternal mortality.^{4,6} Two studies conducted in the USA and Europe highlighted the wide disparity between immigrants from developing countries and the native population in terms of access to healthcare.^{10,11} Communication problems between health professionals and immigrant patients have been postulated as being a key factor underlying this problem.¹² Whether maternal country of origin and ethnicity are risk factors themselves for maternal deaths is a matter of debate. Rather, they might simply be a social construct that reflects more meaningful factors such as culture, economics and baseline health.¹⁰

The length of the period studied limits the consistency of the study. This could be addressed by analysing a longer time series; however, maternal nationality was not available in the maternal death statistics, by cause of death before 1999. Nevertheless, we want to highlight the strength of the use of the national registers and the absence of recall bias. Another limitation of the study is the under registration and under-reporting of maternal deaths that authors have highlighted in different European countries.^{12,13}

This study shows an increased risk of maternal death among foreign mothers in Spain. Maternal mortality is regarded as a preventable cause of death that is strongly related to the quality of the healthcare system and economic and social factors. The quality of healthcare and maternal care provided to pregnant women is an element that may account for the differences in maternal deaths.^{14,15}

In Spain, it would be desirable to implement a maternal mortality active surveillance system and the use of confidential qualitative surveys to allow for the analysis of socio-economic and healthcare circumstances surrounding these deaths. In-depth understanding and characterization of a preventable phenomenon, such as maternal death, would contribute to understanding the differences between the groups and to reducing maternal mortality among foreign and Spanish mothers.

Acknowledgements

We appreciate the support provided during the investigation by the members of the Field Epidemiology Training Program

(FETP) at the National Centre for Epidemiology in Spain, Madrid.

Conflicts of interest: None declared.

Key points

- In Europe, different studies have identified immigrant women coming from developing countries as a risk group for maternal death. In Spain, an ecological study showed higher maternal mortality rates among foreign mothers compared with Spanish mothers during 2003–04.
- The results of this study confirm, at an individual level, that there was a higher risk of maternal death among foreign mothers in Spain during 1999–2006.
- In Spain, it would be desirable to use qualitative surveys to analyse the socio-economic and healthcare circumstances surrounding these deaths to understand the differences in maternal mortality between the groups.

References

- Schuitmaker NW, Gravenhorst JB, Van Geijn HP, et al. Maternal mortality and its prevention. *Eur J Obstet Gynecol Reprod Biol* 1991;42(Suppl.):S31–5.
- Atrash HK, Alexander S, Berg CJ. Maternal mortality in developed countries: not just a concern of the past. *Obstet Gynecol* 1995;86:700–5.
- Valero LF, Saénz MC. [Maternal mortality in Spain, 1980–1992. *Relationship with birth distributions according to the mother's age*]. *Rev Clin Esp* 1997;197:764–7.
- Salanave B, Bouvier-Colle MH. The likely increase in maternal mortality rates in the United Kingdom and in France until 2005. *Paediatr Perinat Epidemiol* 1996;10:418–22.
- Luque Fernández MA, Cavanillas AB, Dramaix-Wilmet M, et al. Increase in maternal mortality associated with change in the reproductive pattern in Spain: 1996–2005. *J Epidemiol Community Health* 2009;63:433–8.
- Philibert M, Deneux-Tharaux C, Bouvier-Colle MH. Can excess maternal mortality among women of foreign nationality be explained by suboptimal obstetric care? *BJOG* 2008;115:1411–8.
- INE [Database]. España: Instituto Nacional de Estadística 1975. Available at: www.ine.es/inebase/ (8 July 2009, date accessed).
- EURO-PERISTAT Project, with SCPE, EUROCAT, EURONEOSTAT. European Perinatal Health Report 2008. Available at: www.europeristat.com. (5 December 2009, date accessed).
- Breslow NE, Day NE. *Statistical methods in cancer research, Vol. I. The analysis of case-control studies*. Lyon: IARC Scientific Publications No. 32, 1980.
- Lang CT, King JC. Maternal mortality in the United States. *Best Pract Res Clin Obstet Gynaecol* 2008;22:517–31.
- Schuitmaker NW. Maternal mortality in Europe; present and future. *Eur J Obstet Gynecol Reprod Biol* 1999;86:129–30.
- Bouvier-Colle MH, Varnoux N, Bréart G. Maternal deaths and substandard care: the results of a confidential survey in France. *Medical Experts Committee. Eur J Obstet Gynecol Reprod Biol* 1995;58:3–7.
- De Miguel Sesmero JR, Temprano González MR, Muñoz P, et al. Maternal mortality in Spain from 1995–1997. *Results of a hospital survey. Prog Obstet Gynecol* 2002;45:525–34.
- UK Health Department. *Report on confidential enquiries into maternal deaths in the United Kingdom 1991–1993*. London: HMSO, 1994.
- Schuitmaker N, van Roosmalen J, Dekker G, et al. Confidential enquiry into maternal deaths in The Netherlands 1983–1992. *Eur J Obstet Gynecol Reprod Biol* 1998;79:57–62.