RESULTS

RESULTS

Our study group included 100 pregnant mothers at delivery and their corresponding newborns. The individual data of this group are shown in appendix. They included maternal and neonatal characteristics, as well as,hematological and biochemical parameters.

TABLES AND FIGURES :

* **Table (1)** demonstrates the mean values of maternal characteristics.

* **Table (2)** demonstrates the mean values of neonatal characteristics.

* **Table (3)** shows the mean values of maternal-neonatal hematological and biochemical parameters at birth compared to each other. The mean value of cord S. vit. A (μg/dl $\pm$ SD) was 23.1 $\pm$ 4.4 μg/dl and ranged from 13.2 to 33.9 μg/dl. Plasma RBP was measured in 57 newborn infants only. The mean value was 2.3 $\pm$ 0.8 mg/dl and ranged from 1.2 to 4.5 mg/dl. The mean values of plasma vit. A and RBP in cord blood were much lower than the corresponding levels obtained from their mothers.

The mean value of S. vit. A in maternal (mat.) venous blood was 34.6 $\pm$ 5.9 μg/dl and ranged from 21 to 49.6 μg/dl. Mean plasma value of RBP in mothers was 3.5 $\pm$ 1.0 mg/dl, that ranged from 1.2 to 5.8 mg/dl.

biochemical parameters. Significant correlations have been found between mat. serum vit. A (s. vit. A) and mat. age, height, MAC, and serum RBP (s. RBP). Similar findings were reported between mat. s. RBP and mat. parity, hemoglobin, hematocrit, and s. vit. A.

* **Table (5)** demonstrates the neonatal correlation matrix between different neonatal characteristics, hematological and biological parameters. There were significant correlations between cord serum vit. A (s. vit. A) and all neonatal parameters. Regarding cord serum RBP (s. RBP), significant correlations were shown with all neonatal parameters except head circumference, fetal hemoglobin and hematocrit.

Fig. (4 & 5) represent the significant correlations between the birth weight and cord serum vit. A and RBP.

Fig. (6 & 7) demonstrate similar significant correlations between fetal hemoglobin and cord serum vit. A and RBP.

* **Table (6)** shows the correlation matrix between some maternal and neonatal parameters. Maternal serum vit. A had significant correlations with calf circumference and cord serum vit. A of corresponding newborns. Also, mat. serum RBP correlated significantly with cord serum RBP.

* **Table (7)** shows the influence of maternal age and parity on plasma Vit. A levels in mat. venous and cord blood. We divided the mothers into two parity groups (1st and 2nd paras, and 3rd paras and more) and into three age groups (< 25 yr, from 25 to 29 yr, and 30 yr and more). The ANOVA indicated a significant difference in mat. S. Vit. A levels between the 3-age groups in women with parity ≤ 2 and in the entire group ($P < 0.02$). This relationship was not observed in cord S. Vit. A. When we applied the T test between the 2-parity groups, we found insignificant difference between plasma Vit. A values in mat. venous and cord blood. Accordingly, mat. age and parity have no affection on neonatal plasma vit. A values.

* **Table (8)** presents the affection of mat. age and parity on serum levels of RBP. The difference between the two parity groups was statistically significant ($P < 0.02$) in mothers aged 30 yr or more. Low parity group had a higher RBP level than the high parity one. Also, a significant difference in mat. S. RBP levels was found between the 3-age groups in women with low parity ($P < 0.05$). There was no influence for mat. age and parity on cord S. RBP.

* **Table (9)** demonstrates maternal and neonatal vit. A and RBP distribution according to residence. Sixty-one percent of mothers came from rural areas and 39% belonged

to urban places. The mean plasma values of vit. A of mothers were 33.4 ± 5.2 µg/dl in rural areas and 36.5 ± 6.2 µg/dl in urban areas. The difference was statistically significant (P <0.01). The corresponding mean values of cord S. vit. A were 22.2 ± 3.9 µg/dl and 24.4 ± 4.8 µg/dl respectively. The difference was statistically significant also (P <0.02). No significant differences have been found between plasma levels of RBP in mat. venous or cord blood according to residence.

Fig. (8) illustrates the distribution of mean plasma values of maternal and neonatal Vit. A according to residence.

Fig. (9) illusrates the distribution of mean plasma values of mat. and neonatal RBP according to residence.

* **Table (10)** demonstrates that 74% of the study group belonged to low social class (LSC) and the remaining 26% belonged to middle social class (MSC). The mean values of mat. S. Vit. A were significantly different (P <0.05) between the two social classes. The corresponding cord S. Vit. A levels were also significantly different (P <0.02). No significant differences have been found between plasma levels of RBP in mat. venous or cord blood according to residence and social class.

Fig. (10) illustrates the distribution of mean plasma values of vit. A in mat. venous and cord blood according to social class.

Fig. (11) shows the distribution of mean plasma values of RBP in mat. venous and cord blood according to social class.

* **Table (11)** shows insignificant difference in birth weight ($P > 0.4$) between rural and urban areas.

* **Table (12)** shows a statistically significant difference in birth weight ($P < 0.05$) between different social classes.

* **Table (13)** shows the influence of fetal sex on some neonatal parameters. No significant influence has been found on birth weight, cord S. vit. A and cord S. RBP levels. On the other hand, significant differences have been reported in P.I. ($P < 0.04$) and fetal Hb ($P < 0.04$) between male and female infants. Male neonates have higher values of P.I and Hb.

* **Table (14)** indicates significant differences in cord serum total protein (s. Tot. Ptn) and serum albumin (s. Alb) between different levels of birth weight ($P < 0.001$ and $P < 0.004$ respectively). We classified birth weight into 3 groups (≤ 2.5 kg, from 2.55 to 3.5 kg, and > 3.5 kg). The t test for each two groups indicate a significant difference also, except in S. Alb between the 2nd and 3rd group ($P < 0.08$).

* **Table (20)** shows the relationship between birth weight and ponderal index (P.I.), and different levels of cord S. vit. A (< 21 μg/dl, from 21 to 24.9 μg/dl, and 25 μg/dl and more). The ANOVA indicated significant differences in birth weight ($P < 0.001$) and P.I. ($P < 0.03$) between the 3-Vit. A levels.

* **Table (21)** demonstrates the significant difference in cord blood hemoglobin ($P < 0.001$) and hematocrit ($P<0.001$) between the 3-levels of cord serum vit. A.

* **Table (22)** shows the statistical difference in cord serum total protein, serum albumin, and serum RBP between the 3-levels of cord serum vit. A ($P <0.001$).

* **Tables (23 and 24)** represent the influence of mat. anthropometric measurements as independent factors on birth weight, cord s. vit. A and RBP. as dependent factors. We have two groups of mothers according to body mass index (BMI) (normal and high) and three groups according to percentiles of mid-arm circumference (MAC) (< 25th percentile, 25th-75th percentile, and > 75th percentile) There was no significant difference in the neonatal factors between the 2-BMI groups or the 3-MAC groups.

Table (1) : Mean ± S. D.* and range of maternal characteristics .

	Age (yr)	Parity	Weight (kg)	Hight (Cm)	MAC** (Cm)
Mean ± SD	26.5 ± 4.5	2.9 ± 2.1	72.3±14.4	158.1±6.3	28.4±3.9
Range	20 – 45	1 – 12	51 – 116	143 – 176	22 – 43

* S. D. Standard deviation

** MAC = Mid - arm circumference

Table (2) :Mean ± S. D. and range of neonatal characteristics at birth .

	Birth Weight (kg)	Supine Length (Cm)	Head Circ. ! (Cm)	Chest Circ. (Cm)	MAC !! (Cm)	Calf Circ. (Cm)	Thigh Circ. (Cm)	Gestation (Wk)
Mean ± S.D.	3.4 ± 0.6	49.7 ± 2.4	34.4 ± 1.6	32.8 ± 2.1	10.5 ± 1.3	10.9 ± 1.3	15.7 ± 1.7	39.8 ± 1.4
Range	1.6 – 4.7	43 – 54	28.5 – 39	26 – 37.5	7 – 13.5	7 – 14	11 – 20	37 – 42

! Circ. = Circumference

!! MAC = Mid-arm circumference

Table (3) :Mean ± S. D. and range of maternal-neonatal hematological and biochemical parameters at birth.

	Hb [a] (g/dl)	Hct [b] (%)	Tot. ptn [c] (g/dl)	S. Alb [d] (g/dl)	Vit. A [e] (µg/dl)	RBP [f] (mg/dl)
Meternal						
Mean ± S.D.	11.7± 1.7	42.6 ± 8.5	6.7 ± 0.8	3.7 ± 0.6	34.6 ± 5.9	3.5 ± 1.0
Range	6.5 – 15.1	24 – 60	4.7 – 8.7	2.0 – 5.2	21 – 49.6	1.2 – 5.8
Neonatal						
Mean ± S.D.	15.1 ± 2.4	49.6 ± 7.1	5.8 ± 0.8	3.9 ± 0.4	23.1 ± 4.4	2.3 ± 0.8
Range	8.6 – 21.2	32 – 70	4.0 – 6.9	3.0 – 4.9	13.2 – 33.9	1.2 – 4.5

a. Hemoglobin

b. Hematocrit

c. Total protein

d. Serum albumin

e. Vitamin A

f. Retinol - binding protein

Fig. 1 : Mean values of hematological and biochemical parameters in maternal venous and cord blood

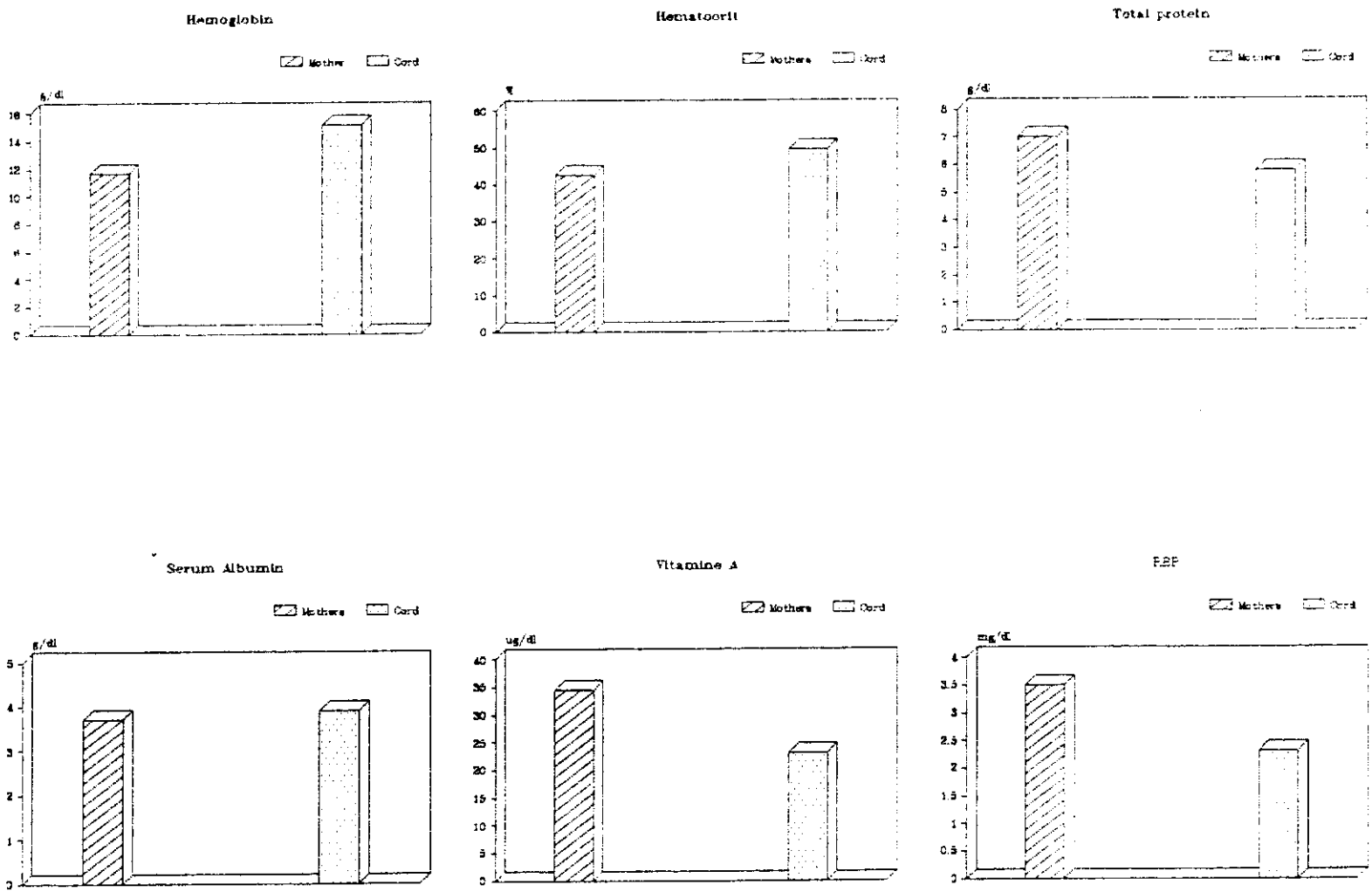
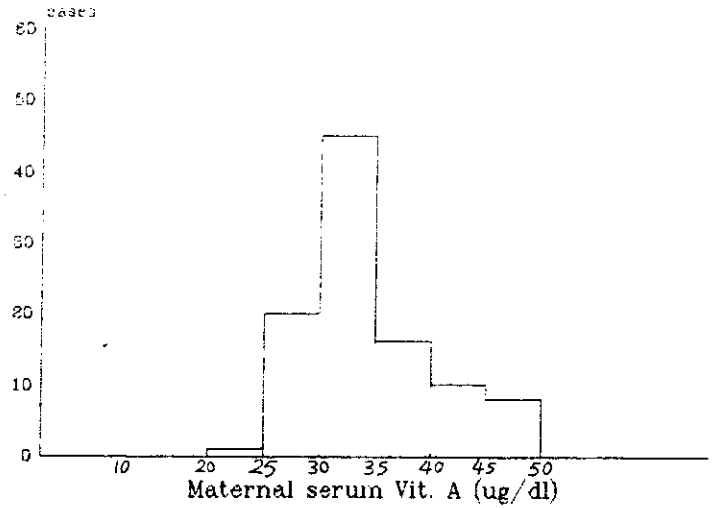


Fig. 2 : A histogram of the distribuation of vitamin A values



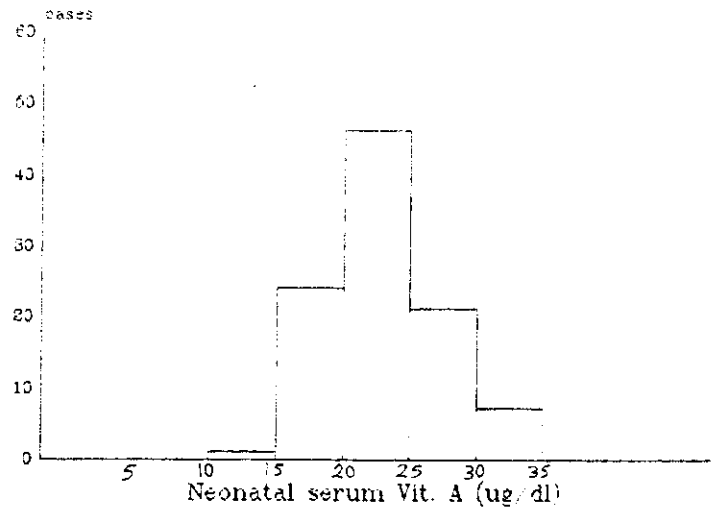
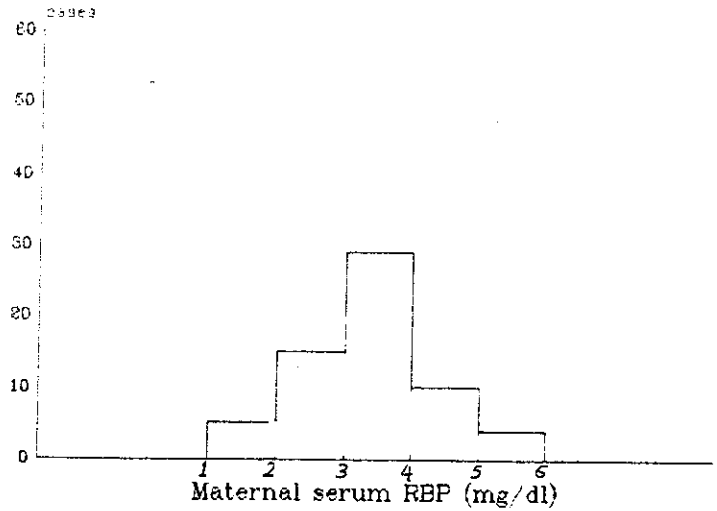


Fig. 3 : A histogram of the distribuation of RBP values



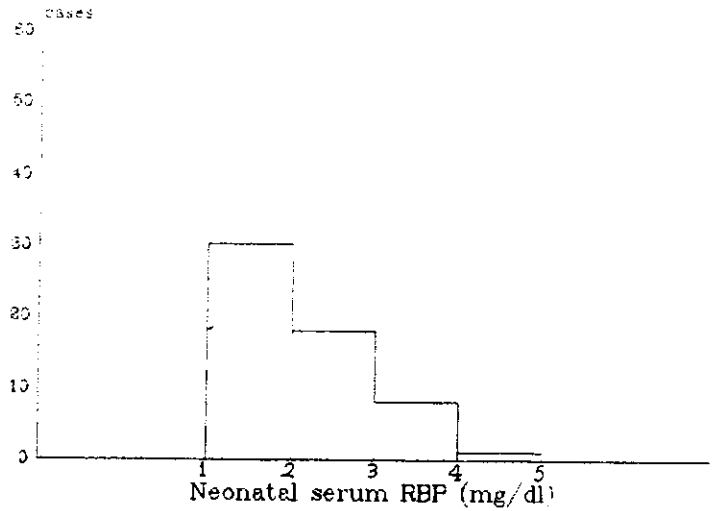


Table (4) : Correlation matrix between different maternal anthropometric, hematological & biochemical parameters .

	Age	Parity	Weight	Height	MAC	Hb	Hct	Tot. Ptn	S. Alb	Vit. A	RBP*
Age											
Parity	0.585										
Weight	0.161	0.130									
Height	0.064	0.043	0.217								
MAC	0.168	0.189	0.735	0.089							
Hb	0.159	0.025	0.666	0.063	0.056						
Hct	0.044	0.105	0.229	0.128	0.267	0.641					
Tot. Ptn	0.011	0.051	0.080	0.121	0.077	0.135	0.107				
S. Alb	0.070	0.023	0.097	0.017	0.041	0.176	0.063	0.576			
Vit. A	0.221	0.172	0.187	0.287	0.266	0.018	0.029	0.158	0.143		
RBP*	0.019	0.264	0.246	0.020	0.102	0.307	0.312	0.229	0.197	0.250	
BMI**	0.186	0.009	0.903	0.191	0.701	0.129	0.192	0.116	0.095	0.085	0.186

Total number (n) = 100

Critical value (2 - tail, 0.05) = +/_ 0.196

* Except RBP, n = 63

Critical Value = +/_ 0.248

**BMI = Body mass index

N. B. Underlined data = Significant correlations .

Table (5) : Correlation matrix between different neonatal anthropometric, hematological & biochemical parameters .

	Wieght	Lenght	Head Circ	Chest Circ	MAC	Calf Circ	Thigh Circ	Hb	Hct	Tot. Ptn	S. Alb	Vit. A	RBP*
Wieght													
Lenght	0.821												
Head Circ	0.790	0.757											
Chest Circ	0.843	0.803	0.813										
MAC	0.845	0.671	0.704	0.819									
Calf Circ	0.817	0.668	0.724	0.804	0.873								
Thigh Circ	0.880	0.790	0.712	0.849	0.817	0.799							
Hb	0.103	0.024	0.089	0.124	0.167	0.179	0.051						
Hct	0.044	0.015	0.042	0.127	0.095	0.089	0.036	0.859					
Tot. Ptn	0.366	0.376	0.330	0.409	0.284	0.253	0.311	0.184	0.180				
S.Alb	0.220	0.240	0.167	0.246	0.179	0.209	0.124	0.359	0.272	0.451			
Vit. A	0.426	0.325	0.303	0.392	0.369	0.462	0.349	0.324	0.350	0.294	0.426		
RBP*	0.414	0.345	0.165	0.442	0.464	0.500	0.433	0.126	0.091	0.353	0.506	0.644	
P . I .**	0.635	0.950	0.388	0.417	0.575	0.550	0.478	0.116	0.032	0.125	0.088	0.318	0.267

Total number (n) = 100

Critical value (2 - tail, 0.05) = +/_ 0.196

* Except RBP, n = 57

Critical Value = +/_ 0.248

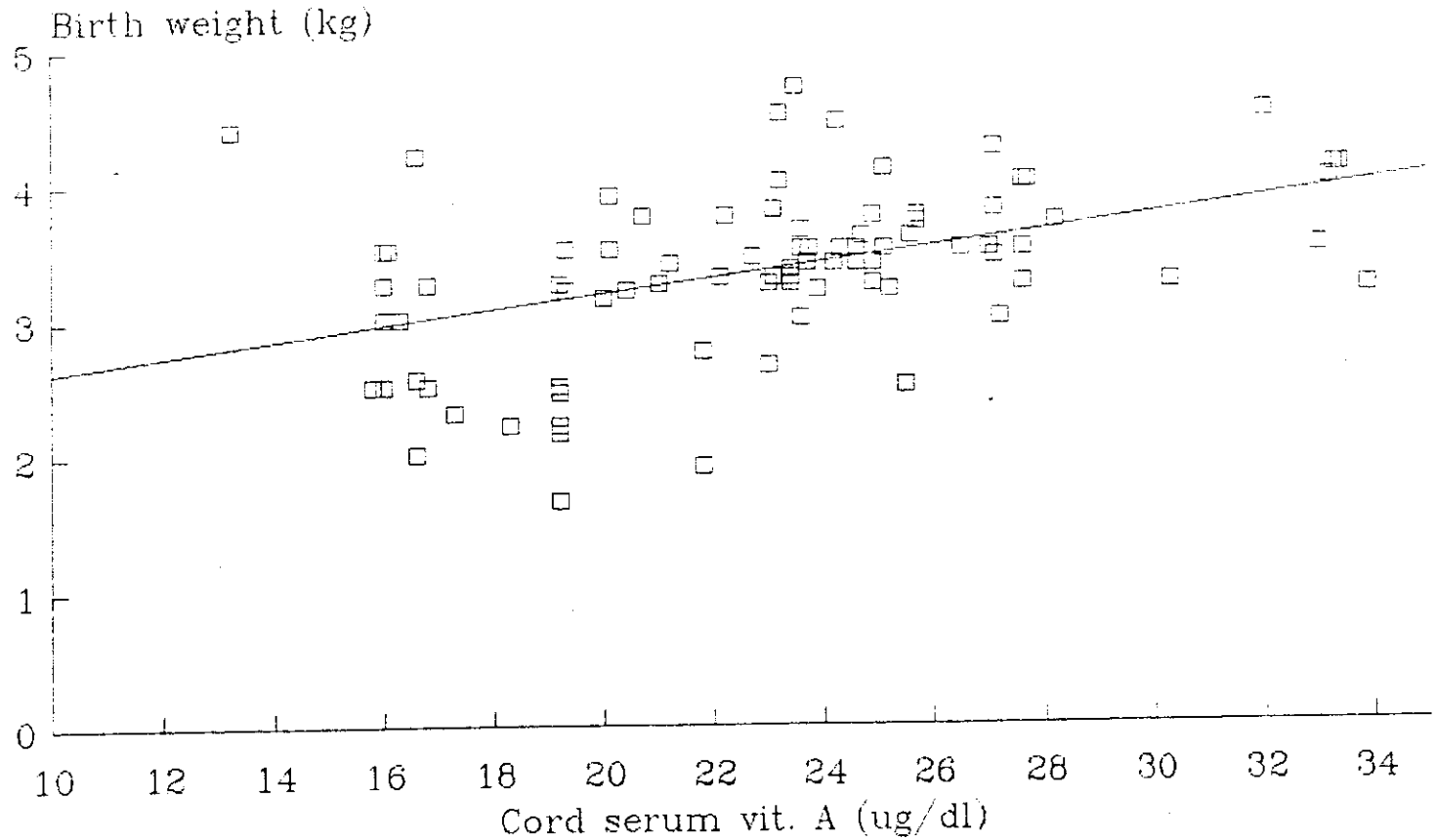
** P.I. = Ponderal index

N. B. Underlined data = Significant correlations .

Fig. 4 : A plot of birth weight values against cord serum vit. A concentrations

n = 100 r = 0.42606

p < 0.001 *

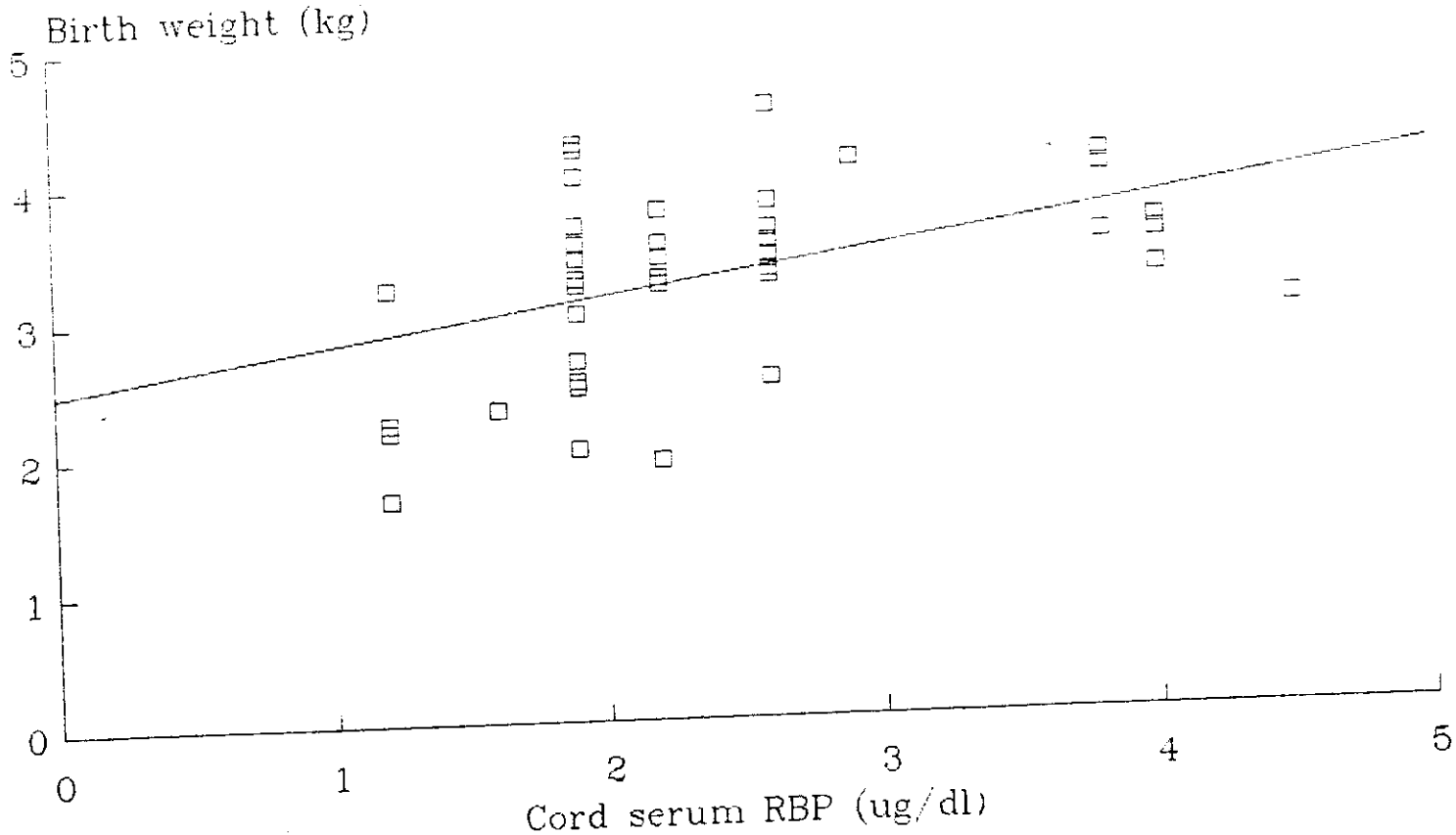


* : Significant

Fig. 5 : A plot of birth weight values against cord serum RBP concentrations

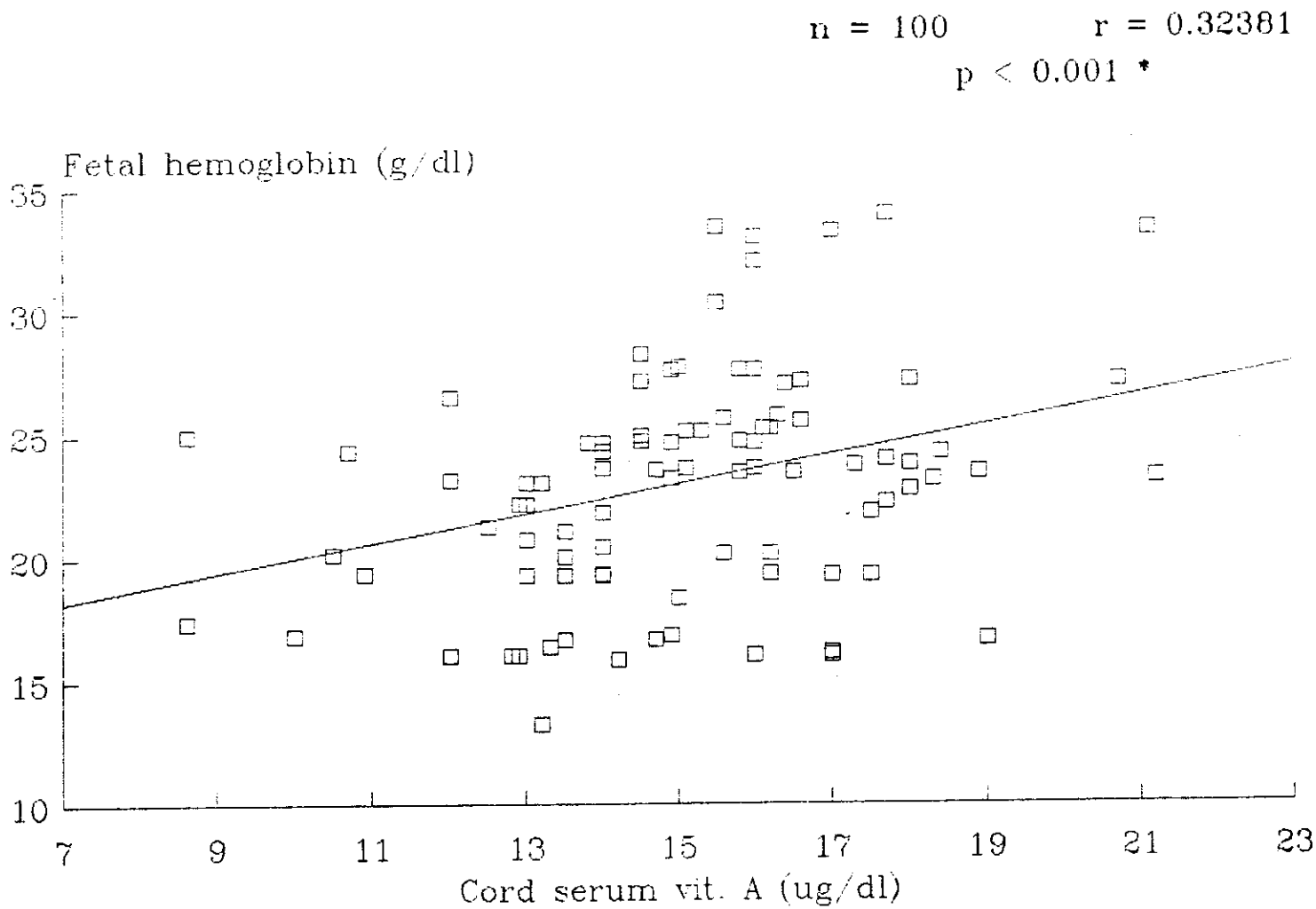
n = 57 r = 0.41441

p < 0.01 *



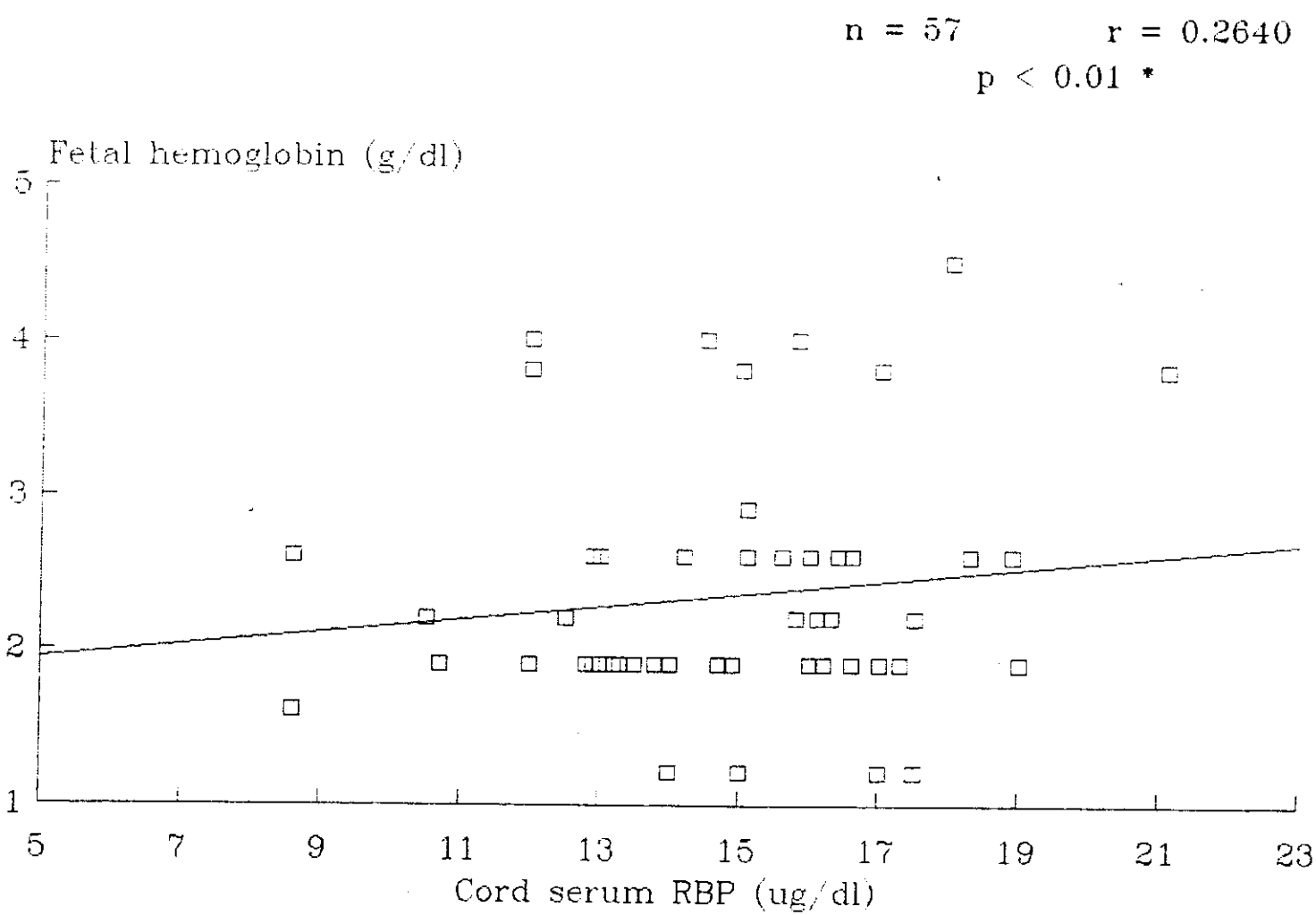
* : Significant

Fig. 6 : A plot of fetal hemoglobin concentrations against cord serum vit. A



* : Significant

Fig. 7 : A plot of fetal hemoglobin concentrations against cord serum RBP



* : Significant

Table (6) : Correlation matrix between different maternal & neonatal anthropometric, hematological & biochemical parameters .

Maternal \ Neonatal	Wieght	Lenght	Head Circ	Chest Circ	MAC	Calf Circ	Thigh Circ	Hb	Hct	Tot. Ptn	S. Alb	Vit. A	RBP
Age	0.057	0.068	0.018	0.035	0.009	0.006	0.038	0.215	0.164	0.091	0.128	0.091	0.080
Hb	0.156	0.172	0.034	0.098	0.134	0.198	0.085	0.391	0.383	0.029	0.209	0.248	0.302
Hct	0.109	0.181	0.022	0.175	0.043	0.121	0.067	0.279	0.315	0.101	0.219	0.190	0.167
Tot. Ptn	0.067	0.155	0.003	0.156	0.185	0.142	0.163	0.098	0.122	0.168	0.294	0.130	0.289
S. Alb	0.125	0.186	0.088	0.137	0.166	0.197	0.144	0.072	0.012	0.072	0.262	0.107	0.275
Vit. A	0.143	0.226	0.120	0.165	0.146	0.198	0.171	0.064	0.050	0.126	0.038	0.285	0.110
RBP	0.107	0.234	0.057	0.057	0.140	0.043	0.143	0.077	0.143	0.150	0.223	0.132	0.265

Total number (n) = 100

Critical value (2 - tail, 0.05) = +/_ 0.196

* Except RBP, n = 55

CriticalValue = +/_ 0.265

N. B. Underlined data = Significant correlations .

Table (7) : Mean serum levels of Vitamin A in maternal venous and cord blood according to maternal age and parity .

Maternal age (yr)	Parity ≤ 2		Parity ≥ 3		ALL		T		P
	n	$\bar{X} \pm SD$	n	$\bar{X} \pm SD$	n	$\bar{X} \pm SD$			
Maternal venous blood (yr)									
< 25	30	32.7 ± 4.1	6	35.3 ± 7.8	36	33.1 ± 4.8	-1.2	> 0.1	N.S.
25-29	16	33.1 ± 4.2	23	34.7 ± 7.4	39	34.1 ± 6.3	-0.8	> 0.2	N.S.
30 –	7	38.3 ±7.5	18	37.2 ± 5.3	25	37.5 ± 5.8	0.4	> 0.3	N.S.
Total	53	33.5 ± 5.1	47	35.7 ± 7.2	100	34.6 ± 6.2	-1.0	> 0.1	N.S.
ANOVA :F		4.3		0.7		4.7			
P		< 0.02 *		< 0.5 N.S		< 0.02 *			
Cord blood (yr)									
< 25	30	22.4 ± 4.8	6	22.3 ± 4.8	36	22.4 ± 4.6	0.1	> 0.4	N.S.
25-29	16	23.9 ± 4.3	23	22.7 ± 4.3	39	23.2 ± 4.2	0.8	> 0.2	N.S.
30 –	7	22.6 ± 6.2	18	24.4 ± 3.2	25	23.9 ± 4.5	-0.9	> 0.1	N.S.
Total	53	22.9 ± 4.6	47	23.3 ± 4.1	100	23.1 ± 4.3	-0.8	> 0.2	N.S.
ANOVA :F		0.5		1.1		0.9			
P		< 0.6 N.S.		< 0.3 N.S.		< 0.4 N.S.			

N.S. = Non Significant.
* = Significant.
ANOVA = Analysis of variance .

Table (8) : Mean serum levels of RBP in maternal venous and cord blood according to maternal age and parity .

Maternal age (yr)	Parity ≤ 2		Parity ≥ 3		ALL		T	P	
	n	$\bar{X} \pm SD$	n	$\bar{X} \pm SD$	n	$\bar{X} \pm SD$			
Maternal venous blood									
(yr)									
< 25	17	3.3 ± 0.9	5	4.0 ± 1.2	22	3.5 ± 0.9	-1.5	> 0.07	N.S.
25-29	8	3.7 ± 0.8	17	3.3 ± 1.3	25	3.5 ± 1.2	-0.8	> 0.2	N.S.
30 –	5	4.3 ± 0.4	11	37.2 ± 0.9	16	3.6 ± 0.9	2.5	> 0.02	*
Total	30	3.6 ± 0.8	33	35.7 ± 1.2	63	3.5 ± 1.1	-0.7	> 0.3	N.S.
ANOVA :F		3.3		0.8		0.1			
P		< 0.05 *		< 0.4 N.S		< 0.9 N.S			
Cord blood									
(yr)									
< 25	17	2.2 ± 4.8	3	1 . 9 ± 0.0	20	2.2 ± 0.7	1.2	> 0.09	N.S.
25-29	8	2.7 ± 4.3	15	2 . 3 ± 0.9	23	2.5 ± 0.9	1.0	> 0.1	N.S.
30 –	4	2.3 ± 6.2	10	2 . 4 ± 0.6	14	2.4 ± 0.6	-0.2	> 0.4	N.S.
Total	29	2.4 ± 4.6	28	2 . 3 ± 0.8	57	5.7 ± 0.8	-0.2	> 0.4	N.S.
ANOVA :F		0.8		0.6		0.7			
P		< 0.4 N.S.		< 0.5 N.S.		< 0.5 N.S.			

N.S. = Non Significant.
* = Significant.
ANOVA = Analysis of variance .

Table (9) : Distribution of maternal and cord serum Vitamin A and RBP according to residence

	Urban		Rural		T	P	
	n	$\bar{X} \pm SD$	n	$\bar{X} \pm SD$			
Maternal							
S. Vit. A[!] (µg/dl)	39	36.5 ± 6.2	61	33.4 ± 5.2	2.6	< 0.01	*
S. RBP [!!] (mg/dl)	26	3.6 ± 1.1	38	3.4 ± 1.0	0.7	> 0.4	N.S.
Cord							
S. Vit. A (µg/dl)	39	24.4 ± 4.8	61	22.2 ± 3.9	2.4	< 0.02	*
S. RBP (mg/dl)	23	2.5 ± 0.7	34	2.3 ± 0.8	1.0	> 0.3	N.S.

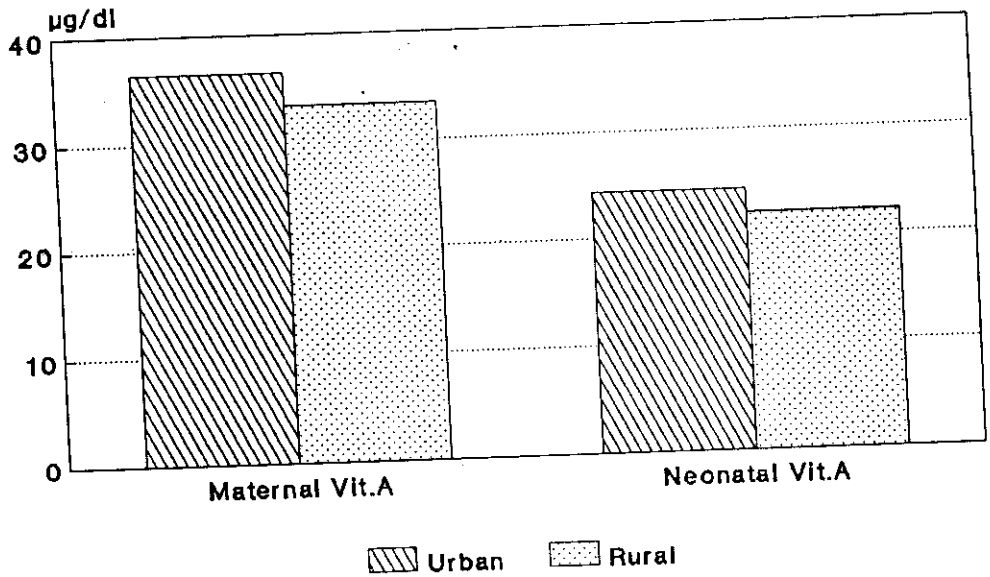
* Significant

N.S. = Non Significant.

[!] S.Vit. A = Serum Vitamin A

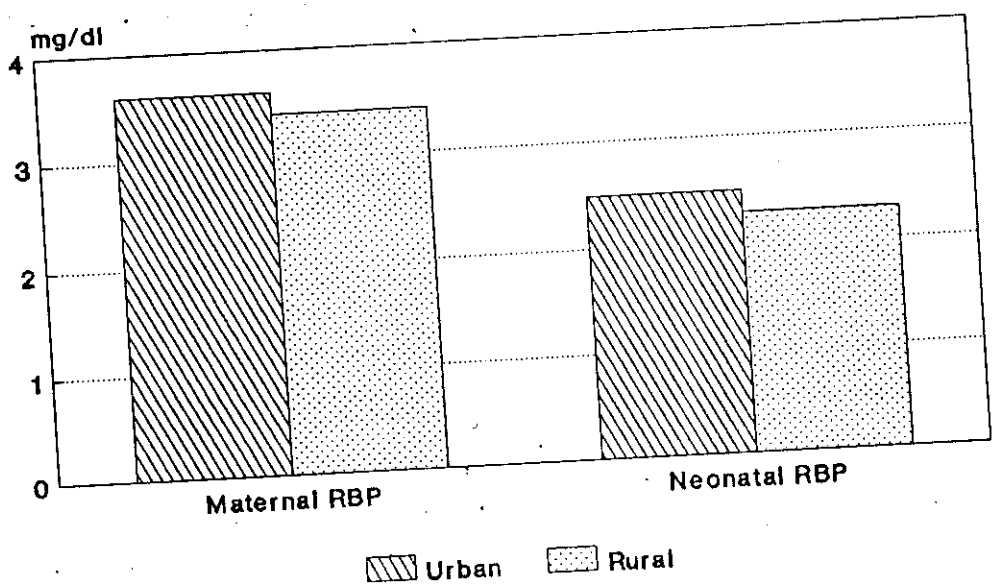
[!!] S. RBP = Serum retinol -binding protein

Fig. (8)



Distribution histogram of maternal and neonatal serum vitamin A according to residence.

Fig. (9)



Distribution histogram of maternal and neonatal serum RBP according to residence.

Table (10) : Distribution of maternal and cord serum Vitamin A and RBP according to different social classes .

	Low Social Class		Middle Social Class		T	P	
	n	$\bar{X} \pm SD$	n	$\bar{X} \pm SD$			
Maternal							
S. Vit. A[!] (µg/dl)	74	33.8 ± 5.6	26	36.8 ± 6.1	2.2	< 0.05	*
S. RBP[!!] (mg/dl)	46	3.5 ± 0.9	17	3.6 ± 1.2	0.4	> 0.6	N.S.
Cord							
S. Vit. A (µg/dl)	74	22.4 ± 4	26	25.1 ± 4.9	2.5	< 0.02	*
S. RBP (mg/dl)	42	2.3 ± 0.8	15	2.4 ± 0.8	0.4	> 0.6	N.S.

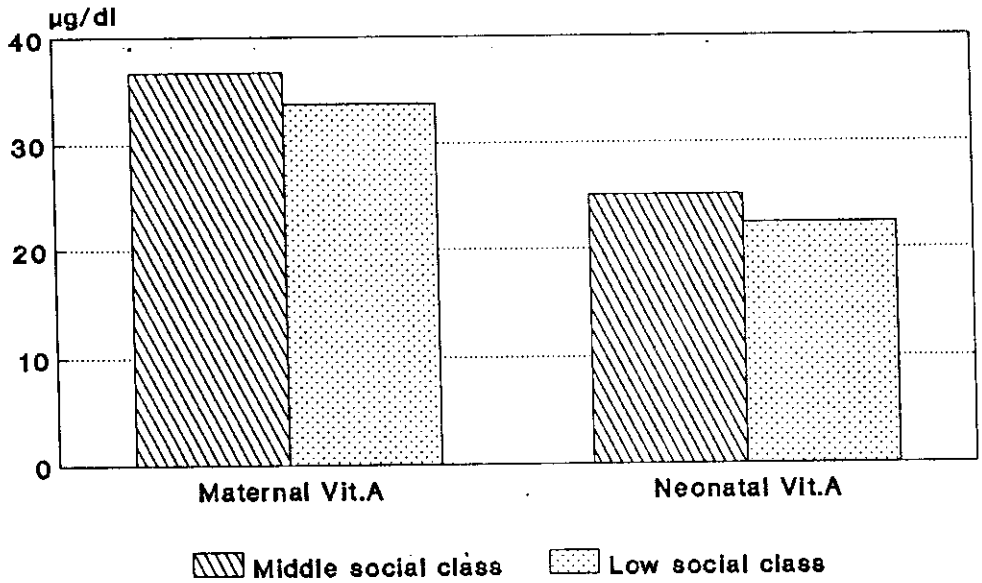
* Significant

N.S. = Non Significant.

[!] S.Vit. A = Serum Vitamin A

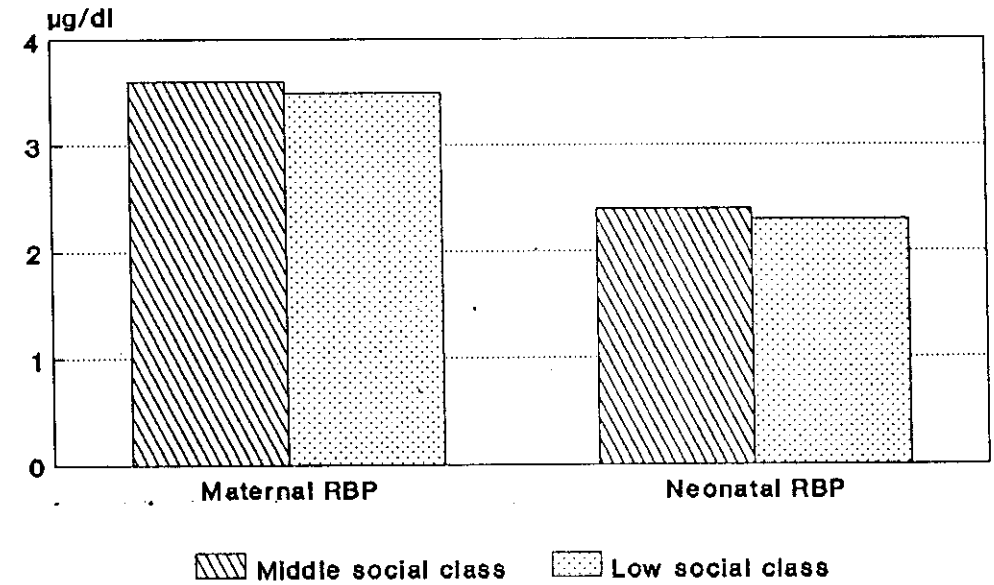
[!!] S. RBP = Serum retinol -binding protein

Fig. (10)



Distribution histogram of maternal and neonatal serum vitamin A according to social class

Fig. (11)



Distribution histogram of maternal and neonatal serum RBP according to social class.

Table (11) : Birth weight distribution according to residence .

	Urban		Rural				
	n	$\bar{X} \pm SD$	n	$\bar{X} \pm SD$	T	P	
Birth Weight (kg)	39	3.4 ± 0.6	61	3.3 ± 0.6	0.8	> 0.5	N.S.

N.S. = Non significant.

Table (12) : Birth weight distribution according to social class .

	Middle Social Class		Low Social Class				
	n	$\bar{X} \pm SD$	n	$\bar{X} \pm SD$	T	P	
Birth Weight (kg)	26	3.5 ± 0.4	74	3.3 ± 0.6	2	< 0.05	*

* = significant.

Table (13) : Birth weight , ponderal index (P.I.), fetal hemoglobin and serum vitamin A and RBP in relation to sex .

Neonatal variables	Males		Females		T	P	
	n	$\overline{X} \pm SD$	n	$\overline{X} \pm SD$			
Birth wt.(kg)	55	3.4 ± 0.6	45	3.3 ± 0.6	1.1	> 0.1	N.S.
P. I.	55	2.8 ± 0.2	45	2.6 ± 0.3	1.8	< 0.04	*
Hb (g/dl)	55	15.5 ± 2.3	45	14.6 ± 2.4	1.8	< 0.04	*
Vit. A (µg/dl)	55	23.6 ± 4.3	45	22.4 ± 4.5	1.4	> 0.08	N.S.
RBP (mg/dl)	31	2.4 ± 0.9	26	2.2 ± 0.6	1.1	> 0.1	N.S.

* Significant
N.S. = Non Significant.

Table (14) : Cord serum total protein and albumin in relation to different values of birth weight .

Birth weight (k g)	Tot. Ptn. (g/dl)			S. Alb (g/dl)		
	n	$\bar{X}$	± SD	$\bar{X}$	± SD
≤ 2.5	13	5.2	± 0.9	3.6	± 0.4
2.55–3.5	57	5.8	± 0.8	4.0	± 0.4
>3.5	30	6.1	± 0.6	3.9	± 0.4
Total	100	5.8	± 0.8	3.9	± 0.4
ANOVA :					
F		11.3		5.7	
P		< 0.001	*	< 0.004	*

* = Significant

Table (15) : Cord serum vitamin A and RBP in relation to different values of birth weight .

Birth weight (k g)	Vit. A (µg/dl)		RBP (mg/dl)	
	n	$\bar{X} \pm SD$		$\bar{X} \pm SD$
≤ 2.5	13	18.8 ± 2.6	12	1.8 ± 0.5
2.55–3.5	57	23.0 ± 4.0	31	2.3 ± 0.7
>3.5	30	25.1 ± 4.0	14	2.4 ± 0.7
Total	100	23.1 ± 4.4	57	2.3 ± 0.8
ANOVA :				
F		11.3		6
P		< 0.001		< 0.004

* = Significant

Table (16) : Classification of neonatal anthropometric measurements at birth into low & high risk groups (LRG & HRG)

Anthropometric measurements	LRG		HRG	
	Cut - Off	%	Cut - Off	%
Birth Weight	! > 2.5 kg	87	!! ⩽ 2.5 kg	13
Length	> 48 cm	74	⩽ 48 cm	26
Head Circ.	> 32 cm	91	⩽ 32 cm	9
Chest Circ.	> 30 cm	88	⩽ 30 cm	12
M.A.C.	> 9 cm	83	⩽ 9 cm	17
Calf Circ.	> 10 cm	73	⩽ 10 cm	27
Thigh Circ.	> 14.5	76	⩽ 14.5	24

! > = more than

!!⩽ = equal or less than

N. B. LRG represents intrauterine normal growth of fetus .

HRG represents intrauterine fetal growth retardation .

Table (17) : Sensitivity, specificity, predictive values positive or negative & relative risk of different anthropometric measurements at birth .

Measurements at Birth	High risk group	Sensitivity ! %	Specificity !! %	Predictive value		Product senitivity x specificity	Relative risk
				Positive %	Negative %		
Length	⩽ 48	100	85	50	100	8500	6.7
Head circ.	⩽ 32	46.1	96.5	66.7	92.3	4416	13.4
Chest circ.	⩽ 30	53.8	94.2	58.3	93.2	5076	9.4
MAC	⩽ 9	76.9	91.9	58.8	96.4	7084	9.6
Calf Circ.	⩽ 10	100	83.9	48.1	100	8400	6.2
Thigh Circ.	⩽ 14.5	100	87.3	54.2	100	8700	7.9

! Sensitivity = The Percentage of low birth weight newborns that were detected by the risk indicators .

!! Specificity = The Percentage of newborns who were not of low birth weight & who correctly classified as such by indicators

All measurements are good indicators for birth weight

Table (18) : Cord serum vitamin A in relation to low & high risk groups according to the neonatal anthropometric indicators .

Neonatal anthropometric indicators	Vitamin A (µg/dl)				T	P	
	L R G !		H R G !!				
	n	$\bar{X} \pm$ SD	n	$\bar{X} \pm$ SD			
Birth Weight (kg)	87	23.7 ± 4.3	13	18.8 ± 2.6	7.0	< 0.001	*
Length (cm)	74	24.1 ± 4.3	26	20.2 ± 3.4	4.3	< 0.001	*
Head Circ. (cm)	91	23.5 ± 4.4	9	19.0 ± 2.4	4.9	< 0.001	*
Chest Circ. (cm)	88	23.6 ± 4.4	12	19.6 ± 3.2	4.3	< 0.001	*
MAC (cm)	83	23.7 ± 4.4	17	19.9 ± 3.3	4.0	< 0.001	*
Calf circ . (cm)	73	24.1 ± 4.2	27	20.3 ± 3.8	4.2	< 0.001	*
Thigh Circ. (cm)	76	24.2 ± 4.2	24	19.7 ± 3.4	4.2	< 0.001	*

* Significant

! L R G = Low risk group

!! H R G = High risk group

!!! Circ. = Circumference

Table (19) : Cord serum retinol - binding protein (RBP) in relation to low & high risk groups according to neonatal anthropometric indicators .

Neonatal anthropometric indicators	RBP (mg/dl)					
	L R G !		H R G !!		T	P
	n	$\bar{X} \pm SD$	n	$\bar{X} \pm SD$		
Birth Weight (kg)	45	2.5 ± 0.8	12	1.8 ± 0.5	3.6	3.6 < 0.001 *
Length (cm)	37	2.5 ± 0.8	20	2.0 ± 0.7	2.5	2.5 <0.02 *
Head Circ.!!! (cm)	51	2.4 ± 0.8	6	1.7 ± 0.6	2.6	2.6 < 0.02 *
Chest Circ. (cm)	49	2.4 ± 0.8	8	1.7 ± 0.5	3.3	3.3 < 0.005 *
MAC (cm)	45	2.5 ± 0.7	12	2.0 ± 0.8	2.0	2.0 < 0.05 *
Calf Circ . (cm)	37	2.5 ± 0.8	20	1.9 ± 0.6	2.9	2.9 < 0.005 *
Thigh Circ. (cm)	41	2.5 ± 0.8	16	1.9 ± 0.4	4.1	4.1 < 0.001 *

* Significant

! L R G = Low risk group

!! H R G = High risk group

!!! Circ. = Circumference

Table (20) : Birth weight and ponderal index in relation to diffrent values of cord serum vitamin A .

Vit . A (µg / dl)	Birth Weight (kg)		Ponderal Index	
	n	$\bar{x} \pm$ SD	n	$\bar{x} \pm$ SD
< 21	31	3.0 ± 0.7	31	2.6 ± 0.3
21-24.9	40	3.5 ± 0.5	40	2.7 ± 0.3
25 -	29	3.6 ± 0.4	29	2.8 ± 0.2
Total	100	3.4 ± 0.6	100	2.7 ± 0.3
ANOVA : F	11.1		3.6	
P	< 0.001 *		< 0.03 *	

* Significant

ANOVA = Analysis of variance

Table (21) : Fetal hemoglobin and hematocrit in relation to diffrent values of cord serum vitamin A .

Vit . A (µg / dl)	Hemoglobin (g/dl)		Hematocrit (%)	
	n	$\bar{x} \pm$ SD	n	$\bar{x} \pm$ SD
< 21	31	14.1 ± 2.3	31	46.1 ± 6.7
21-24.9	40	15.3 ± 2.5	40	50.6 ± 8.0
25 -	29	16.0 ± 1.9	29	51.9 ± 4.6
Total	100	15.1 ± 2.4	100	49.6 ± 7.1
ANOVA: F		5.3		6.4
P		< 0.001 *		< 0.001 *

* Significant

ANOVA = Analysis of variance

Table (22) : Cord serum total protein, albumin and RBP in relation to diffrent values of cord serum vitamin A.

Vit. A (µg/dl)	Tot. Ptn. (g/dl)		S. Alb (g/dl)		RBP (mg/dl)	
	n	$\bar{X} \pm$ SD	n	$\bar{X} \pm$ SD	n	$\bar{X} \pm$ SD
< 21	31	5.4 ± 0.9	31	3.7 ± 0.3	32	1.8 ± 0.3
21 - 24 . 9	40	6.0 ± 0.6	40	4.0 ± 0.4	16	2.3 ± 0.5
25–	29	6.0 ± 0.7	29	4.2 ± 0.4	18	3.1 ± 0.8
Total	100	5.8 ± 0.8	100	3.9 ± 0.4	57	2.3 ± 0.
ANOVA : F		6.8		14.0		22.3
P		< 0.001 *		< 0.001 *		< 0.001 *

* Significant

Table (23) : Birth weight and cord serum Vitamin A and RBP in relation to maternal body mass index (BMI) .

	Normal BMI		High BMI		Total		T	P	
	n	$\bar{X} \pm SD$	n	$\bar{X} \pm SD$	n	$\bar{X} \pm SD$			
Birth Weight. (kg)	81	3.4 ± 0.6	19	3.3 ± 0.6	100	3.4 ± 0.6	-1.3	> 0.1	N.S.
Vitamin A (µg/dl)	81	22.9 ± 4.4	19	23.8 ± 4.7	100	23.1 ± 4.4	0.8	> 0.4	N.S.
RBP (mg/dl)	47	2.3 ± 0.7	10	2.4 ± 1.0	57	2.3 ± 0.8	0.8	> 0.4	N.S.

N.S. = Non Significant.

Table (24) : Birth weight and cord serum Vitamin A and RBP in relation to different percentile groups of maternal mid-upperarm circumference (MAC) .

	Maternal MAC Percentiles						Total		ANOVA		
	< 25 th		25 th - 75 th		> 75 th						
	n	$\bar{X} \pm SD$	n	$\bar{X} \pm SD$	n	$\bar{X} \pm SD$		$\bar{X} \pm SD$	F	P	
Birth Weight. (kg)	20	3.1 ± 0.6	45	3.4 ± 0.6	26	3.4 ± 0.5	100	3.4 ± 0.6	1.6	> 0.2	N.S.
Vitamin A (µg/dl)	20	22.2 ± 4.5	45	23.6 ± 4.2	26	23.0 ± 4.8	100	23.1 ± 4.4	0.7	> 0.4	N.S.
RBP (mg/dl)	12	2.3 ± 0.8	34	2.4 ± 0.9	11	2.3 ± 0.6	47	2.3 ± 0.8	0.1	> 0.9	N.S.

N.S. = Non Significant.

Table (25) : Birth weight, ponderal index and cord blood hemoglobin and hematocrit in relation to different levels of maternal serum vitamin A .

Maternal Vit. A (μ g/dl)	Neonatal Anthropometry			Cord Blood	
	Birth Weight (kg)		Ponderal Index	Hemoglobin (g/dl)	Hematocrit (%)
	n	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$	$\bar{X} \pm SD$
< 30	20	3 . 3 ± 0.4	2 . 8 ± 0.2	16.3 ± 2.3	52.2 ± 7.3
30 - 40	61	3 . 4 ± 0.6	2 . 7 ± 0.3	14.7 ± 2.5	48.4 ± 7.5
> 40	19	3 . 5 ± 0.6	2 . 6 ± 0.3	15.5 ± 1.6	50.7 ± 4.9
Total	100	3 . 4 ± 0.6	2 . 7 ± 0.3	15.1 ± 2.4	49.6 ± 7.1
ANOVA :					
F		0 . 3	1 . 1	3 . 9	3 . 0
P		< 0 . 7	> 0 . 3	< 0 . 03	< 0 . 05
		N.S.	N.S.	*	*

N.S. = Non Significant.

* = Significant.

Table (26) : Cord serum total protein, albumin, vitamin A and RBP in relation to different levels of maternal serum vitamin A .

Maternal Vit. A (μ g/dl)	Cord Serum							
	Tot. Ptn. (g/dl)		S. Alb. (g/dl)		Vit. A (μg/dl)		RBP (mg/dl)	
	n	$\bar{X} \pm SD$	n	$\bar{X} \pm SD$	n	$\bar{X} \pm SD$	n	$\bar{X} \pm SD$
< 30	20	5 . 7 ± 0.8	20	4 . 1 ± 0.4	20	22.4 ± 3.7	20	2 . 1 ± 0.7
30 - 40	61	5 . 8 ± 0.8	61	3 . 9 ± 0.4	61	22.6 ± 4.5	61	2 . 4 ± 0.8
> 40	19	6 . 0 ± 0.7	19	4 . 0 ± 0.4	19	25.3 ± 4.4	19	2 . 4 ± 0.9
Total	100	5 . 8 ± 0.8	100	4 . 0 ± 0.4	100	23.1 ± 4.4	100	2 . 3 ± 0.8
ANOVA :								
F		0 . 4		2 . 7		3 . 1		0 . 4
P		< 0 . 7		> 0 . 7		< 0 . 05		< 0 . 6
		N.S.		N.S.		*		N.S.

N.S. = Non Significant.

* = Significant.