MATERNAL SERUM ALPHA-I-FETOPROTEIN (AFP) LEVELS IN NORMAL PREGNANCY

by

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AFP is an embroy specific protein, which is ordinarily undetectable in serum of adults by conventional methods of low sensitivity. It contains 4.3% of carbohydrate, containing of 2.2% Hexose, 1.2% hexosamine and 0.9% sialic acid (Seppala and Ruoslahti, 1972). The presence of protein specific to fetus in the maternal serum might provide the basis for a rapid screening test which can predict sufficiently early, the presence of fetal distress and other congenital malformations of the fetus. (Seppala and Rouslahti, 1973 and Brock *et al*, 1973).

The present study was undertaken to measure AFP in maternal serum during different gestational periods and to assess its value as diagnostic and prognostic marker.

Material and Methods

A total of 25 healthy pregnant females were taken from out patient, Gynec. & Obstet. Dept., S.N. Medical College, Agra. A detailed history was taken with special reference to any liver disease and clinical examination was conducted.

AFP was estimated by single radial immudiffusion method Mancini *et al* (1965), using M-partigen immuno-diffusion plates (Behring Diagnostic, Germany Lot N.A 0 611A). 5 uml serum was applied in each well and 5 uml of standard in 3 dilutations (1:4, 1:2, 1:1) were applied to set the reference curve. With the help of this interpolated graph, AFP was measured in unknown samples.

Observations

Mean age of 25 pregnant females was 24.2 ± 7.6 years, (range 18-40 year). 20% were primipara and rest 80% multipara. Six females were in first and second trimester each and rest 13 females were in 3rd trimester of pregnancy.

In first trimester mean AFP levels ranged from 42-190 ng/ml with a mean of 136.4 ± 58.3 ng/ml. In second and third trimesters AFP levels increased upto 207.9 ± 66.5 ng/ml and 241.2 ± 64.5 ng/ml, respectively (Table I).

AFP levels were first detected in 8th week of Intrauterine life. The peak of AFP levels reached in 13-18 weeks of

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TABLE I
Maternal Serum AFP Levels in Different Trimesters of Pregnancy

Trimester	Mean ± S.D. (ng/ml)	Range
I	136.4 ± 58.3	42-190
II	207.0 ± 66.5	110-308
III	241.2 ± 64.5	127-392

gestational age. Again, the rise of AFP levels was noted after 25th week of intrauterine life (Table II). After delivery, AFP levels became almost undetectable within 15 days.

TABLE II
Mean Serum AFP Levels at Different Gestational Age

Weeks	n =	Mean AFP level (ng/ml)
6-12	6	136.4 ± 58.3
13-18	2	272.5 ± 50.2
19-24	4	174.2 ± 47.4
25-32	8	238.9 ± 26.1
33-40	5	244.8 ± 106.2

TABLE III
Serum AFP Levels After Delivery

	Mean AFP levels (ng/ml)
1st Day	116.0 ± 33.6
5th Day	57.0 ± 14.3
7th Day	27.0 ± 9.6
15th Day	—

AFP levels rose significantly in those mothers, who delivered a female child, as compared to others, who delivered a male child.

Discussion

AFP is an Alpha-I-globulin normally present in high concentration in fetal serum but in only very small amounts thereafter. It is composed of a single polypeptide chain with a m.w. of 17,000 by gel-electroproresis (Seppala and Ruoslahti, 1971). The role of AFP is useful since the assay was originally applied by Brock and Sutcliffe (1972) in the diagnosis of open-neutral tube defect.

In the present study, AFP was estimated by M-partigen immunodiffusion plates which has monospecific antiserum against AFP. AFP was first detected at 8th week of gestation. During 6-12 weeks, mean serum AFP levels were 136.4 ± 58.3 ng/ml. These levels rose to almost double during 13-18 weeks of gestation. After that a significant fall was observed ($P < .001$), during 19-24 weeks. However, a further, significant rise was noted thereafter, till delivery. After delivery, on the first day mean AFP level was 116.0 ± 33.6 ng/ml, which became undetectable after 15 days. Thus, a significant rise in AFP levels during different trimesters of pregnancy was observed and later, significant fall was noted.

Most of the datas have been furnished by Seppala and Rouslahti (1971) and found increasement in the levels of AFP

TABLE IV
Comparison of AFP Levels in Relation to the Sex of the Baby

Sex of the baby	Period of	n	Mean AFP levels (ng/ml)	
Male	28-36	4	*208.0 ± 77.5	*P<.05
Female	28-36	3	294.3 ± 85.0	

during pregnancy with advancing gastation and almost unrecordable after delivery. In 79, pregnancy serapositive, AFP level during 1st trimester was 18-119 ng/ml, during IInd trimester 96-312 ng/ml. and during IIIrd trimester 103-550 ng/ml.

Ishiguro and Nishimura (1973) first demonstrated AFP levels at 14 weeks of gestation. Maximum level in the series was 386 ng/ml. The AFP levels decreased after delivery and were almost negligiable by 20th day after delivery.

Hay *et al* (1976) made serial measurements of AFP in 63 normal pregnancies and detected as early as at 10 weeks of gestation and showed a gradual rise until 32 weeks, after which the levels declined.

Further, an attempt was made to correlate AFP levels with prenatal determination of sex and it was found that high levels were achieved earlier in gestation in female fetuses. The similar observation has also been earlier noted by Hay *et al* (1976). A detailed study is required in this direction to confirm the role of AFP in determination of prenatal sex of the baby, which is in progress.

Summary

AFP was estimated in 25 healthy pregnant females by single radial-immuno-diffusion methods, using M-partigen immuno-diffusion-plates. AFP levels were first detected at 8th week of gestation and later rose significantly upto 18th week of gestation. A significant fall was noted during 19-24 weeks and thereafter, a significant rise was observed till delivery. After delivery, AFP levels were almost undetectable within 15 days of delivery. High levels of the protein were achieved earlier by mothers who delivered female fetuses, which denotes its role in the determination of prenatal sex of the baby.

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