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Effects of employment and education on preterm and full-term infant mortality in Korea

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ABSTRACT

Objectives: The infant mortality rate is a sensitive and commonly used indicator of the socio-economic status of a population. Generally, studies investigating the relationship between infant mortality and socio-economic status have focused on full-term infants in Western populations. This study examined the effects of education level and employment status on full-term and preterm infant mortality in Korea. Data were collected from the National Birth Registration Database and merged with data from the National Death Certification Database.

Study design: Prospective cohort study.

Methods: In total, 1,316,184 singleton births registered in Korea's National Birth Registration Database between January 2004 and December 2006 were included in the study. Multivariate logistic regression analysis was performed.

Results: Paternal and maternal education levels were inversely related to infant mortality in preterm and full-term infants following multivariate adjusted logistic models. Parental employment status was not associated with infant mortality in full-term infants, but was associated with infant mortality in preterm infants, after adjusting for place of birth, gender, marital status, paternal age, maternal age and parity.

Conclusions: Low paternal and maternal education levels were found to be associated with infant mortality in both full-term and preterm infants. Low parental employment status was found to be associated with infant mortality in preterm infants but not in full-term infants. In order to reduce inequalities in infant mortality, public health interventions should focus on providing equal access to education.

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Introduction

The infant mortality rate (IMR) is defined as the number of infants who die before the age of 1 year per 1000 live births in a given year. IMR is a commonly used index of the socio-economic status (SES) of a population.[1] Multiple studies have reported a negative relationship between SES and IMR.[2–5]

Preterm birth is one of the most important determinants of an infant's health and survival. Compared with full-term infants (37–41 weeks of gestation), preterm infants (<37 weeks of gestation) often develop a wide variety of health problems. Preterm birth increases an infant's risk of death.[4,6] Previous studies have found associations between preterm birth and factors such as ethnicity[6] and SES at the individual[8,9] as well as neighbourhood level.[10,11] A recent study in Korea reported that the combined effects of paternal and maternal unemployment and low education levels increases the risk of preterm birth.[12]

Associations between socio-economic factors and infant morbidity and mortality in full-term infants are well known.[13–15] However, these associations have not been fully investigated in preterm infants. Recently, a study showed that certain sociodemographic factors were associated with infant mortality in preterm infants born in Sweden.[16] However, to the authors' knowledge, this is the first study to investigate the relationship between infant mortality of preterm infants and socio-economic factors in an Asian population. In addition, to the best of the authors' knowledge, differences in the relationships between socio-economic factors and infant mortality among preterm and full-term infants have not been investigated. Therefore, this study examined the effects of parental education and employment on Korean infant mortality in both preterm and full-term infants using data from the National Birth Registration Database.

Methods

Data were obtained from the National Birth Registration Database and merged with data from the National Death Certification Database at the Korea National Statistical Office. The records of 1,355,945 live births between 2004 and 2006 were obtained from the National Birth Registration Database.

In Korea, children must be registered within 1 month of their birth. The following information is collected: registration date, date of birth, place of birth, number of births, birth order, gestational age, gender, parity, parental age, parental education and parental occupation. Death was confirmed through record linkage with the Korean National Death Certification Database up to 31 December 2007. The follow-up rate for deaths was 98%.[17] Computerized searches of death certificate data from the National Statistical Office of Korea were performed using personal identification numbers assigned at birth. The personal identification numbers were subsequently deleted.

In order to protect personal information, the year and month of each birth date were used but not the actual day. To determine infant mortality, the birth date was defined as the median date of the corresponding month.

Education level for each parent was classified into one of three categories: 'college or higher', 'high school' and 'below high school'. The combined parental education level was further categorized as either 'both college or higher', 'only father below college', 'only mother below college' and 'both below college' in order to investigate the combined effect of the education levels of both parents. The employment status of each parent was classified as either 'employed' or 'unemployed'. The combined employment status of the parents was further classified as either 'both employed', 'only mother unemployed', 'only father unemployed' or 'both unemployed'.

The infant's place of birth was categorized as either urban or rural, as determined by government-designated geocodes. Marital status was classified as either married (born from parents of legal marriage) or unmarried. Paternal and maternal age at delivery were categorized into four and three categories, respectively: <20, 20–29, 30–39 or ≥40 years and <20, 20–34 or ≥35 years. Parity was categorized as primiparous or multiparous.

Infants were categorized as either preterm or full-term. Preterm birth was defined as birth before 37 complete gestational weeks. Information on the method used for the estimation of gestational age was not available on the National Birth Registration Database. All baseline characteristics at preterm and full-term birth were expressed as an absolute number (%). χ^2 tests and *t*-tests were used to compare categorical variables and continuous variables.

Odds ratios (OR) and 95% confidence intervals (CI) were calculated to determine the association between socio-economic factors and infant mortality. Multivariate logistic regression was used to adjust for potential confounders such as gender, place of birth, marital status, paternal and maternal age, parity, gestational age and birth weight. Finally, the relationship between education status and infant mortality was investigated after adjusting for the above and parental employment, and the relationship between employment status and infant mortality was investigated after adjusting for the above and parental education. Extreme birth weights (<500 g) were excluded from the logistic regression for sensitivity analysis. STATA Version 11.0 (Stata Corp., College Station, TX, USA) was used for statistical analysis, and *P*-values <0.05 were considered to indicate statistical significance.

Results

In total, 1,355,945 infants were born in Korea between 2004 and 2006. After excluding data from multiple births and infants with missing birth status data (n = 39,761), 1,316,184 singleton births remained for inclusion in the study.

Table 1 shows the baseline characteristics of the study participants for both full-term and preterm births. Most infants were born in an urban area: 91.71% of full-term infants and 90.85% of preterm infants ($P < 0.001$). Of the full-term infants, 51.66% were male compared with 56.24% of preterm infants ($P < 0.001$). Only 1.34% of mothers of full-term infants were unmarried, whereas 3.67% of mothers of preterm infants were unmarried ($P < 0.001$). Teenage mothers and fathers accounted for 0.50% and 0.12% of full-term infants and 0.84% and 0.26% of preterm infants, respectively ($P < 0.001$).