J. of Obst. & Gyn. of India Vol. 51, No. 3 : May/June 2001 Pg 86-89

Foetal Cord Prolactin in Normal and Abnormal Pregnancies.

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Summary

The study was on 54 new borns of normal mothers and 21 new borns of complicated pregnancy to establish a relationship between umbilical cord serum prolactin levels and gestational age, neonatal lung function and maternal complication. Serum cord prolactin level increased from 86 to 326 ng/ml from 24 to 42 weeks of gestation ($P<0.05$) in both normal and complicated pregnancies. A highly significant correlation was demonstrated between cord serum prolactin level and birth weight ($P<0.001$). Infant who developed RDS has a significant ($P<0.001$) low level of serum prolactin (162.5±26.4 ng/ml) as compared to that of non RDS counter parts of similar gestational age (272.6±34.9 ng/ml). The neonates with an Apgar score of 7 or less had significantly ($P<0.001$) lower serum prolactin level (187.3±13.6 ng/ml) than those with Apgar score more than 7)272.3±23.4 ng/ml). New borns of hyper tensive mothers showed higher mean cord serum prolactin levels (291.8 to 316.4 ng/ml) than normal (283.1 to 312.3 ng/ml), while babies of Diabetic mothers had low levels (234 to 286 ng/ml) and developed RDS. Thus the risk that RDS will develop considerably less in a new born who has a high serum prolactin level than in new-born of similar gestational age with low cord serum prolactin level.

Introduction

The role of prolactin in lactation and the factors that regulate pituitary prolactin production in adult human are reasonably well characterized. On the other hand, the determinants of fetal pituitary prolactin and the role circulating prolactin serves, in the developing human are less well established. Two tissues in the fetus that may be regulated by prolactin are the lung and adrenal cortex. Survival of the newborn infant depends primarily on its ability to establish effective ventilation. This ventilation is directly related to the presence of pulmonary surfactant in sufficient quantity to ensure alveolar stability. The development of RDS in neonates is associated with deficient production of pulmonary surfactant, several hormones have been demonstrated to affect 'tetal lung maturation and surfactant production. Prolactin is the latest hormone added to the list.

The relative importance and the mode of action of prolactin is unclear at present. Since prolactin is present in very high concentrations in amniotic fluid and prolactin receptors are present in lung preparations prolactin might act as a direct trigger of lecithin synthesis or in a 'chain also be only an indicator of the degree of lung maturation.

Material and Methods

The present study was conducted on randomly selected new borns delivered at SRN Hospital and K.N.M. Hospital. The study included 75 newborns which were divided into two groups: Grade I includes 54 cases of normal pregnancies and their new borns. And grade II 21 cases of complicated pregnancy and their new borns. A detailed history of the mothers was taken and a thorough examination of each case was done. The gestational period was calculated from the first day of the last menstrual period and if not known, by ultrasonography and later by the examination of the new born.

The mode of delivery was noted. The newborn examined for estimation of gestational age. The Apgar score was noted at 1 minute after birth. The birth weight was taken.

Presence or absence of RDS was determined by:

1. respiratory rate (RDS if RR>60/mt)
2. presence of subcostal and intercostals recession
3. diminished air entry in the lungs.

Three ml of mixed umbilical arterial and venous blood collected in a plain vial just after delivery of the new born. The sample was kept at room temperature. After clot formation the serum was separated and centrifuged. Supernatant serum was stored in plain vials at –20°C. Estimation of prolactin in the serum was done by Lee Bead Prolactin Enzyme Immunoassay in vitro diagnostic kit. This employs a multiple polyclonal antibody enzyme immunoassay mechanism for quantitative determination of human prolactin hormone in serum.

Results

Cord serum levels increased gradually with advancing gestational age ranging from 86 to 320 ng/ml in newborns between gestational ages of 24 and 42 weeks. When individual serum levels of prolactin were analysed as a function of gestational age, significantly positive correlation was noted (r-0.27, P<0.05) (Table I).

When serum prolactin levels were sub-divided according to gestational age groups a significant variation as a function of gestational age was noted (P<0.001) Table II).

In present study a highly significant positive correlation was recorded between serum prolactin levels and birth weight (r=0.62, P<0.001) indicating that serum prolactin levels increase with birth weight (Table III).

Table III: S. Prolactin levels in relation to birth weight

Birth weight	No.	S. Prolactin levels		
		Range ng/ml	Mean ng/ml	SD
2.5 kg	23	86-192	121.46	16.32
2.6-3.5 kg	48	196-290	227.54	29.41
3.5 kg	4	298-320	312.70	22.67
		P<0.001	r=0.62	

The mean prolactin levels in newborns without RDS was 272.6±34.09 ng/ml i.e. 200ng/ml as compared to 182.5±264 ng/ml i.e. 200 ng/ml in those with RDS (Table IV).

Table IV: Cord serum prolactin levels and RDS

	n	Range	Mean	SD	P
Without RDS	64	94-320	272.6	34.91	-
With RDS	11	86-240	182.5	26.42	<0.001.

The newborns who had an Apgar score of less

Table I: Cord serum prolactin levels at different gestational age

Gestational age	Serum prolactin levels (ng/ml)							
	Uncomplicated Pregnancy				Complicated pregnancy			
Weeks	n	Range	mean	SD	n	Range	Mean	SD
24-28	3	86-106	95.30	82.20	-	-	-	-
28-31	2	142-232	187.00	45.86	2	130-226	178.00	48.0
31-34	2	152-240	196.00	44.60	2	163-260	211.49	48.5
34-37	15	260-316	283.07	17.80	10	256-316	265.40	14.3
37-42	32	274-320	312.25	16.18	7	250-326	314.40	20.1
				r=0.27	p<0.05			

Table II: Cord Serum, Prolactin levels and birth weight in different gestational age groups

	Gestational age group				
	24-28 wks	28-31 wks	31-34 wks	34-37 wks	37-42 wks
Prolactin Level (ng/ml)	95.3±8.22	182.5±46.7	203.75±41.94	275.96±31.4	312.63±18.9
Mean Birth weight (gms)	1033.3±124.7	1550±626.5	1825±147.0	2142±116.6	2837±26.3
n	3	4	4	15	49
			P<0.001		

than seven at 1 minute had a mean serum prolactin levels of 183.7 ± 13.6 ng/ml as compared to 272.3 ± 23.34 ng/ml with Apgar score 7 (Table V).

Table V: Serum Prolactin and Apgar Score

Apgar score At 1 min.	n	Prolactin levels (ng/ml) Range	Mean	SD	P value
7	13	86-298	187.3	13.6	-
7	62	194-326	272.3	23.4	<0.001

In pregnancy induced hypertension cases, mean prolactin concentration was significantly higher than in uncomplicated pregnancies (i.e. P<0.001). The only case of essential hypertension delivered at 33 weeks of gestation had a comparatively high prolactin level (30.2 ng/ml). Out of the two new borns of diabetic mothers, the one of 34 weeks gestation had prolactin concentration of 234 ng/ml and developed RDS. The other baby of term gestation showed cord serum prolactin levels of 286 ng/ml and did not develop RDS (Table VI).

Discussion

Cord serum prolactin concentration increased gradually with advanced gestational age between 24 and 42 weeks. A highly significant variation as a function of gestational age (P<0.001). was noted when serum prolactin level were subdivided according to gestational age groups and also between prolactin level and birth weight. This suggests that the pituitary gland of fetus does synthesise and secrete prolactin early in gestation and there is a progressive increase in its secretion during the last trimester of pregnancy. In accordance with our data Winter's et al (1975) Smith et al (1979) Parker et al (1989) also observed a significant positive correlation between cord serum level prolactin and gestational age as well as with birth weight (P<0.001).

In the present study the serum prolactin levels in infants with RDS were significantly lower than those with RDS (P<0.001) raising the possibility that prolactin may influence lung maturation in the foetus by stimulating surfactant formation. Our observations correlate well with the findings of Gluckman et al (1978), Smith et al (1979), Grosso et al (1980) Parker et al (1989) They stated that newborn who subsequently develops RDS have relative deficiency of serum prolactin levels at the birth when compared with infants of similar gestational age who have normal lung functions. In contrast to study of above authors we found a significant correlation (PN0.001) between low serum prolactin and poor Apgar score.

In pregnancy induced hypertension cases the mean cord serum prolactin concentration (296.7 ng/ml) was significantly higher than in complicated pregnancies (P<0.001) but the correlation of prolactin level with RDS had no statistical significance (P<0.01). Similar were the observations of Grosso et al (1980) and Parker et al (1989), who found that with in each gestational age group cord prolactin level from newborn of women with PIH exceded those from infants of women with normal pregnancy.

In the present study the mean prolactin level in new borns of diabetic mothers was low i.e. 260 ng/ml as compared to 276.3 ng/ml in uncomplicated pregnancies. Saltzman et al (1986) also observed significantly low cord serum prolactin level in outcomes of diabetic pregnancies and postulated that decreased foetal prolactin level may be associated with or contribute to the delayed lung maturation with diabetic pregnancies.

Conclusion

On the basis of the results of analysis it seems reasonably clear that during the last trimester of pregnancy the risk of RDS is considerably less in a new born, who has high, serum prolactin level than in a new

Table VI: Umbilical cord serum levels of prolactin in relation to pregnancy complications

	Gestational age group				
	24-28Wks	28-31Wks	31-34Wks	34-37Wks	31-34Wks
Uncomplicated pregnancy	95.3±82 (n=3)	187±45.9 (n=2)	196±44.6 (n=2)	283.1±17.8 (n=15)	312.3±16.2 (n=32)
Pregnancy induced hypertension	-	178±48 (n=2)	-	291.8±20.4 (n=6)	316.4±19.3 (n=5)
Chronic hypertension	-	-	-	302 (n=1)	-
Diabetes	-	-	234 (n=1)	-	286 (n=1)
Others	-	-	260 (n=1)	253+16.3 (n=3)	284 (n=1)

born of similar age who has a low serum prolactin level. The association of lower prolactin level in cord blood and the occurrence of RDS in neonates raises the possibility that prolactin may influence lung maturation in the human fetus.

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