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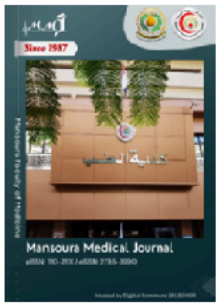

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THYROXIN BINDING GLOBULIN (T B G) AND PREALBUMIN (TBPA) LEVELS IN HEALTHY SUBJECTS

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INTRODUCTION AND AIM OF THE WORK

TBG is an acidic glycoprotein migrating in electrophoresis at pH 8.6 (Marshall and PenskY, 1971). It is synthesized and glycosylated by hepatocytes (Muruta et al., 1985). It carries about 70-75% of total T3, T4 (Refetoff and Larsen, 1989).

Prealbumin includes several minor components migrating electrophoretically ahead of albumin (Schultze and Heremans, 1960). It is synthesized in the liver and has rapid turnover rate (T1/2 = 2 days) (Oppenheimer et al., 1965). Both TBG and prealbumin exert a great infleunce on thyroid hormone and vitamin A blood levels, but prealbumin is more important for transaport of vitamin A than thyroid hormone (Refetoff and Larsen, 1989).

The plasma levels of both proteins sbjected to wide variations due to physiological and pathological factors. The present work is a trial to establish the age and sex induced changes in levels of both proteins in normal persons.

MATERIAL AND METHODS

This study was performed on 120 carfully selected normal healthy subjects. They were classified according to their ages into 8 groups of 15 subjects each, these were as follows: newborns, infants (1-24 months),

children (2-12y). Adolescents (12 - 15y); Pubertal (15 - 18y); Early adults (18 - 30y.); late adult (30 - 50y.), and Geriatrics (50 - 80 y.). Both sexes were represented almost equally in each group.

Each person was subjected to thorough history taking, clinical examination and laboratory investigations, besides intorrogation of drug intake. Any one showing deviation from normality or using a drug that might interfer with the results was excluded.

The laboratory investigations included urine and stool analysis, complete blood picture, liver and kidney function tests, serum T3, T4, FTI. Serum samples for TBG and prealbumin were kept in separate aliquots, frozen at -20 c until time of analysis, within one month of withrowal. Blood samples from newborns were obtained from umblical cord toward placental side.

TBG was determined by the RIA - gnost kit supplied by Behring - West Germany, while prealbumin was determined by immunoturbidimetric technique (SPQTM and ATAB kits, supplied by Atlantic Antibodies an Instar company. Stillwater, Minnesota 55082 U.S.A).

RESULTS

Are shown in tables (1, 2, 3, 4, 5 and Figures 1, 2).

DISCUSSION

The adult ranges for serum TBG in the Present study were 19.83 + 2.92 ug/mL. for early adults and 22.8 ± 2.31 ug/mL. for late adults. Similar results were detected by previous authors, also using RIA technique. William (1981) reported 10-15 ug/ml; Tietz and Logan, (lg87) reported 15-34 ug/mL. and Hambert et al., (1989) reported 16-24 ug/mL. as values for normal adults. By using two site immunoradiometric assay, Gupta et al., (1983) found that the mean serum TBG in normal healthy subjects (age range 20-50y.) was 24.2 8+8 4.4 ug/mL. Herrick et al., (1990) had used ligand partitioning immunosandwitch assay and found that the reference range for TBG in adult was 11-23 ug/mL.

The mean TBG levels in the present work for the newborns was, 25.7 +.58 ug/mL. for infants was 25.4 + 3.28 ug/mL and for children was 23.56 + 4.76 ug/mL. By using the same technique (RIA). Tietz and Logan, (1987) had reported that the reference ranges for newborns at one to twelve months was 20-75 ug/ml. and at 5-10 years it was 25-50 ug/ml.

In the present work plasma TBG levels were nearly constant in girls up to the age of 7.5 Years and then showed progressive decrease, together with that of the male group, till the age of 16 years and then a gradual slight increase occurred till age of 65 years. The highest levels for TBG were encountered at birth and at the age of 65 years, while the lowest one was at the age group of 15-18 years (about two thirds the highest levels) (Fig.1).

Braverman et al., (1966) found diminishing TBG levels reaching a nadir during middle adulthood followed by a trend for a rise with advance of age. Also, Refetoff et al., (1984) found that serum TBG in newborns was about one and half times the normal adult concentration and remained at this level for the first 2 to 3 years of life. By RIA technique, Knobber et al.,(1983) found higher TBG level in the postnatal phase and nearly constant levels between 1-9 years. The values were elevated in the age of 10-11 years and reached the normal adult range at 12-13 years.

The present study demonstrated insignificant sex difference in TBG levels in all age groups (Fig. 1). These findings agreed with Utiger, (1987) who found similar TBG concentrations in normal men and women despite the disparities in gonadal steroid hormone concentrations. On the other hand using immun~electrophoresis the mean levels of TBG were 11.2 ug/mL and 12.5 ug/mL for normal healthY men and women in the age group 18-50 years respectively (Burr et al., 1977). Ingenbleek et al., (1980) found higher levels of TBG in females than males. Also Sack et al., (1982) found a decrease of TBG in male subjects during puberty.

The oestrogen-induced increase in TBG is due to the increase in protein mass and not to an increase in binding affinity (Oppenheimer, 1989). Increased TBG in newborns is almost certainly the result of transplacental passage of oestrogens from the mother (Michener et al., 1962). However its increased level in elderly persons is due to marked reduction of adrenal androgen secretion at that age (Braverman et al., 1966). The present study illustrated no significant correlation between TBG levels and body mass index in all age groups (Table2).

Plasma Prealbumin levels in this work were estimated using immunoturbidimetry in healthy individuals of different age groups (Table 3). It was noted that prealbumin levels were 137.5 ± 12.2 mg/L for newborn and 194 + 35.6 mg/L. for infancy (one month to 2 years).

Sasanow et al., (1986) found that the mean value for newborn was 120 ± 39 mg/L. by using RID technique, while by using rate immunonephlometric microassay it was found that the prealbumin levels were 143-243 mg/L. in infants at 18-23.9 months and 108 - 258 mg/L. at 24 - 36 months (Sherry et al., 1988).

The means of prealbumin levels in the present work in adult (age range 15 - 50 years) were 317 ± 48.5 in males and 279.9 ± 40 in females (Table 3). Daniels, (1975) reported that the normal range of prealbumin was 100.0 to 400.0 mg/L by RID or electroimmunodiffusion techniques while, Audisio et al., (1985) found that that mean for healthy adult females was 294 ± 61 mg/L. using RID.

In this work, the prealbumin levels were nearly constant till the age of 8 years in males but decreased slightly in females. In both sexes, a marked increase was noted from 8 - 14 years, then the increase was much slower till the age of 24 years. The level started to decline slightly from the age of 24 to 40 years and markedly till the age of 65 years (Fig. 2). The highest level of prealbumin was observed at 15 - 25 Years of age which was 2 1/2 folds that obtained or newborns and at 65

years (Table 3). Prealbumin was significantly higher in full term infants than prematures probably due to increase in hepatic protein synthesis with maturation of the fetus (Sasdnow et al., 1986) It has been suggested that the sharp increase in TBPA which occurs at puberty is due to increased secretion of adrenal androgens which occurs at this time while decreased TBPA in elderly is due to marked reduction of adrenal androgens (Braverman et al., 1966).

Braverman et al., (1966) and Tietz (1983) found low levels of TBPA from birth till childhood but the levels rose abruptly during adolescence. This study illustrated that there was significant ($P<0.01$) higher value of TBPA in males than females at the age range 15-50 years (Table 4).

Suraci et al., (1983) found sex dependence of the prealbumin whereby it showed 20% elevation in males.

Significant ($P<0.001$) negative correlations were found between plasma TBG and prealbumin levels in all the studied age groups (Table 5). Braverman et al., (1966, 1967) reported reciprocal relation- ship between changes of plasma the and TBPA in relation to age, sex, glucocorticoids, estrogens and androgens. The later increase the concentration in the plasma of TBPA by stimulating synthesis of protein (Braverman, 1968). Androgenic and anabolic steroids increase the fractional rate of peripheral turnover of T4 by affecting TBG levels.

SUMMARY AND CONCLUSION

This study was carried out on 120 carefully selected normal healthy subjects (56 males and 49 females in addition to 15 newborns). Their ages ranged from newborn to Geriatric. Estimation of plasma TBG and prealbumin by RIA and immunoturbidimetric methods respectively was performed.

Plasma TBG levels were nearly constant in females up to the age of 7.5 years and then showed progressive decrease, together with that of the male group, till the age of 16 years and then showed a slight gradual

increase till the age of 65 years. The highest levels of TBG were observed at birth and at the age of 65 years and the lowest one was at age group of 15-18 years (about two thirds the highest levels). No significant sex difference was encountered in TBC levels among all age groups.

Prealbumin levels were nearly constant till the age of 8 years in males and decreage sligrhtly in females. In both sexes, a marked increase was noted from 8-14 years, then the increase was much slower till the age of 24 years. The level started to decline slightly from age 24 to 40 years and nlarkedly till age of 65 years. The highest level of prealbumin was in age of 15-35 years which was two and half folds that obtained for newborns and old age (65 years). Prealbumin was significantly higher in maleg than females at the age range 15-50 years. Signif icant necrative corre lation was clemonstrated between plasma TBC and prealbumin levels in all age groups.

Table (1) : Plasma TBG levels in all age groups

Age. group		TBG (Ug/ml.)			
1					
New borns	n	15	T1, T2, 3, 8	NS	(P> 0.05)
(less than One	m	25.7	T1, T4, 5, 6	S	(P< 0.001)
month	SD±	4.58	T1, T7	S	(P<0.05)
2					
Infants	n	15	T2, T3.8	NS	(P>0.05)
(one-24 months)	m	25.4	T2, T4, 5, 6	S	(P< 0.001)
	SD±	3.28	T1, T7	S	(P>0.05)
3					
Children	n	15	T3, T4, 5	S	(P< 0.01)
(2-12 Y.)	m	23.56	T3, T6	S	(P<0.05)
	SD±	4.76	T3, T7,8	NS	(P>0.05)
4					
Adolescents	n	15	T4, T5, 6	NS	(P>0.05)
(12-15 Y.)	m	19.4	T5, T7, 8	S	(P<0.001)
	SD±	1.9			
5					
Adulthoods	n	15	T5, T6	NS	(P>0.05)
(15-18 Y.)	m	18.25	T5, T7, 8	S	P<0.001)
	SD±	2.52			
6					
Young adults	n	15	T6, T7	S	(P<0.01)
(18-30 Y).	m	19.83	T6, T8	S	(P<0.001)
	SD±	2.92			
7					
Late adults	n	15	T7, T8	S	(P<0.05)
(30-50 Y.)	m	22.8			
	SD±	2.31			
8	n	15			
Geriatrics	m	25.46			
(50-80 Y.)	SD±	3.96			

Table (2) : Plasma prealbumin levels in all age groups

Age. group		prealbumin (mg/dl.)			
1					
New borns	n	15	T1, T2,3,4,5,6,7	S	(P< 0.001)
(less than One	m	137.5	T1, T8	NS	(P<0.05)
month	SD±	12.2			
2					
Infants	n	15	T2, T3,6,7,8	S	(P< 0.001)
(1-24 m.)	m	194.0	T2, T4, 5	NS	(P>0.05)
	SD±	35.6			
3					
Children	n	15	T3, T4,5,6,7	S	(P< 0.001)
(2-12 Y.)	m	200.3	T3, T8	S	(P<0.05)
	SD±	58.05			
4					
Adolescents	n	15	T4, T5, 6,7	NS	(P>0.05)
(12-15 Y.)	m	294.3	T4, T8	S	(P<0.001)
	SD±	33.9			
5					
Adulthoods	n	15	T5, T6,7	NS	(P>0.05)
(15-18 Y.)	m	298.3	T5, T8	S	P<0.001)
	SD±	45.14			
6					
Young adults	n	15	T6, T7	S	(P<0.05)
(18-30 Y).	m	316.2	T6, T8	S	(P<0.001)
	SD±	53.3			
7					
Late adults	n	15	T7, T8	S	(P<0.001)
(30-50 Y.)	m	286			
	SD±	44.04			
8	n	15			
Geriatrics	m	142.1			
(50-80 Y.)	SD±	22.5			

Table (3) : TBG and Prealbumin sex difference within the same age group.

group			T B G (Ug/dL.)	prealbumin mg/dL
Less than 15 years	Male	n	34	34
		m	44.4	239.4
		SD±	4.47	64.5
	Female	n	15	15
		m	33.3	217.2
		SD±	4.0	60.6
		T	0.75	1.18
		P	>0.05	>0.05
	Male	n	29	29
		m	20.4	317.9
		SD±	3.3	48.5
	Female	n	27	27
		m	20.1	279.9
		SD±	3.0	40.0
		T	0.32	2.92
		P	>0.05	<0.01
	Male	n	7	7
		m	26.1	150.0
		SD±	3.7	25.1
	Female	n	8	8
		m	26.7	135.2
		SD±	18.9	
		T	0.3	1.14
		P	>0.05	>0.05

Table (4) : Correlation between peralbumin and TBG in the different age groups.

	Newborn	Infancy	Children (2-12y)	Adolescence (12-15 y)	Adulthood (15-18 y)	Adulthood (15-18 y)	Young adults (18-30 y)	Adults (30-50 y)	Elderly (50-80 y)
r	- 0.8	- 0.86	- 0.86	- 0.80	-0.61	-0.61	- 0.61	-0.79	- 0.75
p	< 0.001	< 0.001	< 0.001	< 0.001	< 0.01	< 0.01	< 0.01	< 0.001	< 0.001

Table (5) : Correlation between TBG and body surface area in the different age groups.

	Newborn	Infancy	Children (2-12y)	Adolescence (12-15 y)	Adulthood (15-18 y)	Adulthood (15-18 y)	Young adults (18-30 y)	Adults (30-50 y)	Elderly (50-80 y)
r	0.41	0.32	0.18	0.73	0.31	-0.61	0.37	0.16	0.23
p	>0.05	>0.05	>0.05	>0.05	>0.05	< 0.01	>0.05	>0.05	>0.05

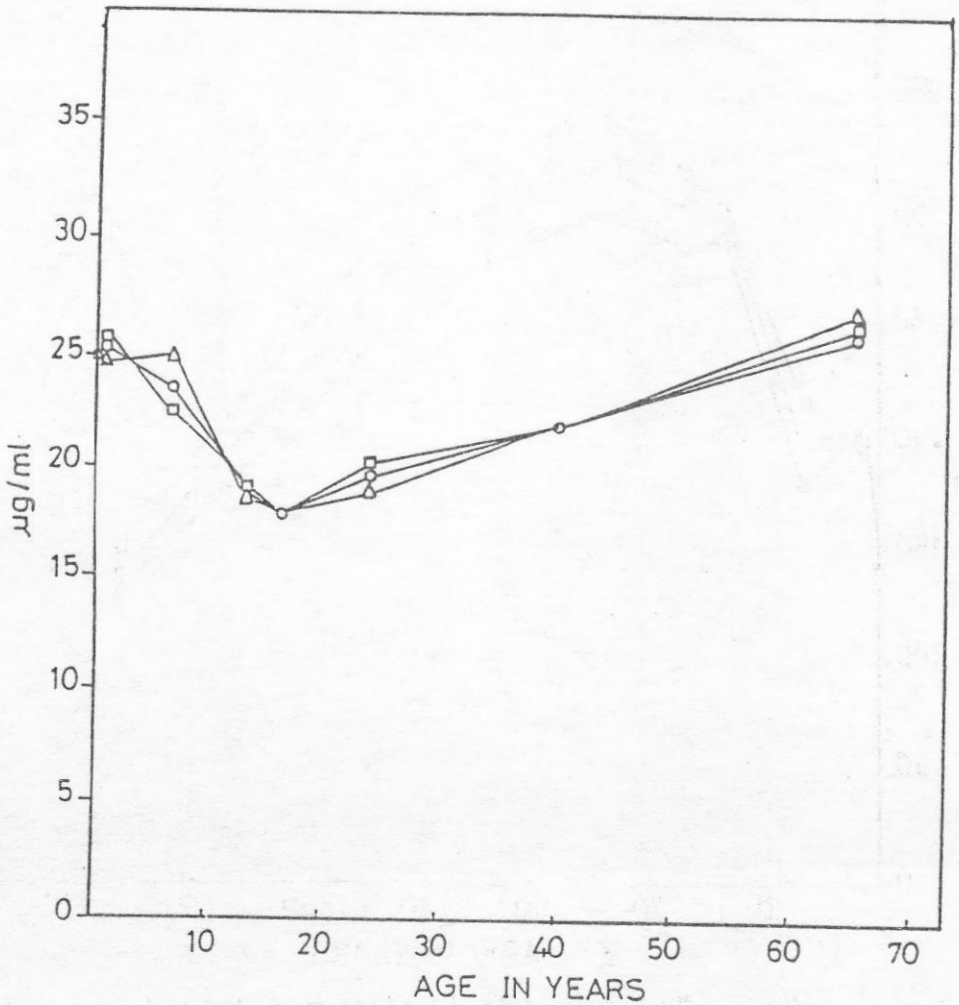

Fig. 1 : TBG in different age groups.

o——o Mean (total)

□——□ Male

Δ——Δ Female

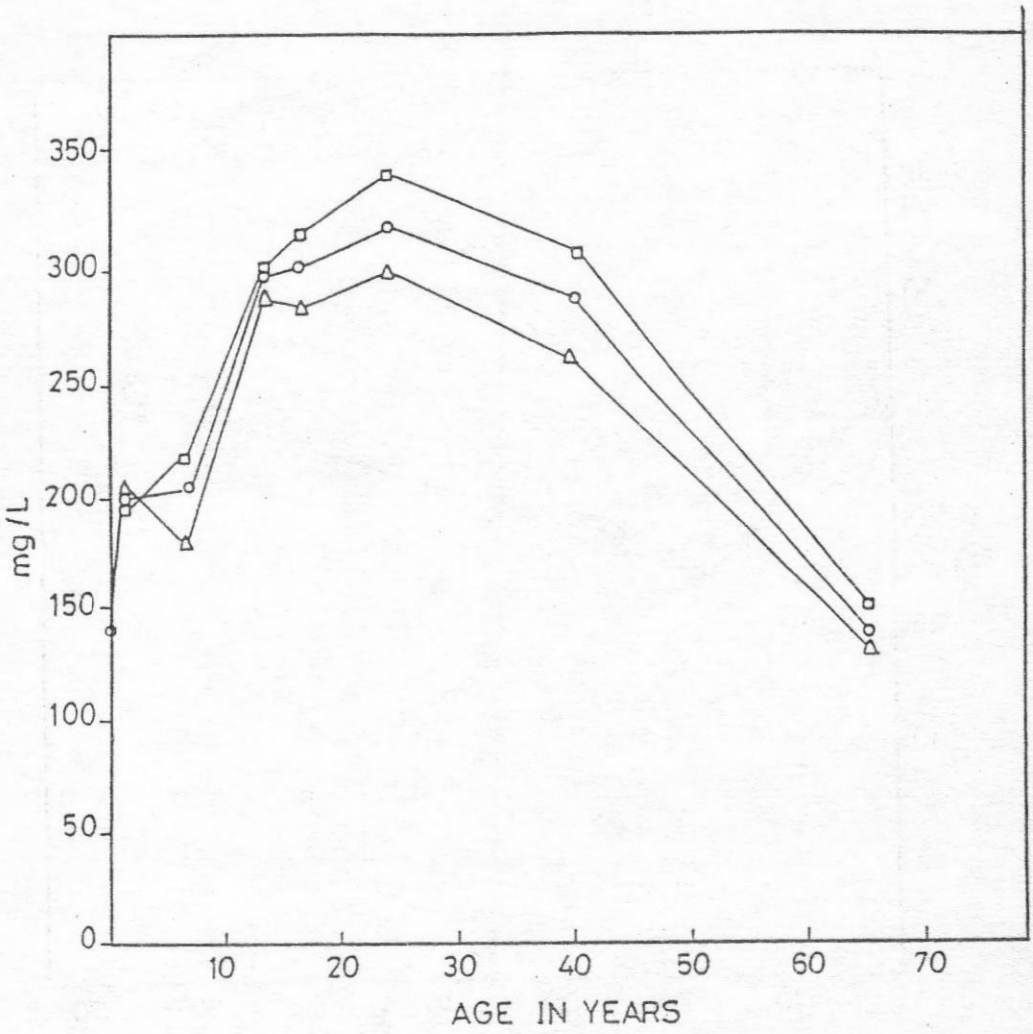

Fig. (2) Prealbumin in different age groups.

o——o Mean (total)

□——□ Male

△——△ Female

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الملخص العربى

مستوى البروتينات الحامله لهرمونات الغده الدرقية فى دم الأصحاء (الجلوبيولين والبروتين السابق للالبيومين)

د. كفايه السيد محمد د. أسامه سعد سلامه

أ. د. اقبال محمد أبوهاشم ط. محمد على عطوه

أجريت هذه الدراسة على ١٢٠ حالة من الأصحاء (٥٦ذكر، ٤٩ أنثى بالإضافة إلى ١٥ حاله حديثى الولاده) تتراوح أعمارهم من حديثى الولادة إلى سن الشيخوخه.

تم تعيين الجلوبيولين الرابط لهورمون الغده الدرقية بواسطة الاشعاع المناعى وعين البروتين السابق للالبيومين بواسطة طريقة مناعة التعكير.

أعلى مستوى من الجلوبيولين ظهر فى سن الولاده وسن الشيخوخه بينما وصل إلى أقل مستوى فى هؤلاء ذوات السن ١٥-١٨سنه.

ولم يوجد هناك فرق ملحوظ بين المستوى فى الذكور والاناث.

مستوى البروتين السابق للالبيومين فى الدم ظهر عكس مستوى الجلوبيولين السابق ذكره حيث أن أعلى مستوى ظهر فى سن ١٥-٣٥ سنه بينما أقل مستوى ظهر فى حديثى الولاده وسن الشيخوخه.

مستوى البروتين فى الرجال أعلى من الاناث فى سن ١٥ - ٥٠ سنه.