Relationship between some maternal haemato-clinical parameters and low neonatal weight. Preliminary study

M. TARTAGNI - P. LOIZZI - A. DIAFERIA - O. CECI

Summary: In a selected group of pregnant women we studied the influence of specific haematoclinical maternal factors (age, pre-pregnancy weight, pregnancy weight gain, blood pressure, haematocrit (HTC), haemoglobinaemia (Hb), platelets (PTL), uricaemia) on neonatal weight. The results show an association among pre-pregnancy low maternal weight, hypertension and low neonatal weight.

The uricaemia behaviour and the role of PTL, Hb, HCT are uncertain.

The factors determining insufficient intrauterine fetal growth differ according to aetiology, time of appearance, intensity and length. Such factors are usually divided into maternal, placental and fetal. Among the maternal factors those that are usually connected with low neonatal weight are: age inferior to 20, mostly among the primiparous, an insufficient maternal weight gain during the last months of pregnancy ([1]), the practice of cigarette smoking, which determines a relative hypoxia due both to the high levels of the carbon monoxide and to a chronic vascular spasm of the uterine arteries ([1, 8]). The placental and fetal causes of the intrauterine growth retardation are less known.

2nd Department of Obstetrics and Gynecology, University of Bari (Italy)
(Head: prof. R. Nappi)
and Chair of Prenatal Physiopathology, University of Bari (Italy)
(Head: prof. P. Loizzi)

Shanklin, after a study on 6,500 placentas, maintained that delayed fetal growth could be associated with 4 conditions: with an angioma of the placenta or of the umbilical cord, to multiple or large placenta infarcts, with anastomoses among placental districts (monocorial twin pregnancies), with an abnormal umbilical cord insertion. Intrauterine growth retardation (IUGR) fetal factors are most frequently linked to congenital malformations (as a consequence of environmental or chromosome factors) and to chronic intrauterine infections.

In our preliminary study we left out IUGR fetal and placental factors, whereas we studied specific haemato-clinical maternal factors such as: age, pre-pregnancy weight, pregnancy weight gain, blood pressure, haematocrit (HTC), haemoglobinaemia (Hb), platelets (PTL), uricaemia, and evaluated their influence on neonatal weight.

Table 1. – *Median (M), Average ($\bar{x}$) and standard deviations (SD) of the continuous variables in the study and control groups.*

Variable	Study group (62 pregnancies)			Control group (70 pregnancies)		
	M	$\bar{X}$	DS	M	$\bar{X}$	DS
Age	24	25	12	27	29	11
Pre-pregnancy maternal weight	55.0	56.8	13.8	58	59.4	10.0
Maternal weight at term	67.0	69.5	11.6	70.5	71.6	9.67
Pregnancy weight gain	11	13.1	12.2	11.5	12	11.3
Systolic blood-pressure	150	149	32.2	120	116	11.3*
Diastolic blood-pressure	90	91.2	18.1	70	72.4	8.4*
Mean blood-pressure	111	110	22.0	86.6	86.8	8.08*
Uricaemia	5.6	5.9	2.28	4.2	4.2	0.40
Hb	11.7	11.5	2.28	11.9	12.1	2.53
Htc	35	34.2	4.32	35.5	34.5	3.67
Ptl Platelets (* 1000)	172	187	90.7	188	185	0.51

* $P < 0.0001$ (Student test for indepedent samples).

MATERIAL AND METHODS

Selection of study groups

We selected sixty-two pregnant women hospitalized in our Institute during the period 1984-1988 who had delivered at the term of their pregnancies low neonatal weight fetuses ($\leqslant$2.500 g); they were all from the same geographic area (Bari District) and had a homogeneous socio-economic level. The personal anamnesis of all the patients was negative for uterine malformations, cardiopathies, pneumopathies, severe anaemias, metabolic diseases, essential hypertension, and infectious diseases such as rubeola, toxoplasmosis and cytomegalovirus infection.

Women who delivered malformed fetuses, or who abused alchool, smoking and coffee or drugs were excluded from this study.

Seventy women who had delivered standard-weight newborn at the same gestational age were chosen at random as control group.

We registered all of the pregnant women: age, pre-pregnancy weight, weight gain at term of pregnancy, diastolic and systolic blood pressure, mean blood pressure, uricaemia, haemoglobinaemia, haematocrito and blood platelet concentration. We then compared these variables with the neonatal weight by means of an association and descriptive, sometimes stratified, analysis. Besides, for convenience of analysis we transformed two variables (mean blood pressure and uricaemia) from continuous into categorical, using careful cut-off (mean blood pressure $\geqslant$105 mmHg, uricaemia $\geqslant$6 mg/dl). We used for statstical analysis the Student test, the χ^2 test, the Fischer test for the exact probability and the Mantel Haenszel test for the stratified analysis.

RESULTS

The maternal age average and median of the study-sample patients were lower than those of the control samples (Table 1). These data, in accordance with literature ([1, 10]), indicated that the low neonatal weight was most frequent in the younger age. The pregnancy weight-gain median of the study sample patients, on the contrary, were almost superimposable that of the control group women (11 kg versus 11.5 kg) (Table 1). On the other hand there was a difference between the averages of the pre-pregnency weight in the two groups even though such difference was not statistically significant (Table 1). It is reported in literature that if the mother's height and weight are low that may lead to intrauterine growth retardation ([1]).

We observed, in accordance with other Authors ([2, 3, 4, 7]), that by analysing the trend of the blood pressure in the two groups, there was a prevalence of women

Table 2. – *Distribution of the pregnant women with normal blood pressure and suffering from hypertension (mean blood pressure ⩾105 mmHg) among those who had delivered low and normal neonatal weight infants.*

	Low neonatal weight	Normal neonatal weight
Pregnant women with hypertension	38	5
Pregnant women with normal blood pressure	24	65

$\chi^2 = 42.4$ P = 0.000001 *OR = 21.1

* The Odds-Ratio (OR) shows that pregnant women suffering from hypertension have a risk of delivering low neonatal weight infants 21.1 times higher than pregnant women with normal blood pressure.

suffering from hypertension (mean blood pressure ⩾105 mmHg) among those who delivered IUGR infants in relation to those who delivered standard deight infants (Table 2). A significant association emerged from the statistical analysis between low neonatal weight and maternal hypertension (Table 2). We then studied the hypertension after stratifying the whole sample into three groups in accordance with the maternal age (⩽25, 26-29, ⩾30 years) in order to eliminate the confusing action of age upon the low neonatal weight idependently of the maternal age.

In the IUGR group the uricaemia showed average values to the normal limit ($\bar{x}$=5.9 mg/dl), while in the control group the average values were lower. But such differences were not significant (Table 1). If the uricaemia is categorized by dividing the patients into those with hyperuricaemia and those with normal uricaemia (cut-off ⩾6 mg/dl), by Fischer's test, a significant association between hyperuricaemia and low neonatal weight (p=0.01) is evident.

The median values of Hb, Hct and Ptl were almost superimposable in the two groups (Table 1). This does not agree with what has been reported by other Authors ([5, 9]), who found a correlation between high Hb and Hct values and low neonatal weight. On the contrary other Authors ([6]) found a reduction of the Hb in women who delivered low weight newborn.

CONCLUSION

The results of this preliminary study agree with those reported in literature as regards the association among pre-pregnancy low maternal weight, hypertension and low neonatal weight.

The uricaemia behaviour shown in the study group higher values was uncertain, although they were not pathological, and of significant value only if categorized. Further studies are necessary to verify the utility of the Hb, Hct and platelets as predictable elements of intrauterine growth retardation.

We intend to achieve a further study on a larger sample, in order to evaluate the effect on the neonatal weight of the various associations among the variables examined and thus to obtain a multivaried logistic predictive model which could be useful to the study of fetal growth.

Table 3. – *Distribution of the pregnant women with normal blood pressure and suffering from hypertension in the study, and control group according to age.*

Age categories years	Study group: pregnant women with hypertension	Study group: pregnant women with normal blood pressure	Control group: pregnant women with hypertension	Control group: pregnant women with normal blood pressure
⩽25	13	9	3	28
26 - 29	9	4	0	25
⩾30	17	10	2	12

$\chi^2 = 38.48$ df = 2 P< = 10 (−6)
OR = 17.66
Confidence limits at 95%: 7.12 and 43.7

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Address reprint requests to:
Dr. M. TARTAGNI
Via dell'Artigianato, 48
72015 Fasano (BR) (Italy)