

BIOCHEMICAL STUDY OF AMNIOTIC FLUID (A DIAGNOSTIC AID FOR FOETAL MATURITY)

by

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Search is being constantly made for reliable methods of predicting foetal maturity by the study of amniotic fluid. The organic nitrogenous compounds such as urea, uric acid, creatinine and protein were studied in the amniotic fluid, maternal serum and foetal blood in early pregnancy and at term (Makepeace *et al*, 1931; Wayton, 1953; Friedberg, 1955; McGaughey *et al* 1960; Serr *et al*, 1963; Pitkin *et al*, 1967; Crosignani *et al*, 1969; Gillbrand 1969 and Lind *et al* 1969).

The object of this study is to find out the biochemical changes in amniotic fluid in comparison to maternal serum during the course of pregnancy and to determine the relationship of changes with foetal growth and developments.

Material and Methods

The creatinine, urea and protein were estimated in paired samples of amniotic fluid and maternal serum from 50 mothers with pregnancy varying from 30 weeks to

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42 weeks duration from Kamla Nehru Memorial Hospital, Allahabad. The samples were collected from hind water rupture, amniocentesis, for investigation of Rh iso-immunization and at caesarean section. Creatinine was estimated by method of Folin and Wu I. Urea was estimated by direct nesslerization and protein by Biuret reaction.

Results

The maternal serum creatinine level ranged from 0.50 mg% to 2.0 mg%, while amniotic fluid level ranged from 1.4 mg% to 3.2 mg% during the entire course of pregnancy (Fig 1). Creatinine level in amniotic fluid was higher than in maternal serum upto 1.0 mg% upto 34 weeks of pregnancy, but as the pregnancy advanced the excess was also increased above 1.0 mg% in most of the cases (Fig. 2).

The maternal serum urea level ranged from 16.0 mg% to 34.0 mg% and amniotic fluid urea level ranged from 18.0 mg% to 42.0 mg% during the entire period of pregnancy studied (Fig. 3). Amniotic fluid urea was higher than the maternal serum level as the pregnancy advanced. The excess was upto 5 mg% upto 35 weeks of pregnancy, but above 36 weeks the maximum excess was upto 15 mg%, but

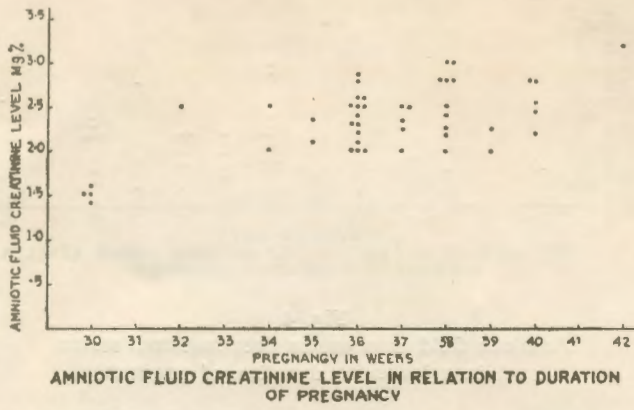


Fig. 1
Amniotic fluid creatinine level in relation to duration of pregnancy.

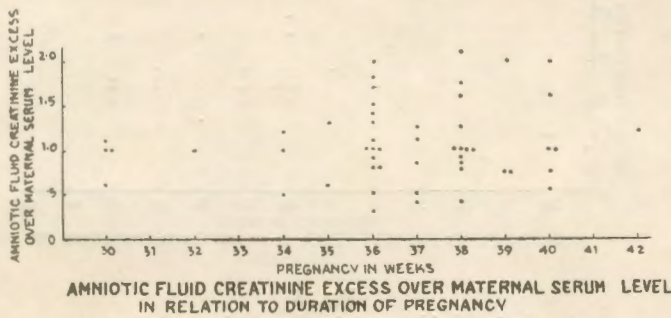


Fig. 2
Amniotic fluid creatinine excess over maternal serum level in relation to duration of pregnancy.

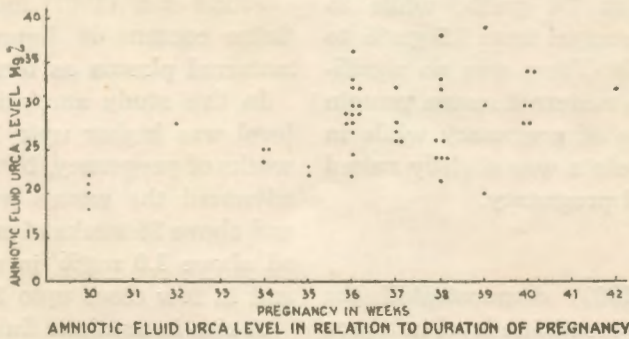


Fig. 3
Amniotic fluid urea level in relation to duration of pregnancy.

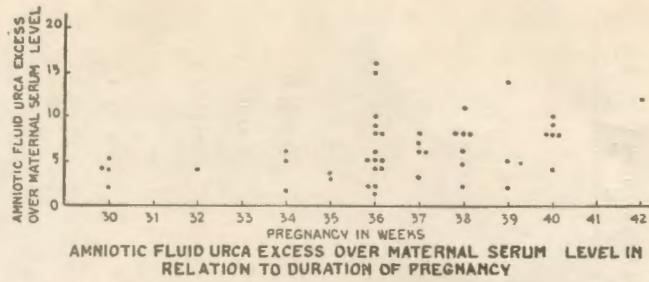


Fig. 4

Amniotic fluid urea excess over maternal serum level in relation to duration of pregnancy.

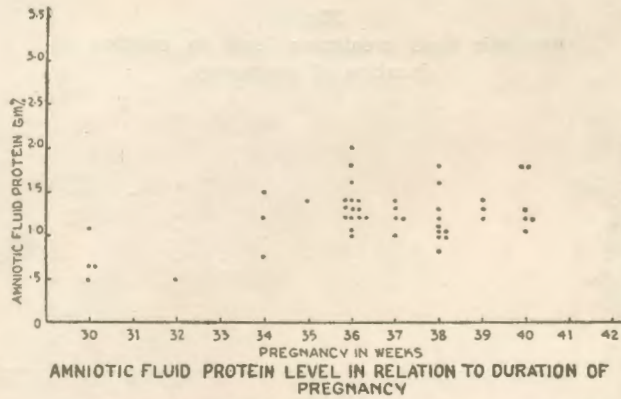


Fig. 5

Amniotic fluid protein level in relation to duration of pregnancy.

above 5 mg% in most of cases. (Fig. 4).

The maternal serum protein ranged from 2.8 gm% to 7.4 gm%, while in amniotic fluid it ranged from 0.5 gm% to 2.0 gm% (Fig. 5). There was no significant alteration in maternal serum protein during the course of pregnancy while in amniotic fluid protein was slightly raised in later period of pregnancy.

Discussion

Lind *et al* (1969) demonstrated the steady rise in the creatinine level in liquor at least after 20 weeks of pregnancy. During the second half of the pregnancy its level was always higher than that of

maternal plasma. In some cases near term it was nearly four times higher.

Pitkin *et al* (1967) found a rise in creatinine content in liquor above that of maternal plasma as term approached.

In this study amniotic fluid creatinine level was higher upto 1.0 mg% upto 34 weeks of pregnancy, but as the pregnancy advanced the excess was also increased and above 36 weeks of pregnancy it reached above 1.0 mg% in most of the cases and in few cases upto 2.0 mg%.

A rise in amniotic fluid urea concentration with advancing pregnancy has been noted in this study. Similar findings were also noted by other workers (Guthmann

and May, 1930; Friedberg, 1955; Sozanskii, 1961; Gillbrand, 1969 and Lind *et al* (1969). A mean amniotic fluid urea excess over maternal and foetal plasma at term was 12.5 mg% (Sozanskii, 1961).

No change in maternal serum urea was noted by Gillbrand (1969) consistent with finding of this study. In this study the excess was upto 5.0 mg% upto 35 weeks of pregnancy but after 36 weeks it was more than 5.0 mg% in most of the cases and reaching maximum upto 15.0 mg% in some cases.

Crosignani *et al*, (1969) found protein concentration in amniotic fluid 1/20th to 1/30th of that maternal serum. Similar findings were recorded by Candiani (1956), Derrington & Soothill (1961), Abbas & Tovey (1960), and Usetegin Gomez *et al* (1966). In the present study it ranged from 1/3 to 1/10.

Makepeace *et al*, (1931), Wayton (1953), Friedberg (1955), McGaughey *et al*, (1960) and Serr *et al*, (1963) have demonstrated that organic nitrogenous compound such as urea, uric acid and creatinine are found in amniotic fluid, maternal serum and foetal blood in similar concentration at early pregnancy but at term the concentration in amniotic fluid is significantly greater than in other two. The present study confirm these findings and there was significant increase of creatinine and urea in the amniotic fluid in comparison to maternal serum after 36 weeks of pregnancy.

Summary

The biochemical study of amniotic fluid and maternal serum of 50 pregnant women of varying duration was done. The concentration of urea, uric acid and creatinine was found significantly higher

at term in the amniotic fluid in comparison to maternal serum. These biochemical changes in the amniotic fluid can be utilized as one of the diagnostic aid to find the foetal maturity.

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