Perinatal Mortality in Twins, Australia, 1973-1980: II. Maternal Age, Lethal Congenital Malformations and Sex

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Abstract. The influence of maternal age and congenital malformations on perinatal mortality in twins in Australia from 1973 to 1980, is described. Stillbirths and neonatal deaths in twins fell with advancing maternal age. For teenage mothers, the twin perinatal mortality rate was 127.15/1,000. The sex ratio in twins is closer to unity than in singletons. Perinatal mortality due to malformation fell as maternal age increased up to 35 years. The role of zygosity and the distribution of birth weight with maternal age are discussed.

Key words: Twinning, Perinatal mortality, Maternal age, Congenital
            malformation, Australia, Sex, Stillbirth

INTRODUCTION

There is no settled view on the effect of maternal age on perinatal mortality in twins. The 1958 British Perinatal Mortality Survey [3] described an extremely high perinatal mortality in twins of mothers less than 20 years, but advancing maternal age did not have the adverse effect on twin mortality that it had in singletons. Stillbirths and neonatal deaths in twins were not analysed separately with regard to age. Other reports have found various patterns of twin mortality with maternal age [4,18,19]. This study examines the effect of maternal age and lethal congenital malformation on perinatal mortality in twins. The pattern is compared with that of singletons during the same period. Materials and methods, as well as the data on perinatal mortality in general, have been discussed in note I of this study [7].

RESULTS

Maternal Age and Mortality

Mortality rates in 5-year maternal age groups and the actual number of births and deaths are given in Tables 1 and 2. The trends with maternal age are illustrated in

Table 1 - Mortality in twins by maternal age, Australia, 1973-1980

Age of mother (yr)	Live births (N)	Stillbirths		Neonatal deaths	
		N	Rate[a]	N	Rate[b]
< 20	2,065	82	38.19	191	92.49
20-24	9,427	346	35.40	577	61.21
25-29	13,691	398	28.25	650	47.48
30-34	7,371	246	32.30	292	39.61
35-39	2,384	72	29.32	92	38.59
≥ 40	337	10	28.82	10	29.67
Not stated	4	4		27	
Total	35,279	1,158	31.78	1,839	52.13

[a]Per 1,000 total births.
[b]Per 1,000 live births.

Figures 1 and 2. In singletons the curves are J-shaped. The same pattern was shown for both neonatal deaths and stillbirths but the trend with increasing maternal age was more marked in stillbirths. The neonatal rate fell from 10.27/1,000 for teenage mothers to 7.03/1,000 for mothers aged 25-29 years; it rose to only 12.66/1,000 for mothers over 40 years. For mothers under 30 years, the stillbirth rates were almost identical to the neonatal rates, falling from 10.03/1,000 to 7.29/1,000. Above 30 years, the stillbirth rates increased more rapidly, being 26.67/1,000 over 40 years, more than double the neonatal rate.

Table 2 - Mortality in singletons by maternal age, Australia, 1973-1980

Age of mother (yr)	Live births (N)	Stillbirths		Neonatal deaths	
		N	Rate[a]	N	Rate[b]
< 20	173,344	1,756	10.03	1,781	10.27
20-24	583,631	4,480	7.62	4,342	7.44
25-29	666,303	4,891	7.29	4,682	7.03
30-34	292,412	2,690	9.12	2,283	7.81
35-39	83,114	1,150	13.65	873	10.50
≥ 40	17,846	489	26.67	226	12.66
Not stated	197	110		459	
Total	1,816,848	15,566	8.49	14,646	8.06

[a]Per 1,000 total births.
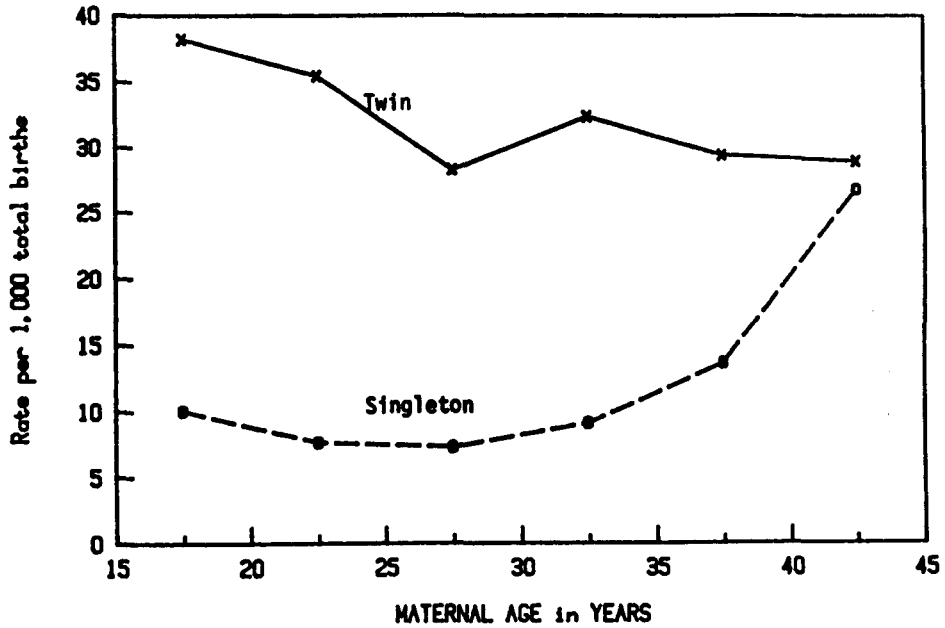[b]Per 1,000 live births.

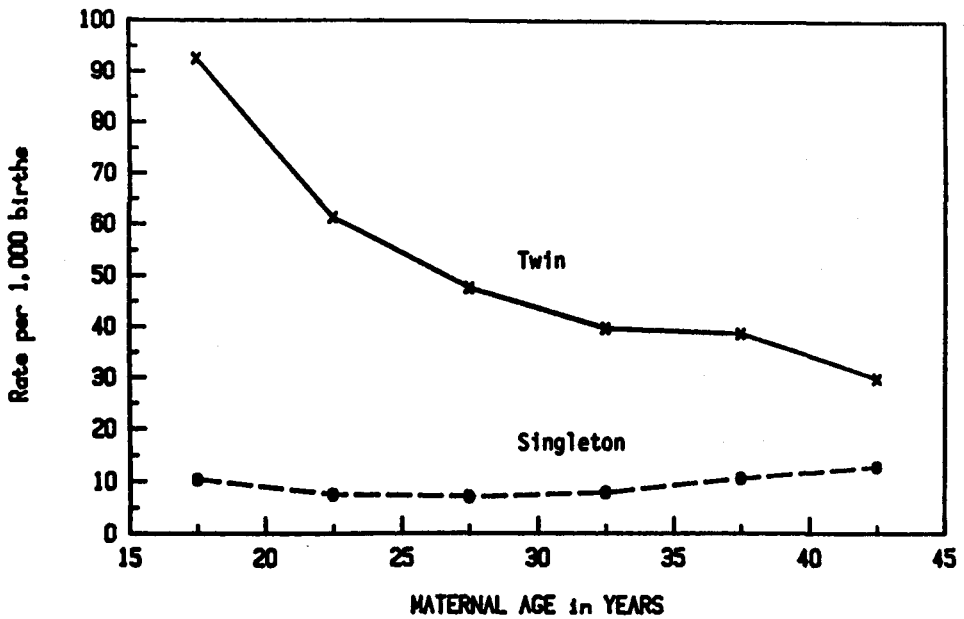Fig. 1. Stillbirths by maternal age, Australia, 1973-1980.

Fig. 2. Neonatal mortality by maternal age, Australia, 1973-1980.

In twins, the trend with age was entirely different: perinatal mortality decreased as age increased. From among 2,147 twins born to mothers under 20 there were 273 deaths (127.15/1,000). Most of these deaths, 191 out of 273 (70%), were in the neonatal period, giving a neonatal mortality rate of 92.49/1,000. Contrasting this with the rate for singletons (10.27/1,000) gives a relative risk of neonatal death in twins for teenage mothers of 9. The neonatal death rate was lower in each higher 5-year age group, being lowest (29.67/1,000) in mothers over 40.
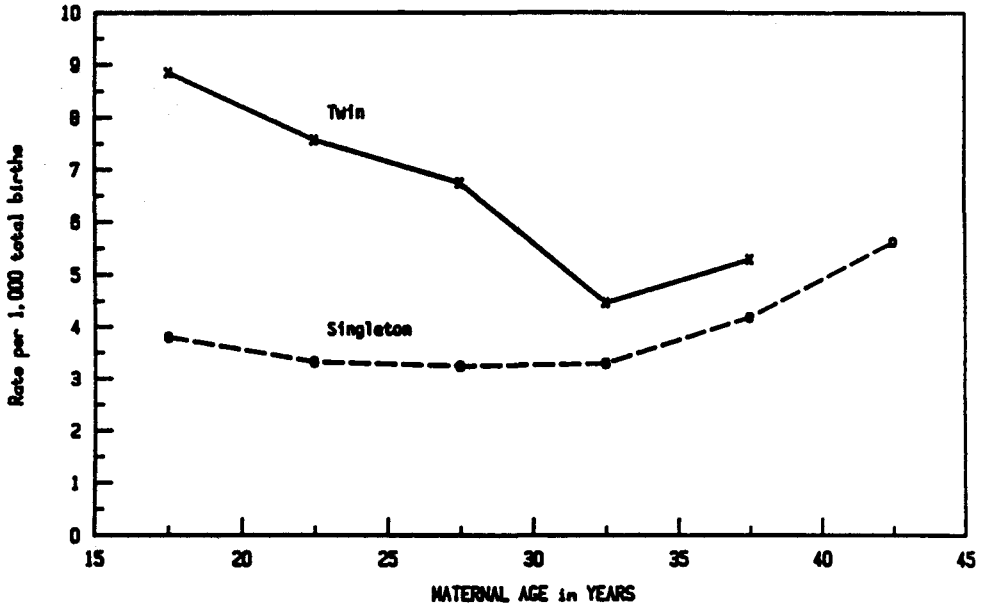

Fig. 3. Perinatal mortality due to malformation by maternal age, Australia, 1973-1980.

The stillbirth rate in twins (Fig. 3) declined with maternal age from 38.19/1,000 to 28.82, with the exception of the 25-29 year group which had the lowest rate, 28.25/1,000. The relative risk of a stillbirth lies between 3 and 4.6, apart from mothers over 40 when it is close to unity. The neonatal mortality rate (Fig. 2) fell sharply with increasing maternal age. From the teenage extreme of 92.49/1,000, it fell to 47.48/1,000 in the 25-29 year group and then to 29.67/1,000 for mothers over 40. The relative risk at 25-29 years of a neonatal death is 6.6 and at 35-39 years it is 3.7.

Twin perinatal mortality fell to 57.64/1,000 for mothers over 40.

Sex and Mortality

There were only slightly more liveborn male twins than females, 17,672 vs 17,602

(Table 3). The sex ratio is 1.004. When 618 male and 532 female stillbirths are are added (Table 4), the sex ratio for total births increases very slightly (1.008). In contrast, the sex ratio for single births is higher, at 1.058 for both live births and total births. Mortality rates by sex are also shown in Table 4. For twins, as well as singletons, mortality was worse for males. Stillbirth rates in twins were not greatly different for males and females, being 33.79/1,000 and 29.32/1,000, respectively. For singletons, they were almost identical, 8.58/1,000 and 8.33/1,000. The relative risks of stillbirths in twins are 3.9 for males and 3.5 for females.

Table 3 - Live births and stillbirths by sex and plurality, Australia, 1973-1980

Sex[a]	Twins		Singletons	
	Live births	Stillbirths	Live births	Stillbirths
Male	17,672	618	934,006	8,082
Female	17,607	532	882,842	7,415
Total	35,279	1,150	1,816,848	15,497
Sex ratio	1.004		1.058	

[a]78 births of indeterminate sex are excluded.

A larger proportion of perinatal deaths were due to neonatal mortality in twins than singletons. There was a greater difference in neonatal deaths between males and females than in stillbirths and this holds true for both twins and singletons (Table 4). The male neonatal death rate in twins was 61.11/1,000 vs a female rate of 43.05/1,000. In singletons, the rates were 9.07/1,000 and 6.99/1,000, respectively, for males and females. The relative risk of neonatal death is 6.7 for a male twin and 6.2 for a female twin.

Table 4 - Perinatal mortality by sex and plurality, Australia, 1973-1980

	Twins[a]				Singletons[b]			
	Males		Females		Males		Females	
	N	Rate	N	Rate	N	Rate	N	Rate
Stillbirth	618	33.79	532	29.32	8,082	8.58	7,415	8.33
Neonatal	1,080	61.11	758	43.05	8,467	9.07	6,167	6.99

[a]Excludes 9 cases of indeterminate sex (1 neonatal, 8 stillbirths).
[b]Excludes 81 cases of indeterminate sex (12 neonatal, 69 stillbirths).

Malformation and Mortality

Deaths from lethal malformation are classified by maternal age in twins and singletons in Table 5 and illustrated in Fig. 3. There were 239 perinatal deaths due to malformation in twins, a rate of 6.56/1,000 total births of that plurality. There

were 6,352 deaths from malformation in singletons, a rate of 3.47/1,000. The relative risk of a perinatal death from malformation is 1.9. Among singletons the trend with maternal age is J-shaped. The rate for teenage mothers was 3.79/1,000 and fell to a minimum of 3.23/1,000 for mothers aged 25 to 29 years; it then rose to a maximum of 5.62/1,000 for mothers over 40 years. This contrasts with the trend with age in twins, where the highest perinatal death rate due to malformation was 8.85/1,000 for mothers under 20. The rate fell in each higher maternal-age group to a minimum of 4.46/1,000 for mothers 30-34 years, and then rose slightly, but the numbers were small above 35 years.

Table 5 - **Perinatal mortality due to malformation in twins and singletons by maternal age, Australia, 1973-1980**

Age of mother (yr)	Twins			Singletons		
	Total births (N)	Perinatal deaths due to malformation		Total births (N)	Perinatal deaths due to malformation	
		N	Rate[a]		N	Rate[a]
< 20	2,147	19	8.85	175,100	663	3.79
20-24	9,773	74	7.57	588,111	1,945	3.31
25-29	14,089	95	6.74	671,194	2,169	3.23
30-34	7,617	34	4.46	295,102	967	3.28
35-39	2,456	13	5.29	84,264	352	4.18
≥ 40	347	1	2.88	18,335	103	5.62
Not stated	8	3		307	153	
Total	36,437	239	6.56	1,832,414	6,352	3.47

[a]Per 1,000 total births of that plurality.

DISCUSSION

Maternal Age

Perinatal mortality in twins is shown to fall with increasing maternal age. This is due to changes in both stillbirths and neonatal mortality with age. It contrasts with the pattern in singletons. An analysis of stillbirths in twins in England and Wales from 1938 to 1948 [16] showed that stillbirths rates were higher in twins than singletons and that the disparity was much greater in younger than older mothers. For unlike-sex pairs the stillbirth rate increased regularly with age. For like-sex twins the rate decreased to a minimum in the 30 to 34 years group and then increased. This could be partly accounted for by a higher stillbirth rate in MZ pairs. An Italian study [10] found a peak mortality at 30 years, and that at age 20 unlike-sex pairs had a mortality rate several times higher than like-sex pairs. A study of 12,809 births including deaths of 252 twins in Nigeria [18] concluded that perinatal mortality increased considerably with maternal age. An analysis of 272 twin confinements in Melbourne concluded that there was no real trend with maternal age [19]. When data for six countries were analysed by maternal age,

greatly differing trends were shown [4]. England had the lowest rates for both first and second twins and a high teenage rate falling to a minimum level for mothers aged 35 to 39 years. Sweden was similar, though without the teenage rate being so high. The other countries had the lowest levels for mothers 25 to 34 years and marked increases for older and younger mothers. Perinatal mortality for twins of teenage mothers in Hungary and the USA was over 200/1,000. The very high risk for teenage twin pregnancies was also found in the 1958 British Perinatal Mortality Survey [3].

Since DZ twinning rises steeply with maternal age and MZ twinning does so only slightly [2], then the proportion of MZ twins will decrease with maternal age and may be a factor in the declining mortality, given the much higher mortality among MZ twins [11]. A more important influence may be that observed by Karn [14] of a positive correlation between birthweight and maternal age in twins. This deserves further study.

Malformation

The relative risk of lethal malformation in twins is 1.9 compared with that for singletons, which is very close to that found in the 1958 British Perinatal Mortality Survey [3], whereas estimates from hospital series have varied widely. The expected pattern of an increased risk with age, apart from a higher risk in the youngest mothers, was found in single births. In twins, the risk of lethal malformation fell with increasing maternal age.

Comparisons with other studies are difficult as different definitions of abnormality are used. Most have been hospital based with the attendant problem of sample bias. In general the lethality of the malformation is not described and stillbirths are excluded. In the 1958 British Perinatal Mortality Survey, lethal congenital malformations were considered separately for first- and second-born twins [3]. The resultant perinatal mortality rates were 81/1,000 and 128/1,000, respectively, vs 58/1,000 for singletons. As a proportion, lethal malformations caused about 8% of twin deaths but 18% of singleton deaths. Analysis of 158 deaths of twins in the first year of life from congenital malformation in England and Wales in 1949 and 1950 found that, for these deaths, malformation was not any more significant in twins than in singletons [1]. Estimates of mortality from stillbirths plus infant deaths in single born, one of DZ pairs and one of MZ pairs, gave relative rates per 1,000 total births for males of 58:159:260 and for females of 47:140:177. Perinatal mortality rates due to congenital malformation were described for 4,754 births at the Birmingham Maternity Hospital in 1960 and 1961 [9]. For twins the rate was 22.4/1,000 while for singletons it was 13.4/1,000.

A higher rate of serious congenital abnormality is found in twins and this is largely contributed by MZ twins [6,12,13,15,17].

In this study no adjustment could be made for the confounding factors of parity and birth weight. The increased incidence of malformation in twins may be wholly due to the excess in MZ twins [20]. MZ twinning and malformation may have a

common factor in their etiology [2,22]. As the proportion of MZ twins decreases with maternal age, this may partly explain the falling rate of lethal malformation with increasing age.

Sex

That the sex ratio in twins is closer to unity than in singletons was first described by Collins [5] and is confirmed here. It is well established that male singletons are at higher risk of perinatal death than females [8,21] and it is demonstrated here that it is also true for twins. Presumably the reduction in sex ratio is a consequence of a disproportionate loss of males in spontaneous abortions.

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