

SERUM ISOCITRIC DEHYDROGENASE IN PREGNANCY

by

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Attempts have been made to detect placental infarction by measuring leakage into blood of various enzymes like Lactic dehydrogenase (Little 1959), Glutamic oxaloacetic transaminase (Borgalin 1958; Crips *et al* 1959) and Isocitric dehydrogenase (Dawkins *et al* 1959; Dawkins and Wigglesworth 1961; Little and Kirpalani 1962). Out of these, the study of serum isocitric dehydrogenase (I C D) seemed specially appropriate because the placenta is a rich source of this enzyme and elevations are found in only few disorders, specially those involving hepatocellular damage besides placental infarction.

Normal values of serum I C D were reported in healthy women and in normal pregnancy (Wolfson *et al* 1957; Little and Kirpalani 1962). Elevated serum I C D levels were reported in cases of pre-eclampsia and accidental haemorrhage (Dawkins *et al* 1959; Daickins and Wigglesworth 1961; Jeacock *et al* 1962; Little

and Kirpalani 1962). Similarly, elevated serum I C D levels have been reported in liver diseases (Sterkel *et al* 1968, Baron *et al* 1959; Kerppole *et al* 1959).

Material and Methods

Estimation of serum I C D was made by modification of the method used by Little and Kirpalani (1962). The results were expressed in some arbitrary units used by Wroblewski and La Dua (1955) for transaminase. The activities were corrected 25% with the use of temperature coefficient of 1.7 used by S. K. Wolfson and Williams-Ashman (1957).

Results

I. Control Group

(a) Normal non-pregnant women of child-bearing age.

Serum I C D was estimated in normal non-pregnant women between 18 to 36 years of age. There was no significant difference in the mean serum I C D levels in various age groups. In 88% of cases, serum I C D values were ranging between 2.1—6 units, the values in different cases have been shown in Fig. 1. The mean serum I C D activity was 4.37 ± 1.08 units (Range 1.8—6.4 units).

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Fig. 1
Occurrence of enterocele following the operation of abdominal cervicopexy done two years ago. The posterior lip of the cervix is long and hypertrophied.

Immunological Pregnancy Test in Abnormal Pregnancies—Usha Krishna et al. pp. 157-161

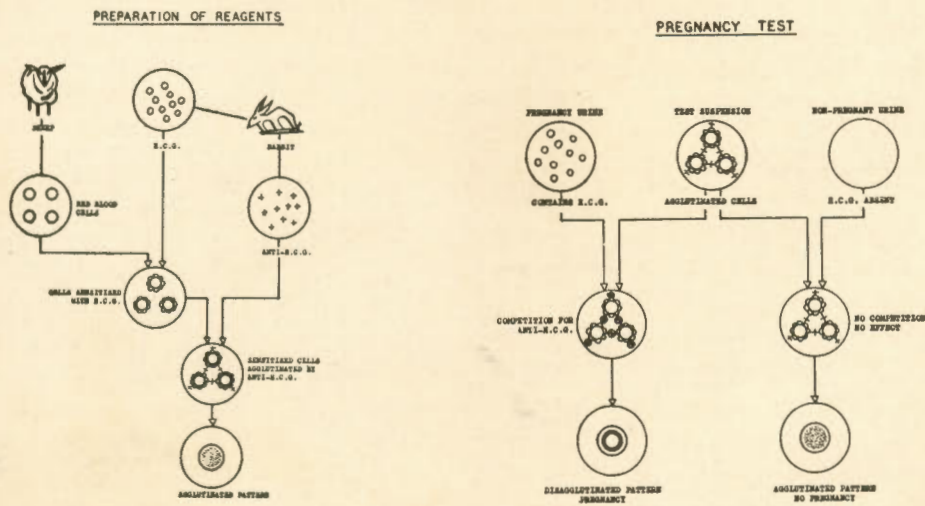


Fig. 1

Fig. 2



Fig. 1
Amniotic fluid showing typical "Stage 1" arborization.

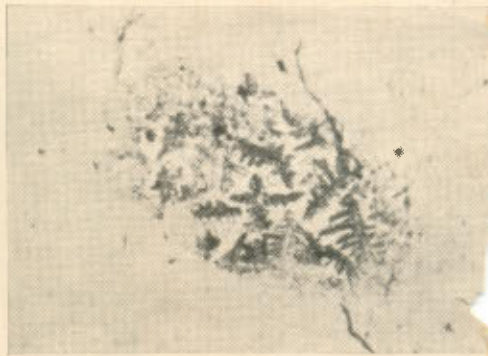


Fig. 4
Cervical mucus showing heavy dark and wide arborization pattern.



Fig. 2
Amniotic fluid showing typical stage II arborization (Note the thin delicate and discrete pattern).



Fig. 5
Vaginal smear showing amorphous debris.



Fig. 3
Amniotic fluid showing stage III arborization.

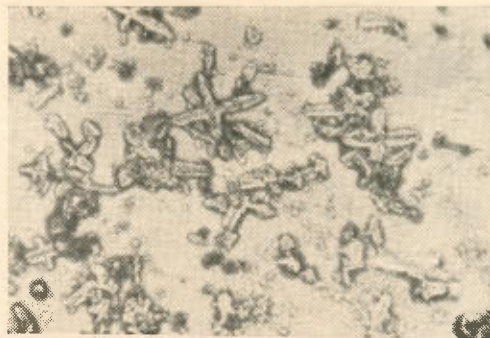


Fig. 6
Cross like crystals seen in dried urine.

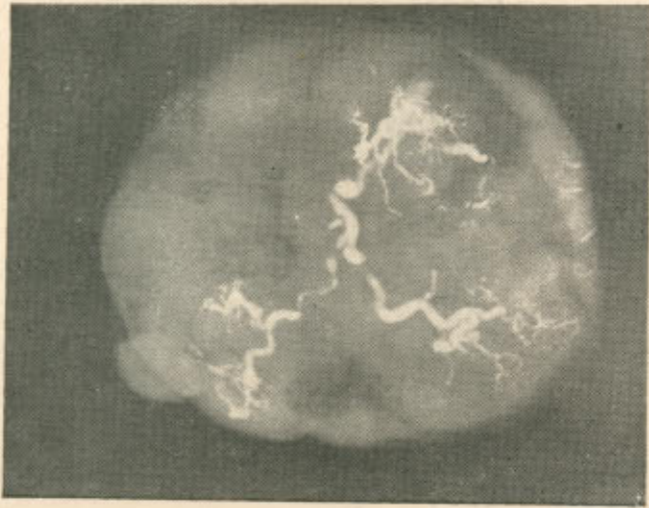


Fig. 1
Dispersed pattern

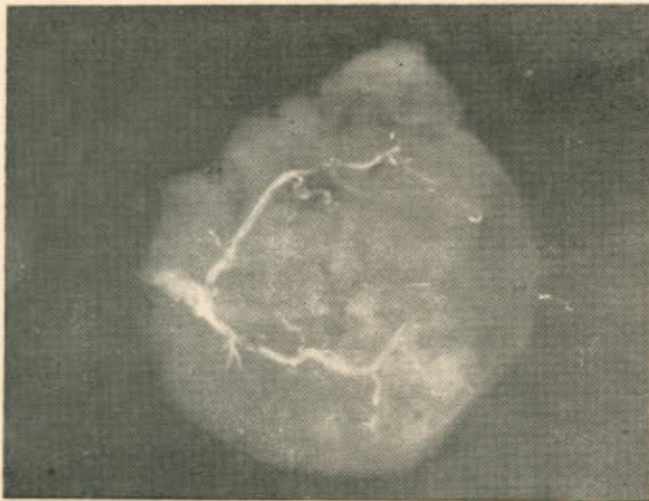


Fig. 2
Magistral pattern

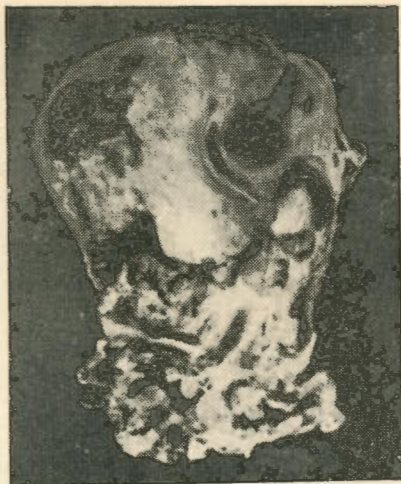


Fig. 1
Photograph of ruptured uterus.

Primary Enterocele—Swami & Vyas p. 226-227

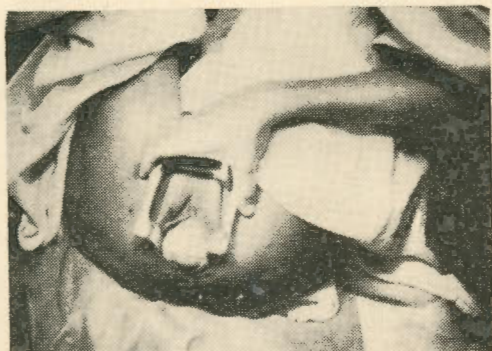


Fig. 1
Enterocele showing the ulcer.

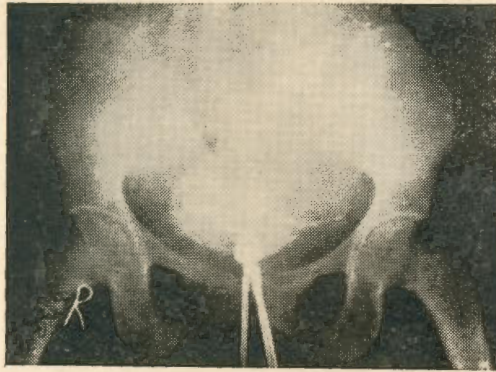


Fig. 1
Secondary abdominal pregnancy case I.

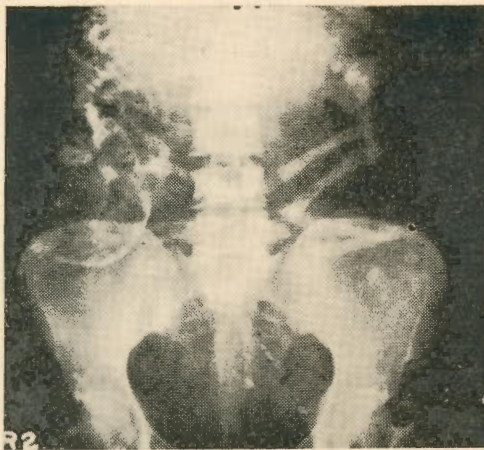


Fig. 2
Abdominal pregnancy living child case II.

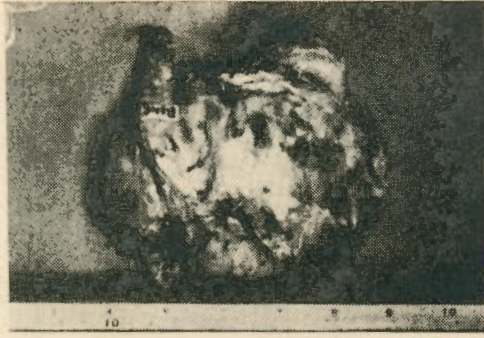


Fig. 1
Gross specimen.



Fig. 2
Microscopic section of tube showing infiltration
of wall with syncytial cells.

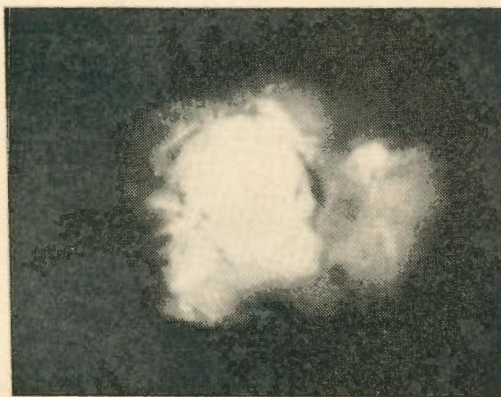


Fig. 3
X-ray of specimen showing twin fetuses.

The highest value for the group was 6.4 units, which was within normal range. The upper limit for normal non-pregnant women in the present study was 6.5 units which is mean plus two standard deviation (S.D.).

values 9.8 and 6.8 units which are higher than normal. The values of serum I C D in cases of normal pregnancy have been shown in Table I. The values of serum I C D for individual cases are shown in Fig. 2.

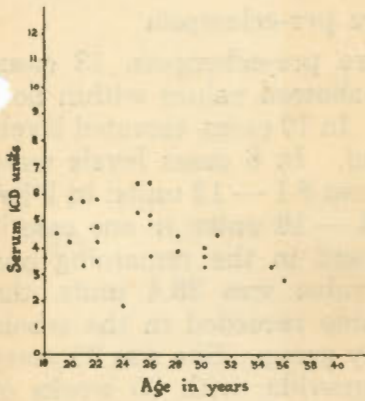


Fig.1. Serum ICD levels in normal non-pregnant women.

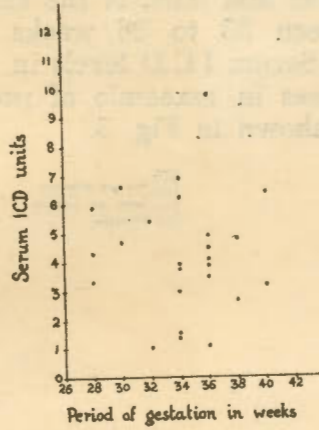


Fig.2. Serum ICD levels in normal pregnant women.

(b) Normal pregnant women.

Serum I C D was estimated in 25 women with normal pregnancy in the 3rd trimester. Out of these, 20 were multigravidae and 5 primigravidae, with a mean value of 4.17 and 4.64 units respectively. The two values are almost similar. Majority of the cases were between 33 to 36 weeks of pregnancy. The mean serum I C D did not show any variation with duration of pregnancy. In 23 out of 25 cases the serum I C D levels were less than 6.5 units (which is the upper limit for normal non-pregnant women). Only two cases showed

The upper limit for normal in normal pregnant women was 7.8 units, which is mean plus two standard deviation as compared to the upper limit for normal non-pregnant women, which was 6.5 units. This small difference in two groups of cases was due to wider scatter of values in the pregnant group.

II. Cases under study

(a) Toxaemia of pregnancy.

Serum I C D was estimated in 60 cases of toxaemia of pregnancy of

TABLE I
Serum I C D levels in normal pregnancy

No. of cases	Serum I C D levels in units		Cases with elevated serum I C D (more than 6.5 units)	
	Mean — S.D. †	Range	No.	Percentage
25	4.27 + 1—76	1—9.8	2	8%

varying severity. Out of these, 32 cases were of mild pre-eclampsia, 23 of severe pre-eclampsia and 5 of eclampsia. These cases were between 18-40 years of age. Regarding parity, 25 were primigravidae and 35 were multigravidae and most of the cases were between 33 to 36 weeks of gestation. Serum ICD levels in individual cases in toxæmia of pregnancy are shown in Fig. 3.

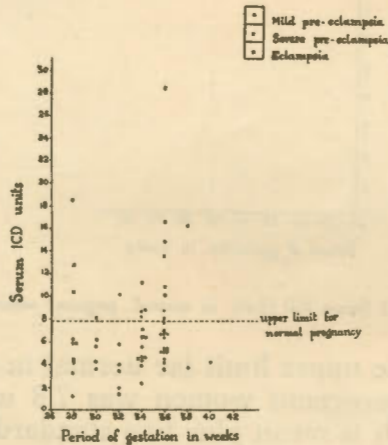


Fig. 3. Serum ICD levels in toxæmia of pregnancy.

(i) Mild pre-eclampsia

In 30 out of 32 cases of mild pre-eclampsia, serum ICD levels were below 7.8 units, which is the upper limit for the cases of normal pregnancy in the present study. Two

cases showed values higher than normal. The mean serum ICD level for cases of mild pre-eclampsia was 4.97 ± 1.49 units (range 1.1—10.1 units). 6.25% cases showed higher values.

(ii) Severe pre-eclampsia

In severe pre-eclampsia, 13 cases out of 23 showed values within normal limit. In 10 cases, elevated levels were found. In 6 cases levels were ranging from 8.1—12 units; in 2 between 12.1—16 units; in one case it was 16.2 and in the remaining one case the value was 28.4 units, the highest value recorded in the whole of the study group. She was 35 years old, multigravida, with 36 weeks of pregnancy. The mean value for this group was 8.63 ± 5.64 units (range 3.3—28.4 units) which was higher than that for normal pregnant women.

(iii) Eclampsia

In all 5 cases were studied. The mean value for the cases of eclampsia was 13.66 ± 4.16 units (range 10.0—18.4 units). All the cases of eclampsia showed higher value than normal. Serum ICD levels in different groups of cases of toxæmia of pregnancy are shown in Table II.

TABLE II
Serum ICD levels in toxæmia of pregnancy

Severity of Toxaemia	No. of cases	ICD activity in units		Cases with elevated values	
		Mean \pm S.D.	Range	No. of cases	Percentage
Mild pre-eclampsia	32	4.97 ± 1.49	1.1—10.1	2	6.25
Severe pre-eclampsia	23	8.63 ± 5.49	3.3—28.4	10	43.48
Eclampsia	5	13.63 ± 4.16	8.7—18.4	5	100.00

(b) Cases of antepartum haemorrhage

Twenty cases were studied in this group. Out of these, 18 cases were of placenta praevia of varying degree and the remaining 2 were of accidental antepartum haemorrhage. The cases studied were between 20-39 years of age; 3 were primigravidae and 17 multigravidae, the maximum number of cases being between 33-36 weeks of pregnancy.

All the 18 cases of placenta praevia showed serum ICD levels within normal limits (7.8 units) but both the cases of accidental antepartum haemorrhage showed higher values, which were 11.8 and 16 units. The mean value for the cases of placenta praevia was 4.5 ± 1.09 units (range 1.4—5.9 units); whereas for the cases of accidental antepartum haemorrhage, it was 13.6 units (range 11.8—16). Serum ICD levels for cases of antepartum haemorrhage are shown in Table III.

The serum ICD levels for individual cases of antepartum haemorrhage and pregnancy complicated with jaundice, are presented in Fig. 4.

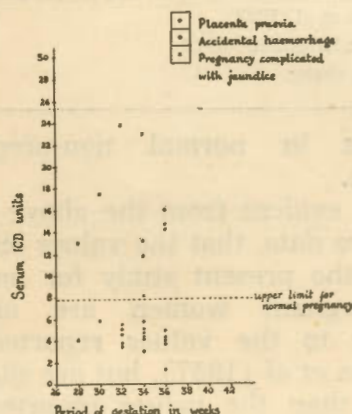


Fig. 4. Serum ICD levels in cases of placenta praevia, accidental haemorrhage and pregnancy complicated with jaundice.

Discussion and Conclusion

Since serum ICD levels have been expressed in different units by different workers, the values expressed by various workers have been con-

TABLE III
Serum ICD levels in antepartum haemorrhage

Cause of haemorrhage	No. of Cases	Serum ICD in units			
		Mean + S.D.	Range	No. of cases	Percentage
Placenta praevia	18	4.5 ± 1.09	1.4—5.9	....	....
Accidental antepartum haemorrhage	2	13.6	11.8—16	2	100

(c) Pregnancy complicated with Jaundice

A total of 8 cases were studied. The cases were between 21 to 38 years of age and were between 28-36 weeks of pregnancy. In all the cases, serum ICD levels were higher than in those for normal pregnant women. The mean value for these cases was 16 ± 5.2 units (range 8.2—23.7 units).

verted into the units used in the present study (Wroblewski units).

I Control Group

The serum ICD in normal non-pregnant women of child-bearing age, ranged from 1.8—6.4 units with a mean of 4.37 ± 1.08 units.

The values obtained in the present study are shown in Table IV, along with the values given by different

TABLE IV
Comparative statement of serum I C D in normal non-pregnant women

Author	No. of cases	I C D levels in units	
		Mean	Range
Welfson et al (1957)	20	3.63 ± 1.86	1.56—8.8
Little & Kirpalani (1962)	38	6.13 ± 2.26	2.66—11.2
Present study	25	4.37 ± 1.08	1.8—6.4

authors in normal non-pregnant women.

It is evident from the above comparative data, that the values obtained in the present study for normal non-pregnant women are almost similar to the values reported by Wolfson *et al* (1957), but are slightly lower than the values reported by Little and Kirpalani (1962). Baron and Bell (1959) reported that the normal range for healthy individuals was 1.15—4.5 units, but the values in our series are higher than their values.

There was negligible variation in the serum I C D levels with age. This finding was in full agreement with Wolfson *et al* (1957); Sterkel *et al* (1958); and Kerppola *et al* (1959); who stated that serum I C D levels were not influenced by age.

The mean serum I C D levels in V.

cases of normal pregnancy were 4.27 ± 1.76 units (range 1—9.8 units). The upper limit for normal in cases of normal pregnant women was 7.8 units (Mean + 2 SD).

Twenty-three out of 25 cases in this group showed values within the same range (6.5 units) as for normal non-pregnant women, whereas the remaining two cases showed values 6.8 and 9.8 units which were higher than for normal non-pregnant women. Similarly, higher values have been reported in some of the cases of normal pregnancy by Dawkins *et al* (1961); Little and Kirpalani (1962) and Jeacock *et al* (1962).

The values obtained in the present study have been compared with the data obtained by various authors in cases of normal pregnancy in Table

TABLE V
Comparative statement of serum I C D in normal pregnancy

Author	No. of cases	Serum ICD levels units		Upper limit for normal women	No. of cases with elevated values
		Mean	Range		
Wolfson et al (1957)	5	3.86 ± 1.2	2.96—5.66	....	....
Dawkins et al (1959)	12	1.7 ± 0.6	....	....	....
Dawkins et al (1961)	50	....	....	3. A	1
Little & Kirpalani (1962)	83	5.96 ± 0.2	2.9—11.33	11.66	1
Jeacock et al (1962)	227	2.86 ± 0.9	1.6—2.6	4.6	Less than 5% Samples.
Present study	25	4.27 ± 1.76	1.0—1.8	6.5	1

From Table V, it is evident that the values obtained in the present study are slightly higher than those reported by Wolfson *et al* (1957) and slightly lower than those reported by Little and Kirpalani (1962).

The values obtained in the present study are higher than the values reported by Dawkins *et al* (1959); Dawkins *et al* (1961) and Jeacock *et al* (1962).

There was no variation in the serum I C D levels with the period of gestation, as has also been observed by Little and Kirpalani (1962) and Jeacock *et al* (1962). Similarly it was found that parity had no appreciable effect; however, in a small series it is difficult to come to any definite conclusion.

I Cases under study

(a) Toxaemia of pregnancy

Mean serum I C D level in cases of mild pre-eclampsia in the present study was 4.94 ± 1.49 units (range 1.1 — 10.1 units) which was almost similar to the mean value for normal pregnant women (4.27 ± 1.7); only 2 cases out of 32 showed values higher than those for normal pregnant women. These values have been compared with the values given by other authors in Table VI.

Thus it is clear that serum I C D levels in cases of mild pre-eclampsia in the present study are slightly lower than the data given by Little and Kirpalani (1962) and slightly higher than given by Jeacock *et al* (1962). Dawkins *et al* (1961) also agree that there is no significant rise in cases of mild pre-eclampsia.

Whatever may be the data given by different authors, all agree that there is no significant rise in serum I C D in cases of mild pre-eclampsia. Only 2 out of 32 cases showed higher values, which is in full accord with Dawkins *et al* (1961); Jeacock *et al* (1962), who also reported 2 and 3 cases respectively with elevated serum I C D.

In cases of severe pre-eclampsia, the mean serum I C D was 8.63 ± 5.49 units (range 3.3 — 24.4 units). Ten cases out of 23 (43.48%) showed values higher than for normal pregnant women. The values of serum I C D obtained in the present study have been compared in Table VII.

From the comparative data given in Table VII, it is evident that the serum I C D levels in cases of severe pre-eclampsia in the present study, are somewhat similar to the values reported by Little and Kirpalani (1962), and are higher than those reported by Jeacock *et al* (1962).

TABLE VI
Comparative statement of serum I C D in mild pre-eclampsia

Author	No. of cases	Serum I C D level In units		Cases with values higher than for Normal pregnant women	
		Mean	Range	No. of Cases	Upper Limit for normal
Dawkins <i>et al</i> (1961)	48	.....	.....	2	3.2
Little & Kirpalani (1962)	25	5.73 ± 0.36	3.93—11.2	.....	.....
Jeacock <i>et al</i> (1962)	23	3.13 ± 2.43	.....	3	4.6
Present study	32	4.97 ± 1.49	1.1—10.1	2	7.8

TABLE VII

Comparative statement of serum I C D in severe pre-eclampsia

Author	No. of cases	Serum ICD level in units		Cases with elevated values
		Mdan	Range	
Dawkins et al (1961)	15	....	....	14
Dawkins et al (1961)	17	....	....	16
Little & Kirpalani (1962)	9	10.55 ± 1.69	6.1—19.47	3
Jeacock et al (1962)	34	3.63 ± 2.43	....	20%
Present study	23	8.63 ± 5.49	3.3—28.4	10

Although the values given by various authors differ, all of them, except Jeacock *et al* (1962), agree that the mean value of serum I C D is raised in cases of severe pre-eclampsia. The present findings are also in agreement with their findings.

The mean serum I C D level in cases of eclampsia was 13.66 ± 4.16 units (range 8.7—18.4 units), show-

reported a mean value of 5.37 units (range 4.23—6.5 units) in 2 cases of placenta praevia.

In both the cases of accidental ante-partum haemorrhage, the serum I C D levels were higher than normal, the values being 11.8 and 16 units. Similarly, raised values have been reported by several authors which are presented in Table VIII.

TABLE VIII

Comparative statement of serum I C D in accidental ante-partum haemorrhage

Authors	No. of Cases	Serum ICD levels in units		Cases with higher values
		Mean	Range	
Dawkins et al (1961)	9	....	2—12	7 (77.7%)
Little & Kirpalani (1962)	3	16.27	12.47—19	3 (100%)
Jeacock et al (1962)	8	....	9.86—12	4 (50%)
Present study	2	13.6	11.8—16	2(100%)

ing a marked rise in serum I C D in all cases of eclampsia.

(b) *Ante-partum haemorrhage*

The mean serum I C D level in cases of placenta praevia was 4.44 ± 1.09 units (range 1.4—5.9 units), which was almost similar to that found for normal pregnant and normal non-pregnant women, showing that there was no alteration in serum I C D in cases of placenta praevia. These findings correspond with those of Little and Kirpalani (1962) who

The levels of serum I C D in the present study for the cases of accidental haemorrhage are slightly lower than the values reported by Little and Kirpalani (1962) and are slightly higher than those reported by Jeacock *et al* (1962). We differ from Jeacock *et al* (1962) in the fact that they reported higher values only in 50% of their cases; whereas in our study both the cases studied showed higher values. However, a large series is to be studied before one can draw a definite conclusion regarding

percentage of cases showing higher values.

(c) *Pregnancy complicated with jaundice*

The mean serum ICD level in cases of pregnancy complicated with jaundice was 16 ± 5.23 units (range 3.2 — 23.7 units). All cases showed higher levels than normal. Similar rise in serum ICD was reported by Little and Kirpalani (1962) in a case of pregnancy complicated with hepatitis, where a value of 39.49 units was reported, which is higher than the value recorded in the present study. It may be possible that their case had a more acute stage of the disease.

Summary

Serum ICD activity was studied in normal non-pregnant women and in cases of normal and abnormal pregnancy, by spectrophotometric method. The mean serum ICD was not influenced by age, normal pregnancy, parity and period of gestation.

The mean serum ICD for cases of mild pre-eclampsia was within normal limits, except in 6.25% cases where a higher value was obtained; 43.48% cases of severe pre-eclampsia and all cases of eclampsia showed higher values. The mean value for cases of placenta praevia was normal. In both cases of accidental antepartum haemorrhage, elevated serum ICD was noted with placental infarction. All cases of pregnancy complicated with jaundice showed higher values.

However, a more detailed work on the problem is required to establish

the significance of serum ICD in pregnancy complicated with diseases involving placental insufficiency.

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