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The Effects of Maternal Age, Parity, and Sex of the Twins on Twin Perinatal Mortality. A Population Based Study

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Abstract. The aim of this study on all twin births in Sweden between 1973 and 1985 was to evaluate the effect of maternal age, parity, and sex on twin perinatal mortality (PNM), by using national data held at the Medical Birth Registry, National Board of Health and Welfare, Stockholm. Zygosity in this study was estimated by the Hardy-Weinberg formula. In all, 22,374 twins were born; 972 (4.3%) of these died perinatally. The relative risk for perinatal death (after standardization for maternal age, parity, and like sex) decreased significantly during the study period, and reached its lowest value (0.3) in 1983. Maternal age was not associated with PNM, while women having their first delivery had a significantly higher PNM than the rest of the parturients. The MZ twinning rate increased fom 0.36% during 1973-76, to 0.40% during 1977-81 and 0.44% during 1982-85 (trend analysis: $\chi^2 = 40.1$, $p < 0.001$). After stratification for year of delivery and birthweight, like-sexed twins had a significantly higher PNM than unlike-sexed twins (odds ratio, OR = 1.25, 95% confidence interval, CI = 1.02-1.54). Males had a significantly higher PNM than females in like-sexed pairs (OR = 1.39, 95% CI = 1.16-1.66), and in unlike-sexed pairs (OR = 1.46, 95% CI = 1.01-2.10). MZ twins had a significantly higher estimated PNM than DZ ones (OR = 1.31, 95% CI = 1.02-1.67).

Key words: Perinatal mortality, Maternal age, Parity, Twinning rate

INTRODUCTION

Previous studies have indicated that a low maternal age is associated with an increased risk for twins to die perinatally [4,9]. It has also been reported that perinatal mortality (PNM) is 2 to 3 times higher for twins born to primigravidae than to multigravidae [7,10].

In a more recent study, Campbell and MacGillivray [5] separated the effects of

maternal age and parity on PNM. They could not verify an independent effect of maternal age on PNM and a low parity did not seem to be associated with a significant increase in PNM.

MacGillivray and Campbell [13] reported on the increased rate of pregnancy complications such as preterm labor, and premature rupture of the membranes for male-male twin gestations. It has also been suggested that male-male gestations differ in some distinctive biologic sense from other twin gestations, but the reason for the worse prognosis for male-male pairs is not known [16].

The purpose of this study was to evaluate the effects of maternal age, parity, and sex of the twins on PNM in a relatively large geographically defined population. Data from nearly all twin deliveries in Sweden during a 13-year period were used.

MATERIAL AND METHODS

Between 1973 and 1985, 22,374 twin births were identified from national data held at the Medical Birth Registry (MBR), National Board of Health and Welfare, Stockholm. Included in MBR are all deliveries with a gestational duration ≥ 28 weeks, or less if the infants were alive at delivery. In the figures of PNM were included all twins dying before, during, or up to 7 days after delivery. Compared to official statistics, 644 twin births (2.8%) were missing in MBR [17].

The Hardy-Weinberg formula was used to estimate the rate of monozygous (MZ) and dizygous (DZ) gestations. For 118 twins (0.5%) information on sex was not found in MBR.

A trend analysis was applied for evaluation of the change in the zygosity rate [1]. When appropriate, stratification was made for year of delivery, birthweight (500 g classes), like/unlike sex, and comparisons were made with the method of Mantel-Haenszel [14]. The relative risk (RR), or the odds ratio (OR) for perinatal death was calculated with 95% confidence interval (CI) [15]. Information on brithweight was missing for 0.5% of all twins. A p-value < 0.05 was considered significant.

RESULTS

In all, 365 twins died before or during birth, while 607 died within 7 days following birth, giving a PNM of 4.3%. The RR for perinatal death decreased during the study period (Fig. 1), and reached its lowest value in 1983 (RR = 0.3). The RR was significantly higher during 4 of the 5 first years, and significantly lower during the last 4 years, although an increasing RR was seen during 1984 and 1985.

Maternal age was not associated with PNM after standardization for parity and year of birth (Fig. 2). Twins born to nulliparae had a significanlty higher PNM than twins born to multiparae after standardization for maternal age and year of delivery (Fig. 3).

The number of twins, like-sexed and unlike-sexed, and the corresponding number of dead twins are given in Table 1. Like-sexed twins seemed to have a higher PNM than unlike-sexed ones (Fig. 4). In Table 2 this point is evaluated statistically using Mantel-
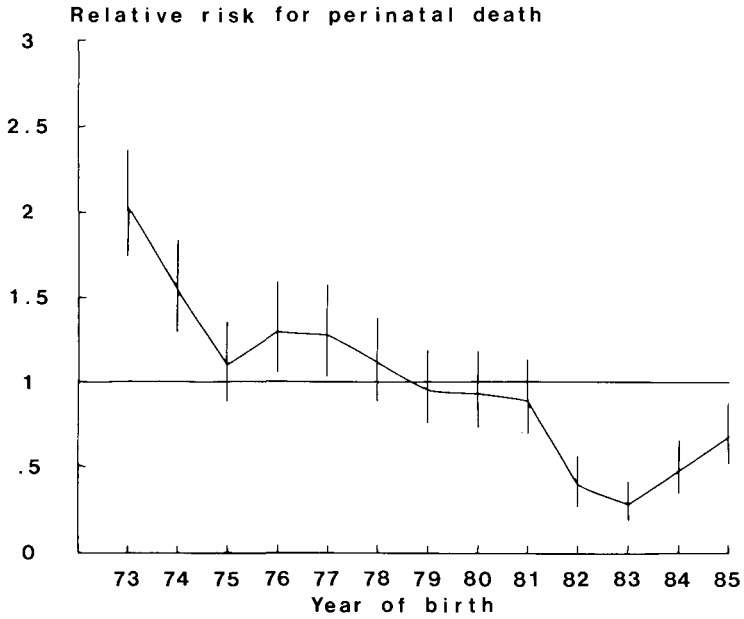
Fig. 1. The relative risk (RR) for perinatal death (95% confidence intervals) between 1973 and 1985, standardized for maternal age, parity and sex of the twins.
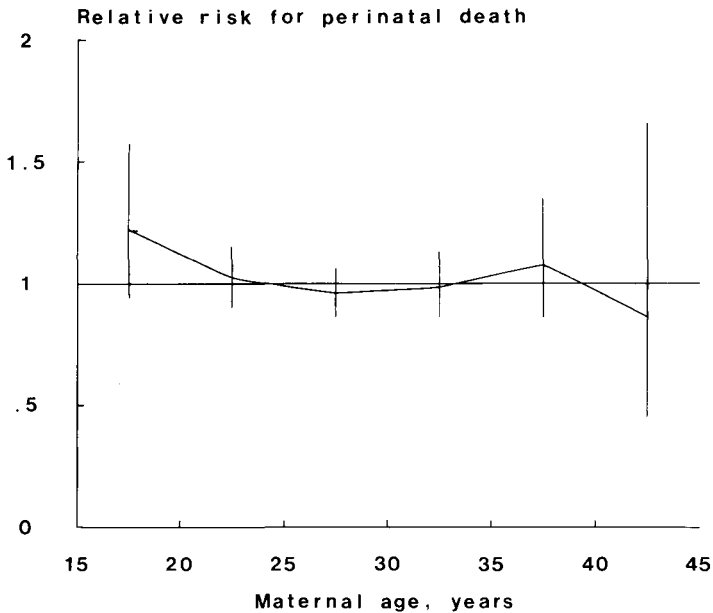

Fig. 2. Maternal age and the relative risk (RR) for perinatal death (95% confidence intervals) standardized for parity, year of delivery, and sex of the twins.
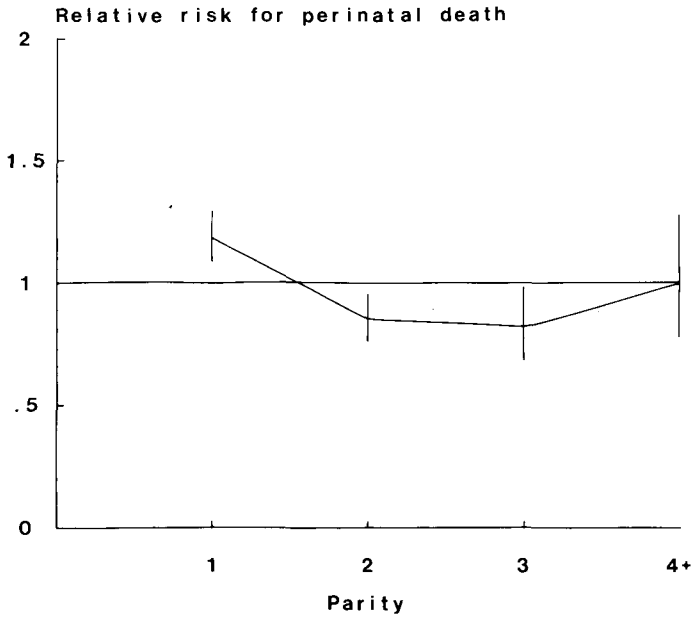
Relative risk for perinatal death

Fig. 3. Parity and the relative risk (RR) for perinatal death (95% confidence intervals) after standardization for maternal age, year of delivery and sex of the twins.
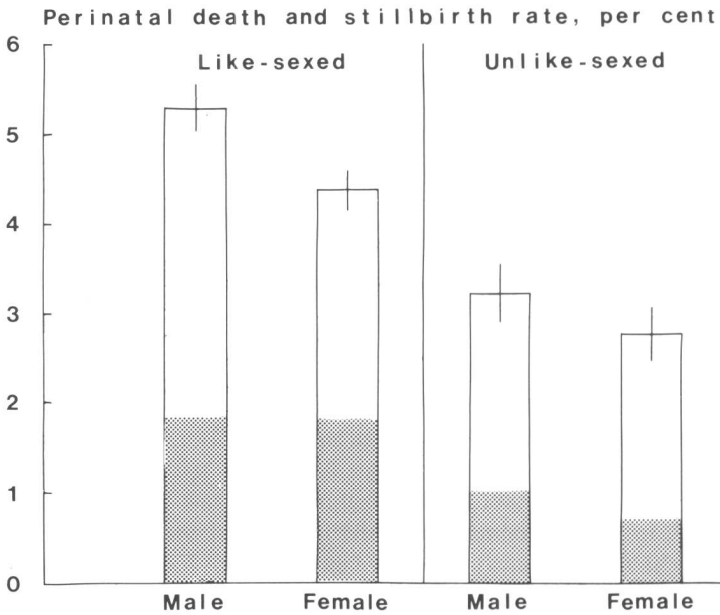
Perinatal death and stillbirth rate, per cent

Fig. 4. Perinatal mortality (crude figures) for like-sexed and unlike-sexed twins. Hatched area indicates stillbirths.

Table 1 - Total number of unlike-sexed and like-sexed twins and the corresponding number of perinatally dead twins

	Total no. of twins	No. of dead twins
Unlike-sexed twins	6,032	180
Males	3,016	97
Females	3,016	83
Like-sexed twins	16,224	781
Males	8,134	428
Females	8,090	353
Sex not known	118	11
Total	22,374	972

Table 2 - Odds ratio (OR) for perinatal mortality after stratification for year of delivery, birthweight, and sometimes sex. CI = 95% confidence interval

	OR	CI
All twins: like-sexed vs unlike-sexed pairs	1.25	1.02-1.54
All males: like-sexed vs unlike-sexed pairs	1.20	0.91-1.58
All females: like-sexed vs unlike-sexed pairs	1.32	0.98-1.79
All males vs all females: like-sexed pairs	1.39	1.16-1.66
All males vs all females: unlike-sexed pairs	1.46	1.01-2.10

Haenszel technique and stratifying for year of delivery and birthweight, sometimes also for sex. It can be seen that like-sexed twins have a significantly higher PNM than unlike-sexed twins – this comparison is made after stratification for sex, so male twins in like-sexed pairs are compared with males in unlike-sexed paris, etc. When divided into male twins and female twins, similar OR between like-sexed pairs and unlike-sexed pairs are found for both sexes and statistical significance is not reached. Males have a significantly higher PNM than females, both within like-sexed and unlike-sexed pairs.

The rate of MZ gestations increased (Fig. 5) significantly from 0.36% during 1973-76, to 0.40% during 1977-81, and 0.44% during 1982-85 (trend analysis: $\chi^2 = 40.1$ at 1 df, $p < 0.001$). An increased rate was seen also for DZ gestations (trend analysis: $\chi^2 = 4.6$ at 1 df, $p < 0.05$). However, the estimated difference was explained by maternal age, that increased during the study period.

MZ gestations seemed to have a higher (estimated) PNM than DZ gestations (Fig. 6), and a significant difference was confirmed after standardization for birthweight and year of delivery (OR = 1.31, CI = 1.02-1.67).
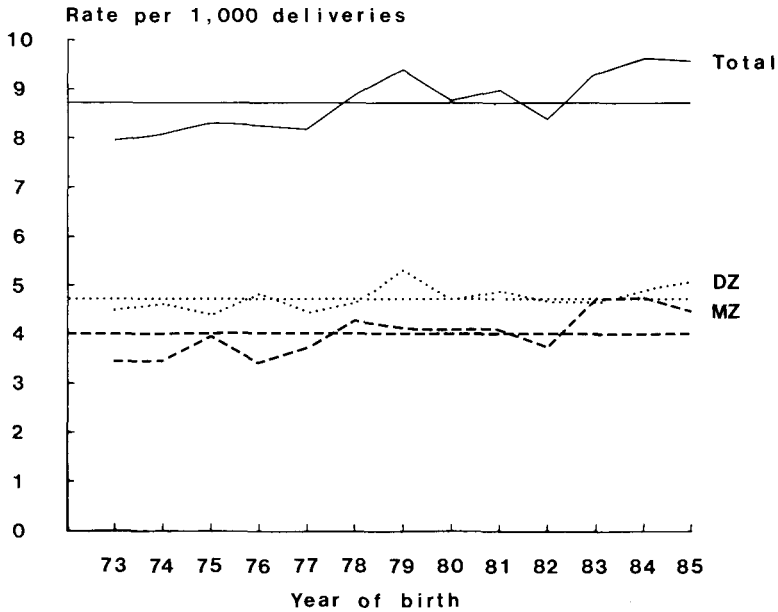
Rate per 1,000 deliveries

Fig. 5. The total twinning rate, and the rate of MZ and DZ gestations in Sweden between 1973 and 1985. The straight lines indicate mean value during the study period for the total material, for the DZ gestations and for the MZ gestations.
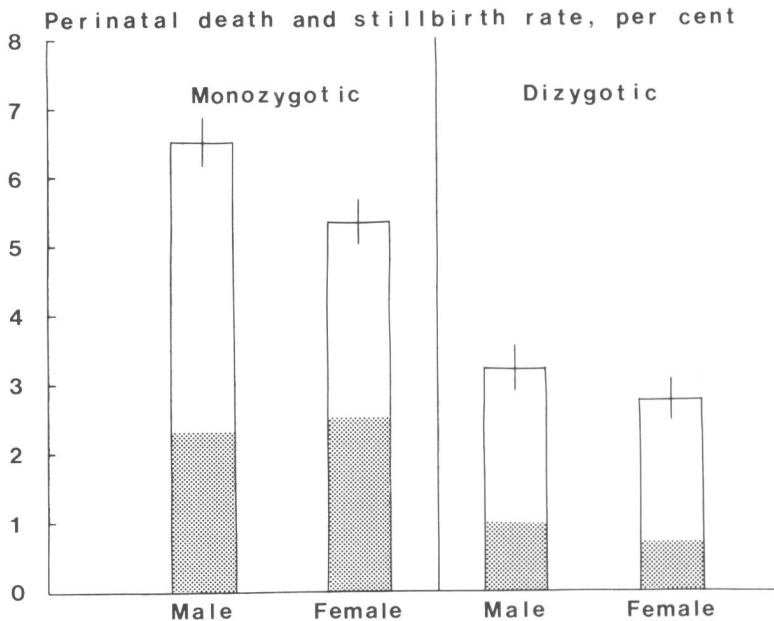
Perinatal death and stillbirth rate, per cent

Fig. 6. Estimated perinatal mortality (crude figures) for MZ and DZ gestations. Hatched area indicates stillbirths.

DISCUSSION

The MBR has collected data on all deliveries in Sweden since 1973. Use of this data base gave the opportunity to identify a relatively large number of twin gestations with information regarding maternal age, parity, and sex of the infants. Information regarding perinatal death is continously cross-checked with official statistics, and the same source makes possible an estimation of the drop-out rate of twins in MBR, being 2.8% during the study period.

The present data verify that like-sexed twins have a higher PNM than unlike-sexed twins [6,18] and that males have a higher PNM than females. The tentative explanation to the higher PNM in like-sexed twins is a better survival in DZ than MZ twins but it has also been proposed [2] that like-sexed DZ twins have a higher PNM than unlike-sexed DZ twins. No independent information on zygosity is available and this point, therefore, cannot be evaluated. However, no indications are found that like-sexedness is a larger burden for male twins than female twins [13,16] – the OR for the two sexes do not differ but that for female twins is larger than for male twins.

The biological hypothesis underlying the possible causal relationship between maternal age and twin PNM is rarely stated. For singletons in Sweden, Källén [11] has previously shown a higher PNM with increasing maternal age over 30 years. Lee et al [12] concluded that aging of the maternal uterine environment or the maternal vascular and endocrine systems lead to a progressive deterioration in the transfer of nutrients to the fetus. For twin gestations, posing greater demands on the supply lines from the mother to the fetuses, no such effect of maternal age on PNM could be detected in the present study.

As previously reported, nulliparous twin pregnant women had a significantly higher PNM than women with one or several previous deliveries, but the difference is much less than that previously described [7,10].

An increase in the MZ rate during the last decades has previously been reported from several European countries [3]. However, during the last few decades the definitions and registration of PNM have been changed in a number of countries, leading to a somewhat higher number of twin maternities registred [8]. Failure to register perinatal deaths diminishes the proportion of especially MZ twins recorded since the frequency of still-births and neonatal deaths is higher among MZ than among DZ twins [3]. Therefore, it is difficult to compare the present results with those from other countries with other definitions of the population included in the study. In our population no clear change in definitions or registration have taken place during the study period.

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