TRANSFERRIN AND HAPTOGLOBIN, AGE AND SEX VARIATIONS

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INTRODUCTION AND AIM OF THE WORK

Transferrin and Haptoglobin are carrier proteins exerting a great infleunce on biologically active components as iron and hemoglobin (Grant et al., 1987). They are affected by a variety of Physiological and Pathological factors (Daniels, 1975; Misaki et al., 1987 and Zilva et al., 1988). Among the physiological factors, age and sex occupy a prominent place.

The present work is a trial to find out the infleunce of age and sex on these carrier proteins in our locality.

MATERIAL AND METHODS

The study was conducted on 120 carefully selected normal healthy subjects. They were classified according to their ages into 8 groups each comprising 15 subjects: new borns, neonates (1-24 months), children (2-12 years), adolescents (12-15 years), pubertal (15-18 years), early adults (18-30 years), late adults (30-50 years) and geriatric (50-80 years). Both sexes were represented in all groups. To study the sex differences the cases were classified again into three groups the first one including those less than 15 years (34 males and 15 females), the second group had age range 15-50 years (29 males and 27 females), the third group comprising those more than 50 years (7 males and 8 females).

All cases were Subjected to thorough history, clinical examination and laboratory investigations to exclude

any disease state, drug intake, or blood transfusion which may affect the results.

Blood samples were withdrown in the morning following an overnight fast. Haemolysis - free serum samples were used for estimation of transferrin and haptoglobin levels by immunoturbidimetric technique (SPQTM and ATAB kits supplied by Atlatic Antibodies and Incstar company. Stillwater, Minnesota 55082 USA.).

RESULTS

Table (1): Shows plasma transferrin levels in all age groups. It is noted that transferrin levels in the newborns were significantly lower than all other groups.

Fig (1): shows gradual increase in the transferrin level from birth to reach the highest level in age group between 12-15 years and then gradual decrease with advance of age to reach lowest level in group above 50 years. The figure illustrated also that the sex differences were not marked in all age groups.

Table (2): shows no correlations between transferrin and MCHC in the different age groups.

Table (3): shows plasma haptoglobin levels in all age groups. It is noted that haptoglobin is abscent in the newborn and shows gradual significant increases till the aduit group which is insignificantly different from the geriatric one.

Fig. (2): shows gradual increase of the haptoalobin level with age to reach the highest level in the geridtric group. The levels in females is slightly higher than males. The sex differences were not marked in all the studied groups as shown from the figure.

Table (4): shows no correlations between plasma haptoglobin levels and albumin in different age groups.

Table (5): shows sex diffferences in transferrin and haptoglobulin levels. It is noted that transferin were insignificantly increased ($P>0.05$) in the first (<15 years) and second groups (15-50 ys) in males than females, while it is

insignificanly decreased in the third group (P>0.05). Haptoglobin levels show insignificant decrease in the first and insignificant increases in the second and third groups in females than males.

DISCUSSION

Various methods were used to measure plasma transferrin and haptoglobin. In the present study, comparison will be made with those utelizing nephlometry. In this study plasma transferrin levels showed their lowest values in newborns (range 175-325 and mean 223.5 ± 38.8 mg/dl). It showed a gradual rise, reaching the highest level at the age of 15 years (Range 275-350 and mean 314 + 26.4 mg/dl). Starting from age 18 years, a gradual decline occured to reach a value of 252 + 23.58 mg/dl. in geriatric patients (Table 1 and Fig. 1).

Plomteux et al., (1987) reported hat the mean levels for transferrin re 215 mg/dl for the neonates, eached 300 mg/dl at 2 years, 280 g/dl at 4 years and at 4 to 18 years it as 315 mg/dl. Low levels of transferrin in neoborns (130 -275 mg/dl) were reported by Titez and Logan (1987).

The low transferrin values observed in newborns could be attributed to the ability of the placenta to extract sufficient iron for the fetus even when the mother is iron deficient (Lanzkowsky, 1961), since the rate of transferrin synthesis depends on the iron level (Idzerda et al., 1980).

The adult and geriatric levels of transferrin in the present work were 273.3 + 29.24 and 252 + 23.58 mg/dl. respectively (Table 1). Griffiths et al., (1985) found that the mean level of transferrin was 281 mg/dl in normal subjects (mean age 59 years), and Tietz and Logan (1987) reported a reference range of 180-380 mg/dl for those more than 60 years by nephelometric technique. The similarity in levels and pattern despite racial and socio-economic differences denotes that such factors may not play a significant role in synthesis of these proteins.

Statistical correlations were made between plasma transferrin as an iron-

binding protein and red blood cell mean corpuscular haemoglobin concentration (MCHC). Insignificant positive correlation was demonstrated denoting that factors other than iron level e.g. hormonal and metabolic status can affect such a relation.

The present study showed that haptoglobin was absent in the newborns and started to appear at the age of one month (table 3 and Fig. 2). Haptoglobin synthesis by the liver does not begin at birth (Hitzig, 1964). Kaplan et al., (1984) found no haptoglobin in cord serum and Hansson et al., (1983) f ound lower haptoglobin levels in inf ants and children than adults.

The mean haptoglobin levels in this work (using immunoturbidemetric technique) were 105 ± 27. 29 mg/dl for age group 15-50 years and 134.3 ± 39.1 mg/dl. for geriatrics (50-80 years) (Table 3). Milman et al., (1988) reported mean haptoglebin levels to be 100 ± 30 mg/dl. for healthy younger subjects (Median age 27 years, range 18-50 years) and 130 + 50 mg/dl. for healthy elderly subjects (Median age 79 years, range 60-93 years).

Serum haptoglobin levels showed a marked increase from the age of one month to the age of 30 years (108.36 + 35.28 mg/dl.), remained relatively constant between 30 and 40 years then gradually increased to reach the highest level (134.3 + 39.1) at the age of 65 years which was signif icantly different from most other age groups (Table 3 and Fig. 2). Haptoglobin levels in infants and children are lower than those in adults possibly due to decreased rate of haptoglobin synthesis by the liver or increased rate of haptoglobin elimination by reticuloendothelial system (Hansson et al., 1983).

To study the infleunce of the synthesing capacity of the liver, correlation with serum albumin was made. No significant correlation was observed between haptoglobin and alb min levels (Table 4). This could be plained by the presence of other si for haptoglobin synthesis other th the liver which is the sole site

albumin synthesis (Gowenlock et al., 1988).

Both transferrin and haptoglobin showed no significant sex difference in all studied age groups (Fig. 1, 2 and table 5). Franco, (1987) found no consistent difference in transferrin levels between adult men and women. Milman et al., (1988) reported that serum haptoglobin displayed no sex difference, since both proteins are subjected to the same anabolic hormonal effects (androgens and estrogens) within the same age groups.

SUMMARY AND CONCLUSION

Immunoturbidimetric technique was used to measures serum transferrin and haptoglobin levels in 120 subjects representing different age groups starting from birth till 80 years. Both sexes were represented almost equally.

Plasma transferrin levels showed a adual rise from birth till the age of 15 years and then dropped sharply at the age of 20 years. A slight decrease was then observed starting from the age of 24 to reach its lowest level at the age of 65 years. The highest level of transferrin was observed at 15 years which was significantly higher than in older age groups.

Serum haptoglobin was absent in the newborn and started to appear at the age of one month. Then it showed marked increase from age of one month to the age of 30 Years, remaining relatively constant between 30 and 40 years then gradually increased to reach the highest level at the age of 65 years which was significantlY different from other age groups. No sex difference was shown for either transferrin or haptoglobin at all age groups. So-age variations need more focusing to standardiz normal levels which requires large number of cases, since it is limited by the high cost of kits in the present study.

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

group		Transferrin (mg/dL)	
1			
New borns	n	15	T1, T2, 3, 4, 5, 6, 7
(less than One	m	223.2	= S (P < 0.001)
month	SD ±	38.8	T1, T8 = S (P < 0.05)
2			
Infants	n	15	T2, T4, 8 = S (P<0.001)
(one m-24 m.)	m	283.3	T2, T3, 7 = S (P<0.05)
	SD ±	26.7	T2, T5, 6 = NS.
3			
Children	n	15	T3, T5, 7, 8 = S (P<0.001)
(2-12 Y.)	m	305.5	T3, T6, = S (P < 0.05)
	SD ±	20.4	T3, T4, = NS.
4			
Adolescents	n	15	T4, T5, 6, 7, 8
(12-15 Y.)	m	314.0	= S (P <0.001)
	SD ±	26.4	
5			
Pupertals	n	15	T5, T8 = S (P < 0.001)
(15-18 Ys.)	m	282.0	T5, T7 = S (P < 0.05)
	SD ±	22.34	22.34 T5, T6 = NS
6			
Early adults	n	15	
(18-30 Ys.).	m	273.66	T6, T7, 8 = NS
	SD ±	36.57	
7			
Late adults	n	15	
(30-50 Y.)	m	22.8	T7, T8 = NS
	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

group	Haptoglobin (mg/dl.)		
1 Newborns (Less than One month	n m SD±	15 0.0 0.0	T1, T2, - 8 = S (P < 0.001)
2 Infants (1-24 m.)	n m SD±	15 194.0 35.6	T2, T3, - 8 = S (P > 0.001)
3 Children (2-12 Y.)	n m SD±	15 200.3 58.05	T3, T4 - 8 = (P > 0.001) T3, T8
4 Adolescents (12-15 Y.)	n m SD±	15 77.3 17.2	T4, T6, 7, 8 = S (P < 0.001) T4, T5 = S (P < 0.05)
5 Pupertals (15-18 Ys.)	n m SD±	15 95.0 22.34	T5, T8 = S (P < 0.001) T5, T7 = S (P < 0.05 T5, T6 = NS
6 Young adults (18-30 Y).	n m SD±	15 108.36 35.28	T6, T7 8 = NS
7 Late adults (30-50 Y.)	n m SD±	15 112.46 24.93	T7, T8 = NS
8 Geriatrics (50-80 Y.)	n m SD±	15 134.3 39.1	

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

group			Transferrin mg/dL.	Haptoglobin mg/dL
Less than 15 years	Male	n	34	34
		m	304.2	60.4
		SD ±	25.8	21.6
	Female	n	15	15
		m	296.9	52.3
		SD ±	29.4	20.1
		T	0.85	1.29
		P	>0.05	>0.05
	Male	n	29	29
		m	274.3	100.5
		SD ±	31.3	26.4
	Female	n	27	27
		m	270.0	110
		SD ±	27.6	27.9
		T	0.47	1.23
		P	>0.05	<0.05
	Male	n	7	7
		m	244.2	126.4
		SD ±	20.7	42.0
	Female	n	8	8
		m	258.7	141.2
		SD ±	25.1	37.2
		T	1.2	0.72
		P	>0.05	>0.05

Table (4) : Correlation between Haptoglobin and albumin 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	-	0.09	0.28	0.33	0.09	-0.61	0.49	0.1	0.27
p	-	>0.05	>0.05	>0.05	>0.05	< 0.01	< 0.05	>0.05	< 0.05

Table (5) : Correlation between Transferrin and MCHC in the different age groups.

	Newborn	Infancy	Children (2-12y)	Adolescence (12-15 y)	Adulthood (15-18 y)	Young adults (18-30 y)	Adults (30-50 y)	Elderly (50-80 y)
r	0.37	0.08	0.18	0.23	0.11	0.15	0.17	0.06
p	>0.05	>0.05	>0.05	>0.05	>0.05	< 0.05	>0.05	>0.05

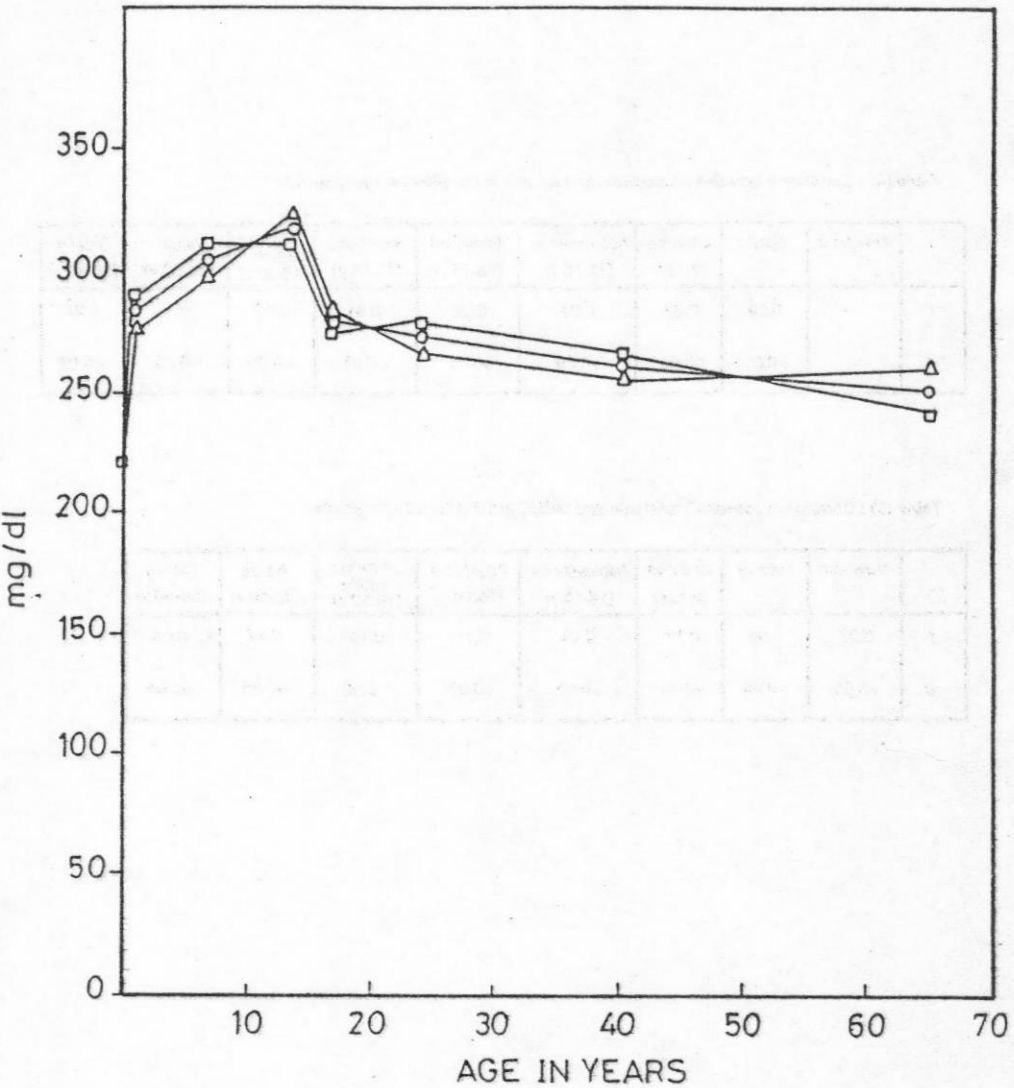

Fig.1 : Transferrin in different age groups.

o—o Mean (total)

□—□ Male

△—△ Female

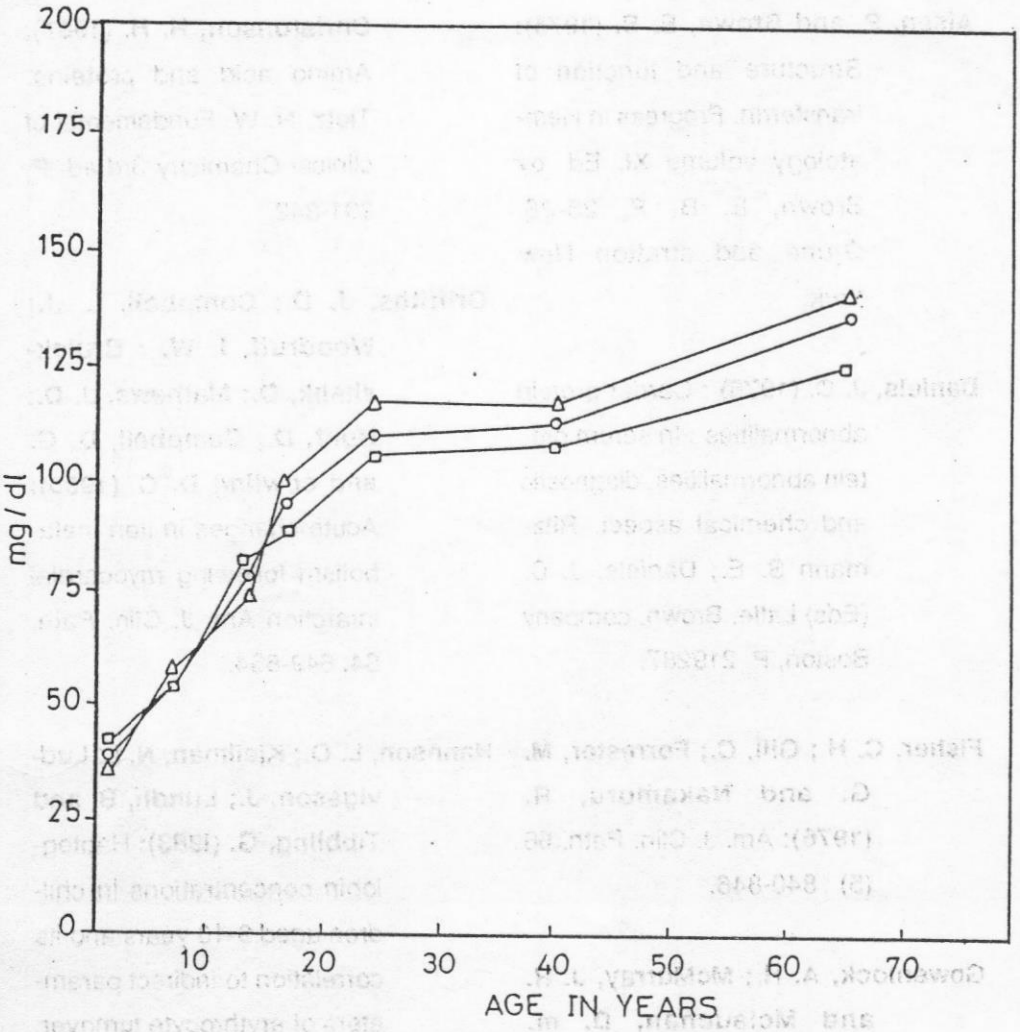

Fig 2 : Haptoglobin in different age groups.

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تغير مستوى الترانسفيرين والهبتوجلوبين مع السن والجنس

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ط. محمد على عطوه

الملخص العربى

تم تعيين بروتين الترانسفيرين والهبتوجلوبين بطريقة التعكير المناعى وذلك لمائة وعشرون شخصاً من الأصحاء تتراوح أعمارهم من حديثى الولادة إلى سن الشيخوخة.

مستوى الترانسفيرين ازداد تدريجياً إلى سن ١٥ عاماً ثم انخفض حتى وصل إلى أقل مستوى فى سن ٦٥.

يختفى بروتين الهبتوجلوبين فى حديثى الولادة ثم يبدأ فى الظهور بعد الشهر الأول حتى يصل إلى سن الثلاثون عاماً حيث يظل ثابتاً تقريباً إلى سن الأربعين ثم يزداد حتى يصل إلى أعلى مستوى فى سن ٦٥ عاماً.

لم يظهر فرق ملحوظ بين مستوى الترانسفيرين والهبتوجلوبين فى الذكور والاناث.