

# AMNIOTIC FLUID CYTOLOGY AS AN INDICATOR OF FOETAL MATURITY

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Amniotic fluid assesment is an important indicator of foetal maturity. The significance of its estimation increases many times in 'high-risk' pregnancies.

Amniotic fluid assesment can be biochemical or cytological. The basis of cytological examination of amniotic fluid were the presence of lanugo hairs (Phillip and Williams, 1929) and foetal squamous cells (Bourgeois, 1942) in vaginal secretions and smears respectively. However, orange staining, fat laden cells were first demonstrated by Kittrich (1963). Later other workers have confirmed the presence of these orange cells (Brosens and Gorden, 1967; Sunandabai *et al*, 1972). Brosens and Gorden (1965) have also demonstrated the presence of a blue staining cell in addition to the orange cells.

## Material and Methods

One hundred cases attending Kamala Nehru Memorial Hospital, Allahabad for

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confinement or medical termination of pregnancy were selected for this study. The cases have been divided in two groups—81 cases of normal pregnancy (Group A) and 19 cases of toxæmia of pregnancy (Group B).

Amniotic fluid was obtained either by amniocentesis, amniotomy or during caesarean sections. The amniotic fluid was examined cytologically after staining with Nile blue sulphate (Brosens and Gorden, 1965). 200 cells at random were counted in the slide prepared and three slides from each sample were examined.

The maturity of the foetus was established by using other accepted parameters like gestational age, birth weight, crown heel length and head circumference.

## Observations

Amniotic fluid was studied microscopically and the results tabulated according to the following four points:

(a) number of nucleated and anucleated cells (b) number of orange cells. (c) presence of fat globules (d) presence of clusters of orange cells.

Orange cells were few and scattered before 32 weeks and thereafter gradually increased till term.

Table I shows the relationship of orange

TABLE I  
Relationship of Orange Cell Percentage With Period of Gestation

Groups	Gestation in weeks	No. of cases	Orange cell percentage	Statistical Comparison		
				Groups comp.	t	P
Normal (A)	1. <32	13	0%	1 & 2	2.02	>.05
	2. 32-34	4	1.5 ± 1.29	1 & 3	9.16	<.001
	3. 35-36	8	8.25 ± 2.4	1 & 4	23.11	<.001
	4. 37-40	42	31.8 ± 8.96	3 & 4	14.42	<.001
	5. 41-42	14	51.14 ± 5.92	3 & 5	22.9	<.001
Toxaemia (Group B)	1. <32	Nil	—	—	—	—
	2. 32-34	3	0.66 ± 0.57	2 & 3	—	<.05
	3. 35-36	3	0.7 ± 2.64	3 & 4	4.03	<.001
	4. 37-40	12	36.3 ± 5.44	2 & 4	13.8	<.001
	5. 41-42	1	47.0	—	21.2	—

cell percentage to the period of gestation. The percentage increased significantly in both groups after 32 weeks of gestation ranging from 1.5% to 51.14% in Group A and .66% to 47% in Group B.

Table II shows the relationship of orange cell percentage with the crown heel length of the baby. The increase in percentage of orange cells was highly significant in both the groups. The percentage increased from 1.5 to 28.4% and from 4.5 to 26.58% in both the groups respectively when the crown heel length increased from 35 cms to 45 cms.

Table III shows the relationship of head circumference with the orange cell per-

centage. With an increase of the head circumference from 25 cms to 33 cms, the percentage of orange cells increased to 39.67 from 5.25% and 24.6 to 2.66% in Groups A and B respectively.

Table IV shows the relationship of the birth weight with the orange cell percentage. With an increase in birth weight from 1 Kg to 3 Kg, the percentage increased to 34.76 and 38.66 respectively in both the groups.

Table V shows the relationship of orange cell percentage to the maturity of the baby. All babies were preterm when the percentage was below 10% in both the

TABLE II  
Relationship of Orange Cell Percentage With the Crown Heel Length

Groups	Crown heel length in cms	No. of cases	Orange cell percentage	Statistical Comparison		
				Groups comp.	t	P
Normal (A)	1. 35.0-40.0	4	1.5 ± 1.29	1 & 2	13.3	<.001
	2. 40.1-45.0	47	28.4 ± 12.36	2 & 3	7.64	<.001
	3. 45.1-50.0	16	50.87 ± 9.04	1 & 3	16.79	<.001
Toxaemia (Group B)	1. 35.0-40.0	4	4.5 ± 4.5	1 & 2	4.44	<.001
	2. 40.1-45.0	12	26.58 ± 14.21	2 & 3	3.44	<.001
	3. 45.1-50.0	3	43.0 ± 3.6	1 & 3	11.8	<.001

TABLE III  
Relation Between Orange Cells and Head Circumference

Groups	Head circumference in cms	No. of cases	Orange cell percentage	Statistical Comparison		
				Groups comp.	t	P
Normal (A)	1. 25.0-30.0	4	5.25 ± 3.66	1 & 2	5.32	<.001
	2. 30.1-33.0	26	24.03 ± 14.20	2 & 3	4.52	<.001
	3. 33.1-36.0	37	39.67 ± 11.97	1 & 3	11.8	<.001
Toxaemia (Group B)	1. 25.0-30.0	3	2.88 ± 2.66	1 & 2	3.27	<.001
	2. 30.1-33.0	8	24.6 ± 16.9	2 & 3	1.91	>.05
	3. 33.1-36.0	8	37.62 ± 6.75	1 & 3	11.0	<.001

TABLE IV  
Relationship of Orange Cell Percentage With the Birth Weight

Groups	Birthweight in Kgs.	No. of cases	Orange cell percentage	Statistical Comparison		
				Groups comp.	t	P
Normal (A)	1.1. 0-2.5	28	18.28 ± 14.42	1 & 2	4.63	<.001
	2.2.51-3.0	25	34.76 ± 9.16	2 & 3	4.25	<.001
	3.3. 1-4.0	15	48.13 ± 9.48	1 & 3	7.69	<.001
Toxaemia (Group B)	1.1. 0-2.5	6	13.00 ± 14.4	1 & 2	4.84	<.001
	2.2.51-3.0	9	38.66 ± 3.88	2 & 3	0.12	>.05
	3.3. 1-4.0	4	39.25 ± 7.67	1 & 3	0.91	<.01

TABLE V  
Relationship of Orange Cell Percentage to the Maturity of the Baby

Orange cell percentage	Foetal Maturity by Clinical exam. (Group A)		Foetal Maturity by Clinical exam. (Group B)	
	Preterm	Term	Preterm	Term
	(no. of cases)	(no. of cases)	No. of cases	(no. of cases)
1-10	23	—	5	—
11-15	2	2	—	—
16-20	—	5	—	—
21-30	—	13	—	3
31-40	—	13	—	7
41-50	—	15	—	3
>50	—	7	—	—

groups. All babies were term when the percentage was 20% or above.

#### Discussion

Orange cells were few and scanty before 32 weeks of gestation (Table I). The

percentage of cells increased significantly after 36 weeks i.e. from  $8.25 \pm 2.4\%$  to  $31.9 \pm 8.96\%$ . After 40 weeks the average value was  $51.14 \pm 5.92\%$ . Small clusters of orange cells and later large clusters appeared as the period of gesta-

tion increased. Free fat globules were observed after 38 weeks. Absence of orange cells or counts below 10% in early stages of gestation have been reported by Brosens and Gorden (1966) Sunandabai *et al* (1972). However, Mehrotra *et al* (1974) have found the count to be as high as 40% at 35-36 weeks.

Sharma and Trussel (1970) have found the cell count of more than 10% after 36 weeks as observed by us also. However, Sharp (1969) did not find any significant increase. In contrast, Anderson and Griffith (1968) found both high and low percentage of orange cells after 36 weeks as compared to the significant increase in orange cell percentage in our study.

#### *Relation with birth weight, head circumference and crown heel length*

Increase in birth weight, head circumference and crown heel length of the baby was directly proportional with the increase in orange cell percentage (Tables II, III and IV). The increase was significant in most of the cases. An orange cell percentage of  $37.76 \pm 9.16\%$  was compatible with a birth weight of 2.51 to 3 Kg, a count near to that which was found with 37-40 weeks gestation. Similarly, a count of  $37.63 \pm 6.75\%$  was observed with a head circumference of 33.1-36 cms which was compatible with the count at 37-40 weeks.

#### *Relation with maturity of the baby*

All babies were preterm when the orange cell count was below 10% (Table V) corresponding to a count found at 32-34 weeks gestation.

All babies were term at a count of 20% or more (Table V). However, Mehta *et al* (1979) reported 60% term babies with a count of 20%.

#### *Accuracy of results*

At a count of 20%, the accuracy of prediction was 100% with no false positive

results. Similarly, Morrison *et al* (1977) found more than 98% accuracy, specially in complicated pregnancies. However, Mehta *et al* (1979) have reported 60% accuracy with some false positive results.

#### *Summary*

Cytological examination of amniotic fluid was done in 100 cases.

An orange cell count of less than 10% was found between 32-34 weeks of gestation. A count of 10% or less indicated that all babies were preterm while a count of 20% or more indicated that all babies were term.

The orange cell percentage was not altered due to toxæmia of pregnancy.

#### *References*

1. Anderson, A. B. M. and Griffith, A. D.: J. Obstet. Gynaec. Brit. C'wlth 75: 300, 1968.
2. Bourgeois, G. A.: Am. J. Obstet. Gynaec. 44: 80, 1942.
3. Brosens, I. and Gorden, H.: J. Obstet. Gynaec. Brit. C'wlth 72: 342, 1965.
4. Brosens, I. and Gorden, H.: J. Obstet. Gynaec. Brit. C'wlth 73: 88, 1966.
5. Brosens, I. and Gorden, H.: Obstet. Gynaec. 30: 652, 1967.
6. Kittrich, M.: Geburtsh. V. Frauenheilk. 23: 156, 1963.
7. Mehrotra, V. G., Mukherjee, K., Pande, M. and Mukherjee, M.: J. Obstet. Gynaec. India 24: 226, 1974.
8. Mehta, H. C., Kapoor, U., Dhatt, P. S. and Singh, H.: J. Obstet. Gynaec. India. 29: 530, 1979.
9. Morrison, J. C., Whybrew, W. D. and Wisner, W. L.: Obstet. Gynaec. 49: 20, 1977.
10. Phillip, E. and Williams, J. W.: Zbl. Gynak. 53: 1618, 1929.
11. Sharma, S. D. and Trussel, R. R.: J. Obstet. Gynaec. Brit. C'wlth. 77: 215, 1970.
12. Sharp, F.: J. Obstet. Gynaec. Brit. C'wlth. 75: 812, 1968.
13. Sunandabai, K., Rohatagi, P., Lahiri, B., and Agnihotri, M.: J. Obstet. Gynaec. India 22: 151, 1972.