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Changes in Maternal Body Composition Resulting from Twin Pregnancies

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The maternal response in terms of changes in weight, plasma volume, total body water, intravascular protein mass and urinary oestriol excretion to a singleton pregnancy has been shown to be related to the size of the baby produced. Twin pregnancies have been studied to assess the maternal response to the double load, to see whether a much greater response is required compared to a singleton pregnancy. It is hoped that this study will eventually show not only what can be considered to be a physiological response to a twin pregnancy, but will show how the maternal organism sometimes fails to respond normally to the double load.

Observations were made at 30 to 32 weeks and again between 36 and 39 weeks of pregnancy in 14 primigravid twin pregnancies and 17 multigravid twin pregnancies, as well as in singleton primigravidae. For the purposes of comparison the singleton pregnancies have been divided up by the amount of weight gain during pregnancy. High weight gain was defined as 600 g/week or more during the 20th to 30th weeks. Normal weight gain was 360-540 g/week and low weight gain 320 g/week or less. The observations made were plasma volume using dye T. 1842 (Evan's Blue); total body water using deuterium oxide and measuring in an infrared spectrophotometer; the intravascular protein mass; the red cell mass; and the urinary oestriol excretion.

The plasma volume at 30-32 weeks gestation is shown in Tab. I. The plasma volume is obviously greater in twin pregnancies than in singleton pregnancies. It is related to the combined weights of the babies (Fig. 1). In the three cases with pre-eclampsia, both the baby weights and the serum volumes were low.

The total body water in singleton pregnancies ranges from about 35 to 40 l. In twin pregnancies the total body water at 30 weeks averaged 44.6 l and rose to 47.6 l at 38 weeks (Fig. 2). There is then a considerable increase in total body water in twin pregnancies compared to singleton pregnancies.

The intravascular protein mass is measured by multiplying the plasma volume by the serum protein concentration (Tab. II). At 30-32 weeks the highest values in twin pregnancies are no greater than in high weight gain singleton primigravidae, and there is again no significant difference at 36-39 weeks, except that in the low weight gain singleton primigravidae there is a low intravascular protein mass.

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Tab. I. Plasma volume (in litres)

Singleton	
Low weight gain (19)	3.6
Normal weight gain (12)	4.0
High weight gain (16)	4.0
Twins (31)	4.5

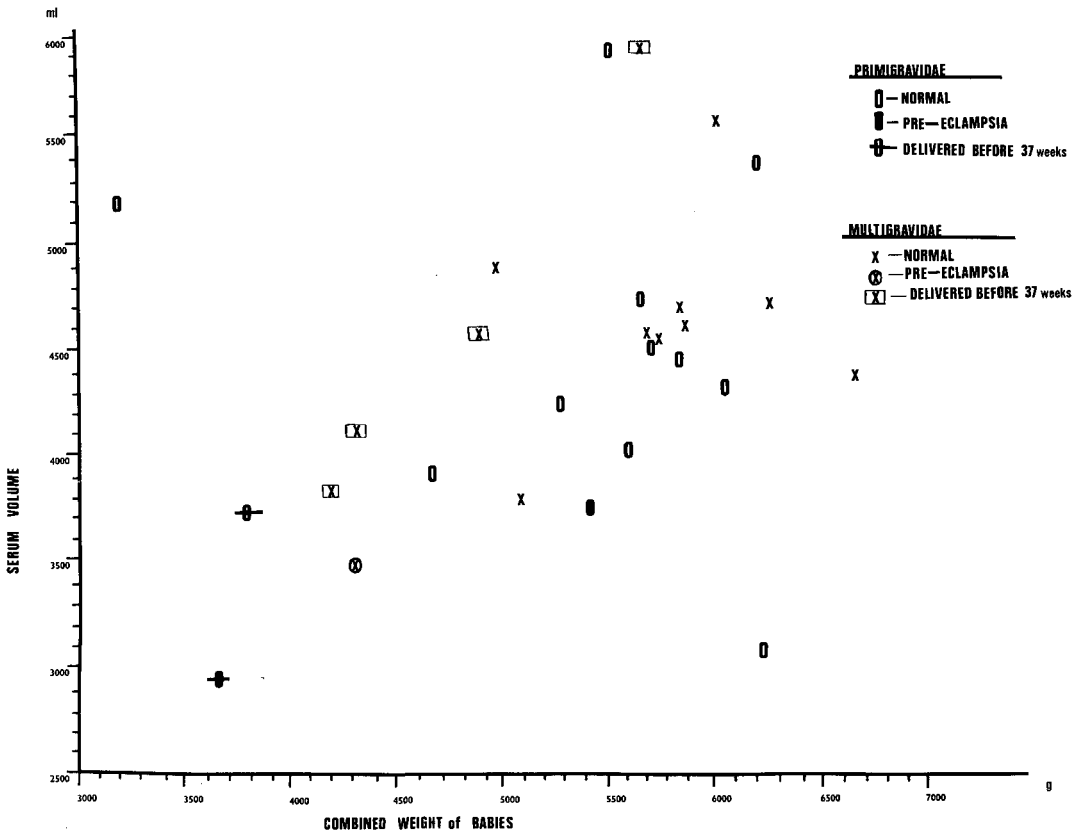

Fig. 1

There is virtually no difference in the red cell mass at 30-32 weeks and 36-39 weeks (1995 ml and 1965 ml respectively) and the values are about 500 ml above that of the singleton pregnancies.

Serial urinary oestriol excretion per 24 hours is shown in Tab. III. At 30-32 weeks the oestriol excretion in twin pregnancies is much higher than in singleton

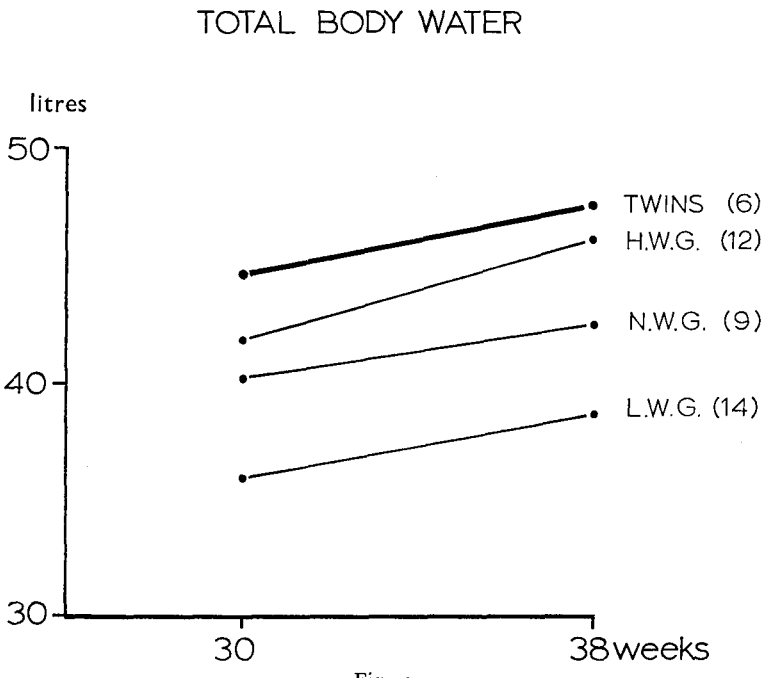

Fig. 2

Tab. II. Intravascular protein mass (in grams)

	30-32 weeks	36-39 weeks
Singleton		
Low weight gain (10)	247.0	215.9
Normal weight gain (9)	241.9	236.7
High weight gain (14)	259.4	242.7
Twins (14)	244.9	238.6

Tab. III. Serial urinary oestriol excretion (mg/24 hrs)

	30-32 weeks	36-39 weeks
Singleton		
Low weight gain (14)	10.3	18.7
Normal weight gain (4)	10.5	23.8
High weight gain (12)	11.5	20.8
Twins (5)	18.1	34.2
	14.7-29.0	17.3-45.0

pregnancies, and again at 36-39 weeks the values are much higher. The range at 36-39 weeks in twins was 17.3 to 45 mg/24 hrs. Presumably, this much higher excretion of oestriol is due to the doubling of the foetal adrenals and also to the greater amount of placental tissue.

The serum concentrations of sodium, potassium and chloride did not differ from those in singleton pregnancies.

These preliminary results tend to show that the response of the maternal organism to twin pregnancy is much greater in terms of the plasma volume, total body water, red cell mass and urinary oestriol excretion, but not to intravascular protein mass except in comparison with the low weight gain singleton primigravidae.

The number of patients in the study is being increased and, in addition, the investigations are being started at an earlier stage of gestation. This is possible by using sonar (pulsed ultrasound) to detect multiple pregnancies and in this series a twin pregnancy has been diagnosed as early as the ninth week of pregnancy. So far, only two twin pregnancies have had serial examinations carried out from the 20th week to the end of pregnancy.

In all cases the zygosity of the twins is being determined by blood groups and blood and placental enzymes. When a sufficient number of cases has been accumulated, it will be possible to compare the results in MZ and DZ pregnancies and in normal and abnormal responses to pregnancy, in particular, the development of pre-eclamptic toxaemia. The changes in pregnancy will also be related to the weights of the babies produced and to their future development.

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