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Factors Contributing to a Reduction of Twin Perinatal Mortality in Singapore

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Abstract. A total of 204 cases of twin pregnancy occurred between 1970 and 1972 have been compared with 102 cases occurred between 1976 and 1978. During the interval of time, specialised care was instituted for the early diagnosis and management of twins. The incidence of twin pregnancy in Singapore decreased from 1:131 to 1:141 pregnancies. With a background of improved socioeconomic conditions and obstetric care, there has been a dramatic decline in perinatal mortality from 76.4 to 29 per 1000. In undiagnosed cases, the perinatal mortality of the first vs the second twin in the earlier group was 64.4 vs 93.6 per 1000. No such difference was observed in the later period, with the average birthweights of twins being significantly higher. The principles of our antenatal supervision, antenatal tocography, and management are presented and the value of early diagnosis, bedrest, and tocolytic therapy discussed. The reduced perinatal mortality and mobidity gives evidence of an improvement in prematurity and augmented intrauterine growth.

Key words: Twin pregnancy, Perinatal mortality, Early diagnosis, Incidence of twinning

INTRODUCTION

With increasing and rapid advances in obstetric care and improved socioeconomic standards, perinatal mortality continues to fall. This declining rate highlights problems such as prematurity and multiple pregnancies as some of the major causes of perinatal loss both in developed countries and in rapidly developing countries such as Singapore. The induction of ovulation with clomiphene and gonadotrophins and now in vitro fertilisation all carry a higher risk of multiple pregnancies. In order to lower perinatal mortality associated with plural pregnancy, it is essential that the major problems as well as the main features associated with such pregnancies should be evaluated. With geographical

and genetic variability in the twinning rate [6] it is necessary for each area to study the problem and attempt to explain observed differences and decline in mortality rates.

Singapore is a tiny country with an educated population. A study of twin pregnancy in Singapore is unusual in that information on three different ethnic groups against a common environmental background is available. The purpose of this study is to present our experience with twin pregnancy in two three-year periods against a background of improving obstetric and health care.

Perinatal mortality in Singapore has seen a falling trend between 1948 and 1980. The perinatal mortality rate in 1948 was 35.9 vs 14.0 per 1000 total births in 1980. This is attributable mainly to improvement in socioeconomic factors, development of our Maternal and Child Health Services, and increasing public awareness of the value of these services. After 1974 there has been specialised care in the university unit with high-risk pregnancies such as twins receiving intensive care.

Perinatal mortality rates are higher in twin than in singleton pregnancies, and reports range between 9.3% and 18.8% [2]. In Singapore the perinatal mortality rate for twin pregnancy was found to be 7.6% [3], about five times higher than the overall perinatal mortality for singletons in the same period (1.8%). Common complications antenatally include anemia, hydramnios, and hypertensive disorders. Although related complications (preeclampsia, polyhydramnios) contribute to the high perinatal mortality, prematurity was the most important factor.

To reduce perinatal mortality in twin pregnancy, early diagnosis is essential in order that therapeutic measures can be instituted and to ensure that there is greater antenatal vigilance and no unnecessary delay in treatment should complications arise. The importance of early diagnosis has been emphasised by Jeffrey et al [7], Jouppila [8], and TambyRaja et al [12], who advocated rest and tocolytic therapy.

For early diagnosis of twin pregnancy to be made, the patients have to be seen early for booking. We are thus dependent on the patients seeking antenatal care early and on the medical practitioners who see them antenatally at the Maternal and Child Health Clinics and in private clinics throughout Singapore to refer them early for antenatal care. It is theoretically possible to diagnose every twin pregnancy near or before the second trimester, or at least before the 28th week of gestation if every patient has an ultrasound scan.

THIS STUDY

A total of 204 cases of twin pregnancy seen between 1970 and 1972 have been compared with 102 cases observed between 1976 and 1978. All cases were seen at the University Department of the Kandang Kerbau Hospital in Singapore and treated by the staff. While in the earlier period bed-rest was the sheet anchor of therapy, in the latter period tocolytics were administered and the fetal welfare monitored with ultrasound and cardiotocography.

RESULTS

Incidence

During the period January 1970 - December 1972, there were 31,224 deliveries undertaken by the University Department. Of these, 204 were twin pregnancies. Thus the

TABLE 1-Twin Deliveries in Singapore (University Unit) in Recent Years

Year	Total deliveries	Twin deliveries	Incidence of twinning
1970	11,063	85	1:131
1978	7,935	78	1:141
1981	7,741	81	1:143

TABLE 2-Distribution by Ethnic Group and Parity

Ethnic group		Parity			Total	
		0	1-4	5+	N	%
1970-72:	Chinese	78	69	18	165	80.8
	Malay	5	10	11	26	12.8
	Indian	2	7	2	11	5.4
	Others	1	1	0	2	1.0
All groups		86 (42.2%)	87 (42.6%)	31 (15.2%)	204	100.0
1976-78:	Chinese	24	60	0	84	82.4
	Malay	5	8	1	14	13.7
	Indian	3	1	0	4	3.9
	Others	0	0	0	0	0
All groups		32 (31.4%)	69 (67.6%)	1 (1%)	102	100.0

TABLE 3-Bed Rest and Preterm Labour

Duration of bed rest	No. of patients		Preterm of labour	
	1970-72	1976-78	1970-72	1976-78
More than 1 week	52	17	15	5
Less than 1 week	31	24	5	4
None	121	28	29	16

TABLE 4-Presentation of Fetuses in Twin Pregnancy (%values)

Presentation	1970-72 (N = 204)	1976-78 (N = 102)
Head and head	47.1	42.8
Head and breech	30.9	44.6
Breech and head	9.3	6.3
Head/breech and transverse lie	8.3	4.2
Breech and breech	4.4	2.1

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incidence of twins in Singapore is approximately 1:153 pregnancies. This is probably a true reflection, since there is no special selection of patients. The incidence is thus lower than that in Caucasians and Negroes [1] and approaches closely that of the Japanese. As elsewhere, the incidence of twinning has declined in Singapore in recent years (Table 1).

Table 2 shows the distribution of twin pregnancy in the two periods studied among the main ethnic groups in relation to parity. The Chinese accounted for nearly 80% in both periods, the Malays for about 13%, and the Indians for 4%-5%. This is in keeping with the population distribution of the races.

While in the first study period there was no difference of incidence with parity (0 = 42.2%, 1-4 = 42.6%), in 1976-1978 increasing incidence with higher parity was noted. High parity is rare in Singapore as a result of the stringent government policies.

Age

There was no particular preponderance of twin pregnancy in any age group. The majority were between 21 and 30 years of age and the age distribution parallels the age distribution of the obstetric population.

Antenatal Diagnosis

In the earlier period (1970-1972) of the 204 patients 59 were unbooked or diagnosed during labour. Whereas in the later period 77% of cases were diagnosed antenatally. In the earlier period diagnosis was made by X-rays but in the later period by ultrasound.

Prenatal Bed Rest

1970-1972. The number of patients who had bed rest and the subsequent outcome of the pregnancy are shown in Table 3. Of the 52 patients who had bed rest of more than a week, 15 (29%) went into premature labour and the perinatal mortality for the group was 125 per 1000. In the 31 patients who had bed rest of less than a week, the respective figures were 16% and 64.5 per 1000. Finally, for the 121 patients who had no formal bed rest, figures were 24% and 103 per 1000. There was no significant difference between the groups in terms of premature labour and perinatal wastage.

1976-1978. In the second period, prophylactic salbutamol (4-8 mg tds) was administered to all patients irrespective of whether or not they were admitted for bed rest. Sixteen of 29 patients delivering preterm had no bed rest but only tocolytic therapy.

Antenatal Complications

Anemia, iron and folate deficiency, and preeclampsia occurred in approximately a third of both groups. Polyhydramnios was noted in about 10% of patients.

Labour and Delivery

In 1970-1972 labour commenced spontaneously in 181 patients, surgical induction was performed in 23. The incidence of preterm labour (before 37 weeks of gestation) was 20% (49 out of 204 patients vs 25 out of 102 in 1976-1978). Only 22 patients (10.8%) went beyond 40 weeks of gestation. The duration of labour was up to 6 hr in 81 of the 204 patients, 7-12 hr in 49, and more than 12 hr in 31. The incidence of the different types of presentation is shown in Table 4.

Birthweight and Fetal Outcome

1970-1972. More first twins (122 out of 204) had birthweights between 2501 and 3000 g. There is a slight shift in the weight of the second twin towards a lower birthweight (1001-2500 g). Perinatal mortality was 76.4 per 1000 (131 out of 406 babies) which is about five times higher than the overall perinatal mortality (18 per 1000) for the same period. Similarly, the perinatal mortality was higher for the second twin (93.6 per 1000) than for the first twin (64.6 per 1000). The sex-ratio was 140.5 males to 100 females, there being 104 male, 74 female, and 26 opposite-sex pairs.

1976-1978. The average birthweight of twin pregnancies was higher than 2122 g. There were 18 deaths in all, 13 of which of prematurity. There was one case of conjoined twins. Delivery took place 7.1 weeks earlier in the undiagnosed than in the diagnosed group. The average birthweight of the undiagnosed twins was 500 g lower than in those who were diagnosed before delivery. The differences in weight between the two groups and for both twins were statistically significant. The perinatal mortality rate for the group diagnosed before delivery was 29 per 1000 (4 deaths out of 138 births). This group received oral salbutamol and also underwent bed rest in a proportion of cases.

DISCUSSION

Several findings emerged from this comparative analysis. An increased incidence with parity was not borne out in 1972 but was apparent in 1977 (Table 2). Maternal age is clearly a much more important factor and maybe in other studies the high parity was merely an expression of increasing age. Also, as a result of the efforts of the Singapore Family Planning and Population Board, grandmultiparity is uncommon. The low incidence of twin pregnancy in Mongoloid group is known to be due to a lower incidence of dizygotic twinning, which apart from genetic factors, is also increased with increasing maternal age and/or parity. Anthropologically, both the Malays and the Chinese are of Mongoloid stock and thus the incidence of twin pregnancy in these two ethnic groups resembles their percentage composition in the population. The decreasing incidence of dizygotic twinning may also result from younger women having smaller families.

Considerable controversy still exists as to the value of prenatal bed rest or tocolytic therapy in twin pregnancy and its effect on prematurity and perinatal salvage. Within the limitations of our study, very little difference in perinatal mortality was found between the group that had bed rest and the group that did not. In fact, perinatal mortality in the group with bed rest of more than a week's duration was actually higher. The obvious explanation for this difference is the bias towards admission for patients with additional complications in a community setting where it would be almost impossible to admit all twin pregnancies routinely for prenatal bed rest. In the absence of conclusive evidence of a significantly beneficial effect of hospital bed rest, and a pressure on antenatal hospital beds, hospitalization and bed rest are advocated in twin pregnancy with antenatal complications, while patients with uncomplicated twin pregnancy are advised to have bed rest at home with oral tocolytic agents. If home conditions are not suitable, then hospital admission may be mandatory.

A double-blind study comparing tocolytic agent salbutamol and bed rest was reported at the third Twin Congress in Jerusalem [13]. This study suggested that the prophylactic use of a powerful beta-adrenergic drug in pregnancy can be of twofold benefit. Firstly, the tocolytic effect of this drug in the dosage described inhibits uterine activity

and significantly prolongs pregnancy. Second, and perhaps more important, are the hemodynamic and metabolic effects of therapy resulting in improved growth and increased fetal weight.

The heavier babies born to salbutamol-treated mothers could have resulted from increased utero-placental blood flow, an induced diabetic state, or an altered fat metabolism. Morris et al [9] have demonstrated decreased uterine blood flow in twins, which may account for the high incidence of fetal growth retardation. The increase in uterine blood flow during beta-adrenergic therapy [2] may play a major role in improving weight. In preliminary studies, we have not detected significant alteration of carbohydrate metabolism in mothers receiving salbutamol. It seems likely that, in this instance, Pederson's [10] hypothesis of maternal hyperglycemia, inducing fetal hyperinsulinism and macrosomia, is not tenable. The elevated triglyceride and cholesterol levels suggests that in man lipolysis is mediated by B_2 receptors [5]. Szabo and Szabo's [11] suggestion of fatty acids being a metabolic fuel to the fetus has recently been confirmed [16]. Goldberg et al [5] have shown increases in fatty acid levels following administration of salbutamol. In pregnant diabetics, higher plasma levels of free fatty acids lead to gradient-dependent diffusion transfer of free fatty acids across the placenta. Whether it is a subtle diabetic state that leads to fetal hyperinsulinism by a direct action on the fetal pancreas or lipolysis that causes fetal macrosomia is only speculative.

Tocolytic therapy is favoured in our unit following the trial. It is again stressed that the better results of the twins in 1976-78 are not the result of tocolysis only. Improved socioeconomic changes and neonatal care must have been of considerable importance.

In the 1970-72 group, the twins more often had low Apgar score, very low birth weight and were small-for-gestational age. In this group, an 18-days average period of hospitalization at the Neonatal Ward of the newborns was demonstrated. Hospital care was mainly concentrated to infants with low birth weight. Among the 1976-78 twins, the average time of hospitalization was reduced by 33%. The difference in hospital stay between the groups reflected in part different antenatal care policy but also the higher degree of prematurity in the 1970-72 group.

In twins, over two-thirds of all deaths in the first week of life occur in babies of low birthweight who are perfectly formed. Most have been born too soon, and pulmonary immaturity and intraventricular hemorrhage are the leading causes of death. Some are mature but have grown poorly in the uterus and are vulnerable to perinatal asphyxia. A few low birthweight babies suffer the dual disadvantage of being both premature and malnourished.

Socioeconomic factors are often regarded as a strong contributory cause of low birthweight. If this were true, improved socioeconomic conditions should reduce the frequency of low birthweight children. The frequency of low birthweight infants in Singapore has decreased by about 2% during the last decade. With the improved standard of living in all socioeconomic classes, biological factors such as the mother's age, parity, and spacing of family affect the incidence of low birthweight. These factors are difficult to separate from purely social variables [14]. Baird [1] showed a clear correlation between low socioeconomic class and high frequency of low birthweight children. Drillien [4] showed that the social group to which the infant's maternal grandfather belonged was of greater importance than that to which the father belonged as an expression of the mother's environment and nutrition during her childhood. If this is true, then those developing countries like Singapore, with improving socioeconomic conditions and control of fertility, will see improved birthweights in the next few decades.

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