

USE OF RATIO OF OESTRIOL TO CREATININE IN SINGLE MORNING
URINE SAMPLES IN MANAGEMENT OF DIABETES AND
HYPERTENSION IN PREGNANCY

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SUMMARY

Determination of E/C ratio in single morning urine specimen is convenient to both patient and clinician.

Estimation of creatinine in same samples of urine obviates the problem of unequal volume on different days and in different patients.

E/C ratio is a good index of fetal well being in cases of hypertension. Sub-normal values with increasing pattern suggest that fetus is growing, but at a slower rate.

In cases of diabetes, E/C ratio is not a good index of fetal well being. Even if it is lower, patient may deliver healthy baby. It is the blood glucose level which actually affects fetal prognosis more.

Introduction

Large amount of oestrogens are found in maternal blood and urine during pregnancy. Upto 12th week they are synthesized from corpus luteum but after that from foetus and placenta. These oestrogens are excreted in maternal urine. Hence amount of oestrogens excreted in maternal urine in 24 hours can be used as an index of fetal well being and placental function.

The ratio of the three types of oestrogens oestrone, oestriol in non-pregnant state is 3:3:1 but in pregnancy, concen-

tration of oestriol rises 10 folds. So estimation of oestriol alone in urine gives an estimate of total oestrogens in urine.

In present study, we have measured oestriol creatinine ratio in single morning urine sample to determine fetal outcome in cases of various degrees of hypertension and diabetes.

It is difficult for patients as well as clinician to collect 24 hours urine sample. There is considerable diurnal variation in volume of urine passed and also oestriol excreted in it. Dicky *et al* (1965) showed that oestriol excretion varied directly with creatinine excretion, so same factor is responsible for variation in both. Mackay *et al* (1968) showed that correla-

tion coefficient for oestrogen and creatinine excretion is 0.86. This further proves that oestrogen excretion varies directly with that of creatinine excretion. Thus estimation of oestriol creatinine ratio in the same sample of urine reduces the diurnal variation of oestriol excretion over a limited time.

Luther *et al* (1973) stated that here is least variation in volumes of single morning urine specimen in different patients. Patients are easily motivated to collect morning urine specimen.

Total value of urine x corrected 0514 unknown

=

10 x corrected 0514 Int.—corrected unknown

Material and Methods

We have taken the patients attending the antenatal clinic and those admitted in UISE. Maternity Hospital and various Nursing Homes of Kanpur as subjects for study. Healthy pregnant women were taken as controls and pregnant women with diabetes and hypertension were the subjects.

Oestriol was measured by biochemical and spectrophotometric method devised by Oakey *et al* (1967). This method is based on Kober's reaction (1938). Creati-

nine was determined by alkaline picrate method (Bonsness and Tauskey, 1945).

Calculation

E/C ratio is expressed in mg/gm. Oestrogen in any sample is calculated by Allen's correction formula (1950).

Corrected Estriol 514 20514—(0472 + 0556)

The, Oestriol in given sample is calculated by

Creatinine is calculated as follows.

Reading of unknown in gms per litre.

Reading of Standard

So E/C ratio = mgm/gram.

Observations

One hundred and sixty-two samples of morning urine from control group, 70 samples from hypertensive patients and 52 samples from diabetic patients were analysed for E/C ratio from 24-40 weeks of gestation.

Table I shows mean values of E/C ratio, standard deviation and upper and

TABLE I

Weeks of Gestation	Mean	Standard Deviation	95% confidence limits	
			Upper	Lower
24-25	8.2	2.0	9.20	7.2
26-27	10.8	2.4	11.86	9.86
28-29	14.6	4.2	17.20	12.0
30-31	15.0	5.2	18.70	12.70
32-33	17.90	8.0	21.90	13.90
34-35	27.5	8.2	30.70	24.30
36-37	39.20	9.8	42.76	35.64
38-39	42.5	10.4	46.94	38.10
40-41	43.6	11.3	48.66	38.54

lower limit of 95% confidence interval in normal patients from 24-40 weeks of gestation.

The above Table shows that there is increasing E/C ratio with increasing week of gestation. Since all the patients did not turn up for weekly follow up there is variation in number of samples obtained in various weeks of gestation.

Hypertension

Serial estimation of E/C values have been done in 15 patients of hypertension. These patients had B.P. more than 140/90 mm of Hg. before 24 weeks of gestation and all of them were known hypertensives. The cause for their hypertension was not known. They were kept on sedation diuretics and antihypertensives.

TABLE II
E/C Values in Hypertensive Patients

E/C Values	No. of patients
1. Within normal limits	3
2. Below normal limits but gradually increasing	10
3. Below normal limits but not increasing	2
Total	15

In 2 patients E/C values was in decreasing order. In one of them B.P. was not

controlled as she did not turn up for regular followup. Rest of the patients had normal blood pressure with anti-hypertensive drugs.

Above Table shows that 11 patients delivered at term giving birth to dysmature babies, i.e. less than 10% of their expected weight. One patient had intra-uterine death at 32 weeks. Her B.P. was not controlled inspite of drug treatment. One patient was induced prematurely at 36 weeks because of persistently decreasing values of E/C ratio.

Discussion

In our study, 3 patients (20%) had E/C values in their normal limits and 12 patients (80%) below the normal limits. Out of these 12, 2 patients (16.6%) had E/C values in decreasing pattern. Out of 3 patients, 2 patients (66.6%) delivered full term healthy babies while 1 patient (33.3%) delivered dysmature baby at term. Out of 12, 10 patients (83.3%) delivered dysmature babies at term. 1 patient (8.33%) had intra-uterine death. Her blood pressure was not controlled and even her E/C values were persistently low. Another patient (8.33%) who had decreasing pattern of E/C values was prematurely induced at 36 weeks, giving birth to small for date baby.

TABLE III
Outcome of Pregnancy in Relation to E/C Values in Cases of Hypertension

Outcome of pregnancy	E/C within normal limits	E/C below the normal	Percentage
Full term normal delivery	2	—	13.3
Full term delivery of dysmature baby	1	10	73.3
Intra-uterine death	—	1	6.6
Premature delivery	—	1	6.6
Total	3	12	

Diabetes

We have analysed 52 samples for E/C values in 12 patients of diabetes from 24 weeks to term. Out of these 12 patients, 8 patients were gestational diabetics, 4 were clinically diabetic. All these were given insulin on regular follow up basis.

TABLE IV
Values in Cases of Diabetes

Type of diabetes	Normal E/C values	Normal but low values at term
Gestational diabetics	3	5
Clinically diabetics	1	3
Total	4	8

4 patients had normal E/C values but 8 patients had falling E/C values at about 36-40 weeks.

TABLE V
Outcome of Pregnancy in Relation to E/C Values in Cases of Diabetes

Outcome of pregnancy	E/C values within normal limit	E/C values below the normal at term
Full term normal delivery	3	3
Premature normal delivery	1	1
Intrauterine death at 32 weeks	—	2
Full term still birth	—	2
Total	4	8

Six patients delivered normal babies at term weighing more than 4.5 kg, 2 patients had intra-uterine death at 32 weeks

and 2 patients had intrauterine death at 38 weeks. In all these 4 patients blood sugar was not adequately controlled by insulin.

Discussion

In our study 4 patients (33.33%) had E/C values within normal limits and 8 patients (66.6%) had normal E/C values in earlier weeks but sub-normal values at term (36-40 weeks) out of 4 cases, 3 patients (75%) delivered normal babies at term while only 1 patient (25%) delivered prematurely. Out of 8 patients, 3 patients (37.5%) had normal delivery at term while 4 patients (50.0%) had intra-uterine death or full term still birth. This shows that in this group, who had sub-normal E/C values at term, the outcome of pregnancy is not appreciably influenced by E/C values. It is the adequate control of diabetes which influences the fetal prognosis more. Only 1 patient (12.5%) had premature delivery.

Since the field is still virgin comparison of the findings has not been possible.

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