

GROWTH AND DEVELOPMENT OF TWINS COMPARED WITH SINGLETONS AT AGES ONE AND FOUR YEARS

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Objective: To compare the growth and development of twins with normal control singletons and also with matched 'high risk' singletons, at one and four years of age. **Design:** A four year prospective follow up study. **Setting:** High risk clinic (HRC) of a referral hospital. **Subjects:** Twin pairs enrolled in the HRC; normal full term singleton controls; and high risk "matched" singletons enrolled in the HRC. **Methods:** The height, weight and head circumference was measured at one and four years. Development was assessed at 1 year using the Bayley Scales of Infant Development. At 4 years, the intelligence quotient was determined by the Stanford Binet Intelligence Scale. **Results:** Forty two twins and an equal number of controls were assessed at one year. All the twins weighed less than 2 kg at birth. They lagged behind in all three parameters of growth, namely, height, weight and head circumference. At 4 years, 24 twins came for follow up. Although, they had caught up for head circumference, they lagged behind in height and weight, particularly the group of fourteen SGA twins. The growth parameters of LBW twins and LBW matched singletons did not show any significant difference. At one year, the development of twins was within normal limits although the motor quotients were significantly lower than that of controls. At 4 years, the intelligence quotients of twins were well within normal limits. **Conclusions:** Twins were lighter and shorter than controls at four years, particularly the SGA twins. The growth parameters of LBW twins and LBW matched singletons showed no significant difference. The intelligence of twins was normal at four years.

Key words: Development, Growth, Twins.

HISTORICALLY, twins have been the subject of awe, wonder and speculation. There is considerable evidence that twins are disadvantaged in terms of long term growth(1) and neurodevelopmental status. There is a paucity of follow up studies of twins in the Indian literature. McDiarmid and Silva(2) showed that Australian twins were significantly shorter, lighter and had smaller head circumference at 3 years and were significantly slower in language development. Alfieri *et al*(3) stud-

ied the height and weight of 200 Italian twins born between 1975 to 1985 and compared them with singletons. They showed that twins appeared to catch up considerably in their weight but not in their height at the ages of 4-7 years.

A prospective follow up was undertaken to study the growth and development of twins discharged from our Neonatal Special Care Unit (NSCU). Parameters of growth and development of twins were

compared with those of normal singletons at one and four years. We also wanted to see if "twinning" was an additional risk factor for poor outcome or whether this was merely related to the increased incidence of intrauterine growth retardation, low birth weight and prematurity in twins(4). Hence these parameters were also compared with those of another group of singletons, who were matched "high risk" infants discharged from our unit during the same period.

Subjects and Methods

Study Population

Thirty one pairs of twins enrolled in the High Risk Clinic during an eighteen month period from 1st October 1987 to 30th April 1989, were identified for follow up. In all, 42 infants (14 pairs and 14 single survivors) were available for the one year assessment. Six infants had shifted to other states and fourteen infants had died in their first year. All were low birth weight, with weight less than 2000 g. At the age of 4 years, only 24 twins (10 pairs and 4 single survivors) came for the follow up, as eight families had shifted to other cities and six were untraceable.

We had a large 'high risk' prospective study(5,6) going on simultaneously as the twin study, with an identical protocol. Two groups of singleton controls were retrospectively selected at the time of analysis of the twin data from this large cohort: (i) Full term normal neonates with birth weight more than 2500 g, with a normal antenatal, natal and postnatal history, formed the normal birth weight (NBW) controls; and (ii) The other group of controls were low birth weight (LBW) singletons, who were matched with twins for type of delivery, birth weight, gestation, other risk factors and socio-economic status. The LBW babies were further classified according to their

weight for gestational age(7) as appropriate (AGA) or small (SGA). An identical number of singleton controls from each group were identified for comparison.

Follow up

The study was carried out in the High Risk Clinic (HRC). The HRC only enrolls infants discharged from our Neonatal Special Care Unit. At each visit, the weight was recorded on an electronic weighing scale (Atco) with an accuracy of ± 10 g. Length was measured till the age of 2 years by an infantometer and beyond 2 years on a stadiometer (Microtoise, CMS instruments). Head circumference was measured by a non-stretchable tape. All measurements were taken by a trained person, three readings were taken and averaged for analysis. Many of the families lived in far off places and could not come for regular visits. They were called by sending letters at 1 and 4 years.

Development was assessed at 1 year by a trained psychologist in a sound proof room, using the Indian adaptation of the Bayley Scales of Infant Development(8). Corrected age was determined by subtracting the number of weeks of prematurity from the chronological age and this age was used for assessment of preterms at 1 year. At the age of 4 years, the intelligence quotient (IQ) was determined by using the Indian adaptation of Stanford Binet Test(9). A development quotient > 85 and an IQ > 90 was considered as normal.

Statistical analysis was done by using the Student 't' test for comparing inter-group differences. Chi-square test was used to compare proportions. In order to confirm 'catch up' growth, SD scores (Z scores) were calculated at four years by using standards for British Children(10). A Z score of greater than -2 (actual value within 2 SD of median) was considered as 'catch up'(11).

Results

The frequency distribution of gestation and birthweight of the 42 twin infants who came for the 1 year follow up is shown in *Table I*. Twenty four of these were females and eighteen were males. All were LBW with 31 (73.8%) being preterm, and 17 (54.97%) of these were small for gestational age. All eleven full terms were small for gestational age. There were four pairs of discordant twins in this group. Three pairs were highly discordant and one pair had low discordancy. Two pairs had a differ-

ence of 35% in their birthweights and one pair had an intertwin difference of 20% in their birth weights. Eight babies (18.8%) developed hyaline membrane disease, 4 (9.4%) had birth asphyxia and three babies had intraventricular hemorrhage and two had repeated apneic spells. Nine babies (21.4%) developed septicemia.

The weight, length and head circumference of these 42 infants at one year of age was compared with that of an equal number of singleton NBW controls and singleton matched LBW controls (*Table II*). The

TABLE I—Birth Weight and Gestation of Twins

Birth weight (g)	n	%	Gestation (weeks)	n	%
≥ 2000	0	0	≥ 37	11	26.1
1501-1999	26	61.9	33-36	25	59.6
1001-1500	15	35.7	28-32	5	11.9
≤ 1000	1	2.4	< 28	1	2.4
Total	42			42	

Full term SGA 11 (26.1%), Preterm SGA 17 (40.4%), and Preterm AGA 14 (33.5%).

TABLE II—Comparison of Anthropometry in Twins and Controls at 1 and 4 Years

At 1 year	Singleton Controls		Twins
	NBW (n=42)	LBW (n=42)	(n=42)
Weight (kg)	8.6 (0.7)	7.5 (0.8)*	7.5 (0.7)*
Height (cm)	75.0 (3.3)	71.0 (4.2)**	71.5 (3.2)**
Head circumference (cm)	45.5 (1.9)	43.9 (1.9)**	44.0 (2.0)**
At 4 years	Singleton Controls		Twins
	NBW (n=24)	LBW (n=24)	(n=24)
Weight (kg)	13.2 (1.7)	12.1 (1.4)*	12.1 (1.6)*
Height (cm)	99.2 (4.0)	94.9 (5.4)*	94.1 (4.7)*
Head circumference (cm)	48.1 (1.9)	46.6 (1.8)	44.6 (1.0)

Values expressed as Mean (SD)

NBW-Normal birth weight; LBW-Low birth weight

* p < 0.05 Twins/LBW vs NBW controls

** p < 0.01 Twins/LBW vs NBW controls

difference between the mean weights, height and head circumference of twins and LBW controls was not significant. However, the difference in weights of twins and NBW controls was significant ($p < 0.05$) and the difference in length and head circumference was highly significant ($p < 0.01$). When comparison was done between 24 twins and LBW controls at 4 years (Table II), there was no significant difference between their mean weight, height and head circumference. However, when a similar comparison was done between twins and NBW controls (Table II), there was a significant difference between their mean height and weight ($p < 0.05$).

An attempt was made to find out, whether twins who were SGA at birth, had different growth parameters compared to AGA twins. Out of 24 twin children measured at 4 years, 14 were SGA and 10 were AGA. The mean height and weight of these two groups was compared with NBW controls (Table III). There was no significant difference between the mean height and weight of controls and AGA twins. But there was a significant difference between the mean height and weight of SGA twins and controls ($p < .01$). This finding was also confirmed by determining Z scores, which

were less than -2 for height and weight of SGA twins, indicating no 'catch up'.

At one year, there were 4 twins and 3 LBW controls with motor quotients below 85. The mean motor quotient of twins was 85.8 ± 8.9 , which was just within normal limits, whereas the mean for LBW controls was 84.9 ± 9 . The NBW controls had a mean motor quotient, of 95 ± 6.3 and the difference between these two groups was highly significant ($p < 0.001$). There was only 1 twin and 1 LBW control with mental quotient less than 85. The mean mental quotient of twins was 92 ± 6.7 and there was no significant difference with mean mental quotient of NBW controls (96 ± 8.1). At 4 years, there were 3 twins and 2 LBW singletons with IQs below 90, whereas there were no children with below normal IQ in the NBW control group. The difference in the mean IQs of twins (106 ± 4.3) and NBW controls (108 ± 3.2) was not significant.

Discussion

Twins form a particularly high risk group of newborns because of their tendency for premature birth and intrauterine growth retardation. It is reported that the incidence of twin babies is increasing in

TABLE III— Comparison of Growth of AGA and SGA Twins and AGA and SGA LBW Controls with NBW Controls at 4 Years

Group	n	Mean (SD) Weight (kg)	Mean (SD) Height (cm)	Mean (SD) Head circumference (cm)
AGA Twins	10	12.89 (1.5)	96.38 (4.8)	48.14 (1.5)
AGA LBW Controls	10	12.27 (1.4)	96.08 (5.4)	47.42 (1.4)
SGA Twins	14	11.49 (1.5)*	93.93 (4.5*)	47.19 (1.7)
SGA LBW Controls	14	11.92 (1.5)*	93.96 (5.4)*	46.28 (2.0)
NBW Controls	24	13.24 (1.7)	99.2 (4.0)	48.1 (1.8)

AGA—Appropriate for gestational age; SGA—Small for gestational age; NBW—Normal birth weight

LBW—Low birth weight

* $P < 0.05$ for contrast with NBW Controls.

USA due to the use of fertility drugs and conception in elderly mothers(12). Our

twin cohort was not very large, but we were fortunate that a large cohort of LBW babies was being followed up simultaneously and thus a matched sample of singleton LBW high risk babies was easily available for comparison.

At the age of one year, twins lagged behind in all three growth parameters of height, weight and head circumference. At four years, they caught up with normal birth weight controls for head circumference, but remained shorter and lighter than controls. These findings are comparable to those reported in Australian twins(2, 13) at the age of 3, 5 and 7 years and also at the age of 9 and 11 years(14). Wilson(15) suggested that weight was more effected than height in 4 year old twins. Alfieri(3) reported that twins were shorter by 5 cm at the age of 4-7 years.

Morley *et. al.*,(4) compared the growth and development of twins and singletons born before 32 weeks of gestation. They concluded that there was no significant difference in the outcome of preterm twins and preterm singletons. Our study shows that there is no difference in the growth and development of LBW twins and LBW singletons. There are many studies on the catch up in growth and development of discordant twins (16,17). We had only 3 highly discordant twin sets in our sample and the number was too small to study intertwin differences.

It was apparent in our study that LBW twins and singletons did not catch up with controls in height and weight. These low birth weight babies were then categorized according to their birthweight, as AGA and SGA. It was seen that the AGA group had caught up with controls, while it was the SGA group (both twins and singletons) that was lagging behind.

The twins fared much better in their development. The mean motor quotient of twins at one year was just within normal limits, though significantly lower than that of the controls. The mental quotient was well within normal limits at one year. The development quotients of the LBW singletons were very similar. At four years, the IQ of twins was comparable to the IQ of controls. Silva(13) compared 24 twins with a large group of 1013 controls and reported that intelligence scores were lower in twins at ages five and seven.

Our results show that twins have normal intelligence at four years, but they lag behind in their height and weight. However, it is the SGA twins who lag behind, whereas the AGA twins catch up. The growth and development pattern of LBW twins is absolutely similar to that of LBW singletons. This may indicate that 'twinning' *per se* is not an additional risk factor. Ours is a very small study and more studies on the growth and development of twins are needed to confirm these findings.

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