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Low Birth Weight in Twins Versus Singletons: Separate Entities and Different Implications for Child Growth and Survival

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The condition of low birth weight is compared in twins and in singletons in terms of birth weight distributions and with respect to factors such as the incidence of sillbirths, length of gestation, maternal age, parity, and legitimacy. In the light of demographic, biological, and developmental considerations, it is concluded that low birth weight in twins is a different condition from low birth weight in singletons and should be dealt with independently, especially in view of the different implications for child growth and survival.

Key words: Birth weight, Stillbirths, Length of gestation, Maternal age, Parity, Child growth, Twins

INTRODUCTION

Two recent, highly authoritative reports, one by the World Health Organization (WHO) and the other by the National Center of Health Statistics (NCHS) of the United States, are devoted to the problem of low birth weight (LBW) [10, 11]. This condition, reported to apply to over 20 million infants in 1979 – ie, 17% of all births worldwide (vs about 6% in the United States) – is considered to represent an important health indicator and to affect especially the poorest layers of the population. It appears to be associated with extremely high neonatal risk and infant mortality, with serious implications for the survivors' growth and development. According to studies by Gabrielli in the Roman population, LBW accounted for almost 30% of infant mortality in 1972–1973 and was associated with other causes of death in over 50% of cases [3].

Because of the specific relevance this problem has in twin research, we should like to take up the invitation of the World Health Organization in presenting their review: "...as a means of stimulating interest in and discussion on the subject and especially in order to encourage studies which will eventually replace the approximate estimates by valid data." In fact, it occurred to us that, although the LBW infant twin may appear clinically to be no different from any other LBW infant, so that all LBW infants, singletons and twins alike, are combined in the above and other reviews for statistical purposes, the causes and the consequences of the LBW condition may differ considerably in the two groups.

To the extent that the distinction can be made, this is of importance for twin care, since it reflects upon the prognosis, treatment, and follow-up of the LBW twin. In addi-

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tion, such a distinction would also considerably affect the overall rates of LBW infants; in fact, LBW accounting for over 50% of all infants from multiple births vs only about 6% of single births, and with a general twinning rate of roughly 1% maternities, LBW twins may represent about 20% of all LBW infants.

ANALYSIS OF LOW BIRTH WEIGHT IN TWINS

For our analysis, we will refer to data provided by the Italian Institute of Statistics (ISTAT) for the Italian population in one year of recent decades, 1965.

We first consider the birth weight distribution in twins and in singletons (Fig. 1). The two distributions are clearly different, and it can be noted that the mean value of the twin distribution, 2,650 g vs 3,450 g for singletons, is very close to the upper limit of 2,500 g for the definition of LBW infants adopted by official agencies such as WHO and NCHS, as well as by the majority of studies, including the present one. This introduces an important statistical differentiation between LBW twins and LBW singletons.

To analyze the phenomenon further, we examined a number of factors considered to correlate with the incidence of LBW: (1) the incidence of stillbirths, (2) length of gestation, (3) maternal age, (4) parity, and (5) legitimacy. In so doing, we could see to what extent the analysis of these factors can help differentiate LBW twins from the bulk of LBW infants as well as confirm the different etiology of the two conditions.

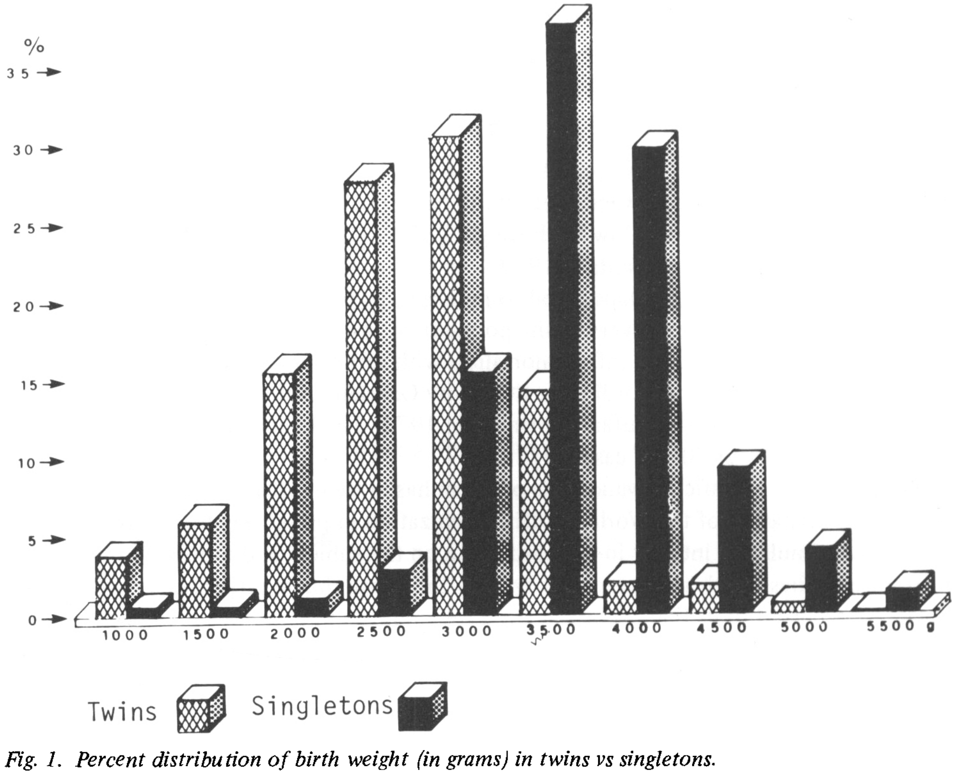

Fig. 1. Percent distribution of birth weight (in grams) in twins vs singletons.

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Stillbirths

The incidence of LBW infants and the incidence of stillbirths, along with the ratio between the two, are compared in Table 1 for twins and for singletons. The fact that the number of LBW infants per stillbirth is about 5 times higher in twins than in singletons lends further support to the hypothesis that LBW has different implications and causes in twins than in singletons, and that the LBW twin has a much higher probability than the LBW singleton to be born alive. Therefore, when considering the relation between birth weight and perinatal mortality, the data should always be broken down according to whether they refer to twins or to singletons, rather than combined as it is usually done.

TABLE 1. Incidence of Low Birth Weight Versus Stillbirths for Twins and for Singletons

	A LBW infants (% births)	B Stillbirths (% births)	A/B Number of LBW infants per stillbirth
Twins	51.04	4.80	10.6
Singletons	4.48	1.99	2.2

Length of Gestation

The length of gestation is one of the most important factors associated with birth weight. About one-third of LBW infants in developing countries and two-thirds in developed countries are accounted for by a shorter length of gestation [see eg, 7]. The length of gestation is, on the average, about 20 days shorter for twins than for singletons. However, as can be seen in Figure 2, the shorter length of gestation can only partially account for the incidence of LBW in twins, which is always higher in twins than in singletons at equal length of gestation.

It can be noted from the figure that all twins and nearly all singletons born alive at the sixth month of gestation are of low birth weight. From month seven onwards, the incidence of LBW in singletons decreases greatly to almost nil, whereas the incidence of LBW twins remains considerably high and does not go below 39%. Thus, here too, we find the LBW condition to behave differently in twins than in singletons.

Different effects must stem at least in part from different causes. It seems to us that the premature delivery of twins might be due to the erethism of the uterine musculature since, although the twins are of LBW, they are two (or more) so that the uterine contents, much before term, are equal to or greater than that of a single fetus at nine months. In addition to the greater volume and weight of the uterine contents, a multiple pregnancy is also characterized by increased fetal mobility and, probably, by an increased fetal production of proteic substances with an oxytomimetic effect. It therefore seems to us that the different length of gestation is another good reason to consider LBW in twins and LBW in singletons as separate entities.

Maternal Age

Maternal age, which is highly correlated with twinning (particularly DZ twinning) frequency, can also be considered to influence the incidence of LBW. In fact, as shown in Figure 3, whereas the incidence of LBW singletons is practically constant at about 4% at all maternal ages, LBW twins decrease from about 60% at maternal age 21–25 to about 47% at maternal age 30 and over. This is probably due to the increased share of DZ twins and the relative decrease of monochorial twins (ie, those in which the LBW condition is most frequent) with increasing maternal age.

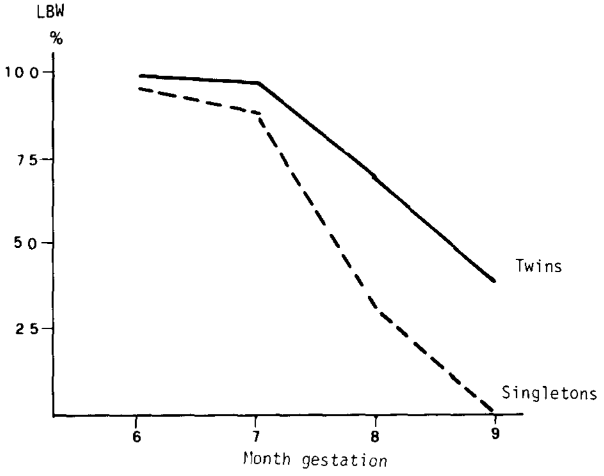

Fig. 2. Low birth weight (LBW) in twins vs singletons by length of gestation.

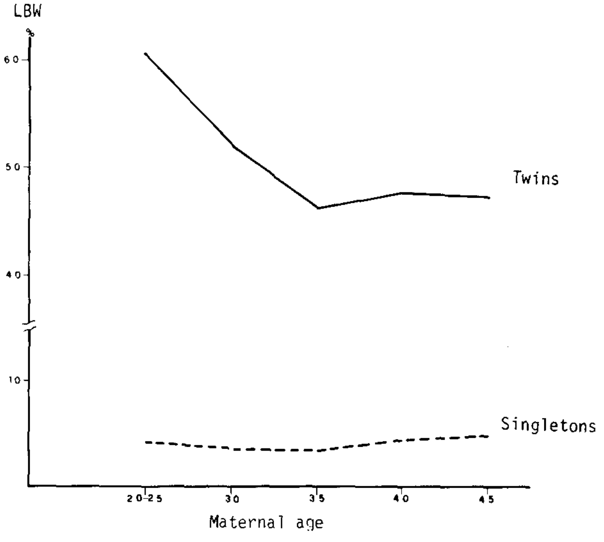

Fig. 3. Low birth weight (LBW) in twins vs singletons by maternal age.

Parity

Very similar considerations apply to the analysis of parity, which is also known to influence the incidence of DZ twinning. Thus, as shown in Figure 4, whereas the incidence of LBW singletons is practically constant at about 3% for all parity classes, the incidence of LBW twins decreases from about 65% at parity 1, to about 50% at parity 2, down to about 40% and less for higher-parity classes. Here, too, this may be caused by the relative decrease of monochorial twins with increasing parity. However, a role might also be played by a possible better tolerance of the double fetal load by the uterus that has already gone through a number of gestational events.

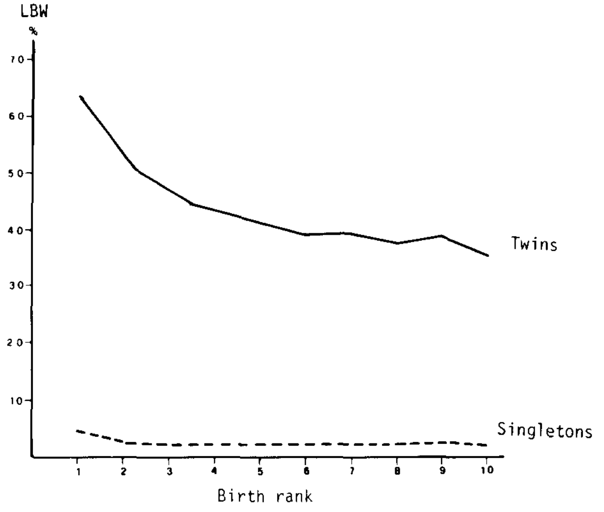

Fig. 4. Low birth weight (LBW) in twins vs singletons by birth rank.

Legitimacy

The analysis of legitimacy, a factor known to influence birth weight, has been carried out for the sake of completeness, and the results are shown in Figure 5. The birth weight at various lengths of gestation has been compared in legitimate vs illegitimate births, both for single and for plural births. As expected, the mean birth weight is consistently lower for illegitimate vs legitimate infants at all lengths of gestation and similarly so for single births and for plural births. Apparently, the conditions of psychological, social, and nutritional stress that generally characterize (although perhaps less so in recent years) the illegitimate pregnancy, do not particularly differ for twins as compared to singletons.

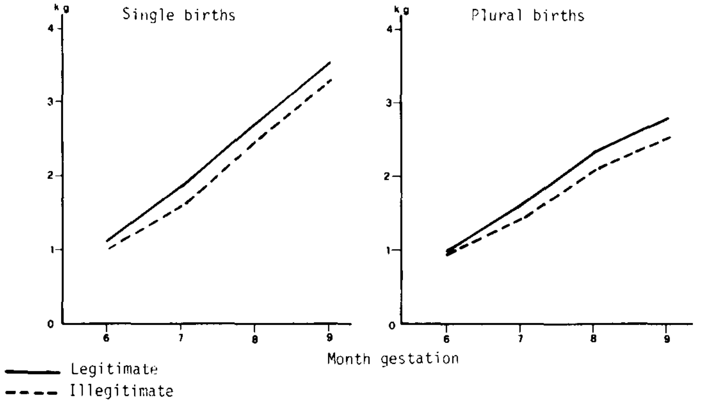

Fig. 5. Mean birth weight (in kg) in single births vs infants of plural births by legitimacy and length of gestation.

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CAUSAL CONSIDERATIONS FOR THE DISTINCTION OF LBW TWINS AND LBW SINGLETONS AS SEPARATE ENTITIES

Our contention that LBW in twins should be considered a separate entity from LBW in singletons would appear to be supported by the data presented and is based on considerations of a biological, etiological, and pathogenetic nature.

The principal biological consideration is based on the observation that over 50% of twin newborns lie below the 2,500 g officially adopted as the upper limit for the definition of LBW infants (52.98% of twins in the ISTAT 1965 data, 53.7% of twins in the NCHS 1976 data). This fact alone makes it questionable that this limit may apply to newborn twins as well.

Another good reason to differentiate LBW in twins from LBW in singletons is that otherwise a considerable bias is introduced into the population rates of LBW infants because of the variable incidence of twinning: About 1% in Caucasoid populations vs 0.6% in Mongoloid and 2.5% in Negroid populations, with further subgroup differences (although the MZ component, which is likely to contribute most to LBW, is relatively more stable).

In terms of etiology and pathogenesis, then, it seems unquestionable that the LBW condition has a different meaning in twins than in singletons. Prematurity and/or LBW in singletons may be caused by a variety of factors generally related to pathological conditions of the mother and/or of the fetus, or to social and behavioral factors among which tobacco and alcohol use and abuse are known to play a relevant role, as has been even shown experimentally in the mouse [2] and the sheep fetus [8] and has been also widely publicized. (For instance, a researcher of the French National Institute of Health has recently declared that the fetus in utero becomes "a passive drinker and smoker," whereby the risk of immaturity and LBW "... valued at 8% for nonsmokers, becomes 11% for smokers who do not inhale and 16% for smokers who inhale; it is 9% among women who drink less than 30 cc of wine but reaches 13% among those who drink more" [9].)

In contrast, the prematurity and LBW of twins is essentially due to the erethism of the uterine muscles on account of the total volume, weight, and fetus mobility. The etiology in twins is therefore essentially mechanical (and perhaps partly hormonal) and is related to the uterus and its load, whereas a mechanical etiology of prematurity and LBW in singletons is rare and is generally related to outer factors (trauma, drugs, psychosocial factors, etc).

From the above data and considerations, we conclude that LBW in twins is a distinct condition from LBW in singletons and should be dealt with independently. It seems to us that this conclusion is important not only from a theoretical point of view but also in a practical perspective, especially for its consequences in the follow-up of the infant growth and development in the early pediatric practice.

THE LOW-BIRTH-WEIGHT TWIN IN THE EARLY PEDIATRIC PRACTICE

Previous studies have already indicated that the LBW twin generally tends to catch up with respect to singleton standards and usually does so in the first year [1] or years [12] of life, which is a clear, further indication of the different nature of the LBW condition in twins as compared to singletons.

The higher speed of early postnatal growth in twins as compared to singletons can easily be noted from the following data derived from the longitudinal study of 107 twin pairs from the Mendel Institute (29 MZ and 26 DZ male-male, and 26 MZ and 26 DZ female-female), and from the monthly weight increases (Table 2).

TABLE 2. Weight Increase (in grams) in Twins and Singletons of the Two Sexes in the First Year of Life

Interval (months)	Males		Females	
	Twins	Singletons	Twins	Singletons
0–3	2,625	2,428	2,399	2,175
3–6	2,053	1,995	2,070	1,875
6–9	1,534	1,405	1,536	1,268
9–12	1,312	1,040	1,170	1,072
0–12	7,524	6,868	7,175	6,390

The comparison of the average weights reached by the end of the first year of life indicates no difference between twins and singletons in our data (males: 10,197 g in twins vs 10,163 g in singletons; females: 9,632 g in twins vs 9,603 g in singletons).

Other studies show that twins actually catch up much later than the first year of life [eg, 12]. The explanation we can offer is that our twins are all regularly followed, especially in the first year of life, so that our average twin presumably receives a considerably higher medical and social assistance than the average infant in the Roman population, and perhaps also higher than the average twin elsewhere.

The problem is clearly one of appropriate feeding and general neonatal care, and the pediatrician obviously should never forget that one mother has to care for two children at the same time, which may frequently require appropriate practical solutions. When breastfeeding is involved, it should obviously be realized that the mother is unlikely to conveniently feed the two children so that appropriate formula aid will be needed. Also, appropriate follow-up should be based on growth charts specific for twins, as have been developed at the Mendel Institute and elsewhere, so as to avoid the mistake of comparing the twin infant to the standard infant, at least until the former has caught up.

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