URINARY OESTRIOL IN PREGNANCY WITH ANAEMIA

by

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There has been a good deal of observation on urinary oestriol excretion as an index of feto-placental efficiency in high risk cases. However, there has not been much study of the level of urinary oestriol in anaemic individuals during pregnancy. To our knowledge no report of the influence of anaemia on oestriol level has appeared in the literature. The present study is concerned with a number of observations on oestriol level in the second half of pregnancy in anaemic women with a view to diagnosing any associated placental insufficiency and to establish the correlation, if any, between the oestriol value and the birth weight of the new born.

Materials and Methods

Primiparae and multiparae with parity less than five having hypochromic iron deficiency type of anaemia with haemoglobin less than 8.0 Gm per cent (Sahli's method) were selected for study in the second half of pregnancy. Apart from anaemia the pregnancies were uncomplicated and the women were reasonably certain about the date of last menstrual period. They were all between 145 to 150 Cm. in height and less than 35 years of age. A 24 hour urine was collected and oestriol estimation was done by the method of Brown *et al*, (1968). During delivery the evidence of fetal distress was sought by clinical methods and after delivery the weight of the new borns were recorded. The period of gestation at which the patients delivered was also considered.

Results

Primigravidae

Table I lists the oestriol levels (in niligrams) for primigravidae in the later months of pregnancy. There are in all 50 cases. They are grouped in three classes, (i) 29 to 33 weeks; (ii) 34 to 38 weeks; and (iii) 39 to 41 completed weeks, of gestation.

Figure I shows the mean and standard deviation curves of the oestriol levels with the prediction limits.

Table II gives the analysis of variance to test whether the difference in the mean levels of oestriol have any statistical significance under the usual normality assumption. The observed 'F' ratio is very small, which indicate that the mean levels of oestriol are not significantly different over the three gestation periods in general.

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Accepted for publication on 11-12-1974.

TABLE I

Oestriol Levels in the later months of Pregnancy (Primigravidae)

	Gestation periods in weeks		
	29-33	34-38	39-41
Number of cases 'n'	14	17	19
Mean levels X (in mgs)	11'200	11'076	9'831
Standard deviations (in mgs)	10'210	7'638	6'701
Prediction limits (95 per cent confindence)	0-34'027	0-27'737	0-24'275

TABLE II

Analysis of Variance Test for the Significance of difference amongst the Mean Oestriol Levels in different weeks of Pregnancy

Source of variation	Degrees of Freedom	Sums of square	Mean square	F ratio	Tabulated 5%
Between gestation periods	2	20'05	10'025	0'1521	F'05,2,40 = 3'23
Within Gestation Periods	47	3097'05	65'895		F'05,2,60 = 3'15
Total	49	3117'10			

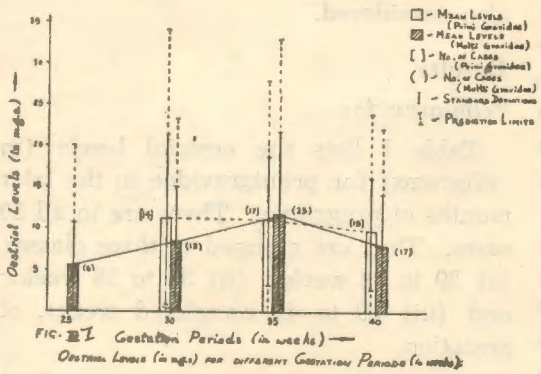

Fig. 1

Oestriol levels (in miligrams) for different gestation periods in primigravidae and multigravidae.

Next the correlation and regression coefficients between oestriol levels (in miligrams) 'X' and the birth weight of the babies (in Grams) 'Y' have been calculated for the 50 cases in the last trimester of pregnancy. Since the observed (t) to test the significance of correlation coefficient is much smaller than the tabulated 5 per cent value, the correlation coefficient between the oestriol level and the birth weight is insignificant. Therefore, in general, the correlation coefficient may be taken as Zero. It also signifies that the regression line Y = a + bx is not helpful to predict the weight of the baby (fig. 2) from the oestriol level of the mother in the later months of pregnancy.

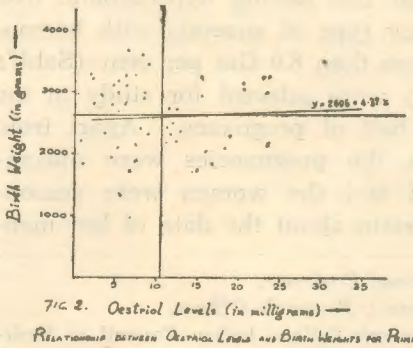

Fig. 2

Relationship between oestriol levels and birth weights of fetuses in primigravidae.

Multigravidae: Table III and fig. 1 are indicative of the oestriol levels, the mean, standard deviations and prediction limits corresponding to four groups, viz (i) 24 to 28 weeks; (ii) 29 to 33 weeks; (iii) 34 to 38 weeks, and (iv) 39 to 41 completed weeks in 60 multiparae.

Table IV gives the analysis of variance to test whether the difference in the mean levels of oestriol have any statistical significance under the usual normality assumption. The observed 'F' ratio is less than the 5 per cent value of 'F' which indicates that there is no significant difference between the mean levels of oestriol for the different groups in the later months of pregnancy.

The correlation and regression coefficients between the oestriol levels (in miligrams) 'X' and the birth weight of the babies (in Grams) 'Y' have been calculated for all the 60 cases (Table V and

TABLE III

Oestriol Level in Multigravidae in the later months of Pregnancy

	Gestation periods in weeks			
	24-28	29-33	34-38	39-41
Number of cases 'n'	6	12	25	17
Mean level X (in Mg)	5'471	8'525	11'640	8'118
Standard deviations	5'215	6'496	10'111	6577
Prediction limits	0-19'953	0-23'406	0-32'923	0-22'465

TABLE IV

Analysis of Variance for Testing the Significance of difference amongst the mean Oestriol Levels for Different Weeks of Pregnancy

Source of variation	Degrees of freedom	Sums of Squares	Mean square	F ratio	Tabulated 5% F
Between Gestation periods	3	219'81	73'270	1'0947	F'05,3,40 = 2'84
Within Gestation periods	56	3748'31	66'934		F'05,3,60 = 2'76
Total	59	3968'12			

TABLE V

Relationship of Oestriol Levels and Birth Weight of Fetuses

No. of cases 60	Oestriol levels 'x' (in mgs)	Birth weight 'y' (in Gms)
Mean	9'839	2739'6
S.D.	8,425	549'03

correlation coefficient

r = —0'00494

To test the significance of r

t = —0'0356 d.f = 58 t'025,40 = 2'021

t'025,60 = 2'000

Regression line y = a + bx

Regression coefficient b = —0'3218 Gms per mg, of oestriol

a = 2742 '8 Gms.

fig. 3). Here also similar to primigravidae the observed 't' is much smaller than the tabulated 5 per cent value, which means it is insignificant and may be taken to be zero in general. It also signifies that the regression line $Y = a + bx$ (fig. 3) is not helpful to predict weight of a baby from oestriol level of mother.

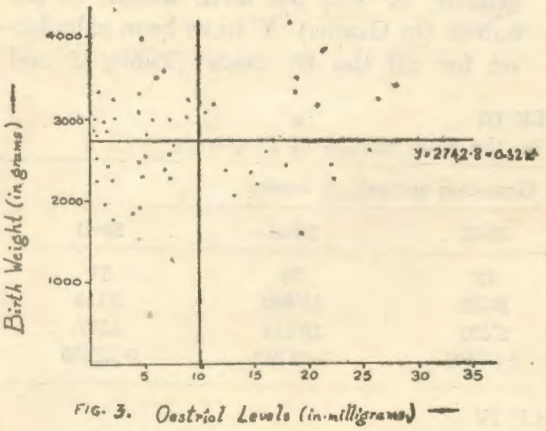

Fig. 3
Relationship between oestriol levels and birth weight of the fetuses in multigravidae.

Discussion

The present study shows that the urinary oestriol concentration in anaemic women during pregnancy rises slowly until about 36 weeks and then falls before delivery. In normal pregnancy Klopper *et al,* (1963) found a continued rise of urinary oestriol with a slow rise before 32 weeks, a steep rise until 40 weeks and a further continued rise after 40 weeks. Plasma oestriol assay by Mason (1973) has confirmed Klopper and Billewicz's observation in the majority of cases. Urinary oestriol is derived from feto-placental unit, maternal ovary (Barlow and Logan, 1966; Eren *et al,* 1967) and the maternal liver (conversion from oestrone and oestradiol). In the second and third trimesters the feto-placental unit is the predominant contributor. The relatively low level of oestriol with advancing pregnancy in the present study may be suggestive of chronic placental insufficiency associated with maternal anaemia. The slow rise of oestriol and a subsequent fall, more so in primigravidae after 36 weeks point to a progressive feto-placental failure. However, this variation of oestriol concentration in different weeks of pregnancy and the subsequent fall before delivery are not statistically significant. One puzzling feature of this study is that inspite of the low levels of oestriol, its slow rise and fall, there has not been any correlation between the oestriol levels and the birth weight of the babies. Even in normal pregnancy attempts to correlate oestriol level and the birth weight of the babies failed to show any definite relationship (Klopper and Billewicz, 1963; Mason, 1973). Such a correlation was however found by Coyle and Brown (1963) and (Beling, 1967). One might presume that in maternal anaemia the fetus as a host gets its own full quota of nutrition or there are other variable factors of fetal growth which keep the growth pattern unchanged, irrespective of the maternal haemoglobin status. It would thus appear that the slow rise of oestriol excretion in urine and some fall after 36 weeks of pregnancy is the most characteristic feature in anaemic individuals, the significance of which remains ill understood.

Summary

The urinary oestriol estimation has been made in anaemic women during pregnancy without any other complications. The mean levels and variation have been ascertained. There has been a persistently low value and slow rise of oestriol concentration until around 36

weeks with a subsequent fall, more so in primigravidae. The slow rise of oestriol with advancing pregnancy and its fall before term is not statistically significant. The low level of oestriol in anaemic women may be suggestive of inadequate placental function. However, there is no statistical correlation between the oestriol level and the birth-weight of the newborns.

Acknowledgements

We are grateful to Indian Council of Medical Research for the grant which supported this work. We also thank Professor W. Klyne and Dr. D. N. Kink of the Medical Research Council, Steroid Reference Collection, Chemistry department, Hampstead, London for the gift oestriol standard supplied to us. Thanks are also due to Dr. S. N. Ray and A. S. Nag, the statisticians, the Principal and Superintendent of our college and to Professor K. L. Mukherjee of the Institute of Child health, Department of bio-chemistry, Calcutta for immense help in hormone analysis.

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