SERUM PROTEINS IN RICKETS PATIENTS AND THEIR MOTHERS[+]

Dr. Suad Y. Al-Kass[*]

Abstract :

This research is mainly concerned with study of changes of serum total protein, albumin & globulin in rachitic patients and their mothers. Effect of order of the baby in his/her family, feeding type, skin pigmentation and the stage of the disorder for infants were studied. Also the number of siblings breast fed, socioeconomic state and lactation effect for their mothers were studied.

The results showed a decrease in albumin as order of the baby increased, increase in total protein, albumin and globulin in those infants fed human milk in addition to other type of food, total protein and globulin decreased in black skin pigment patients and albumin decreased in severe cases of rickets.

In mothers, the results indicate a decrease in total protein and a significant decrease in globulin was observed as parity increase, a significant decrease in globulin in mothers of good socioeconomic state and no effect of lactation was observed.

Key words: Serum proteins, Patients with rickets

المستخلص

يتضمن البحث قياس البروتين الكلي والالبومين والكلوبيولين في مصل الدم لمرضى الكساح وامهاتهم. ثم تم دراسة تغيرهذه المتغيرات حسب تسلسل الطفل في العائلة ونوع الغذاء الذي يتناوله ولون الجلد ودرجة الاصابة بالمرض عند الاطفال. اما بالنسبة للامهات فقد تم دراسة تاثير عدد الاطفال الذين ارضعتهم وتاثير الحالة الاقتصادية وتاثير الرضاعة.

اوضحت نتائج الدراسة على مرضى الكساح، انخفاض الالبومين مع زيادة تسلسل الطفل في العائلة، زيادة البروتين الكلي والالبومين والكلوبيولين عند الاطفال الذين يتغذون على حليب الام بالاضافة الى انواع اخرى من الاغذية. كذلك لوحظ انخفاض البروتين الكلي والكلوبيولين عند المرضى ذوي صبغة الجلد الغامقة وانخفاض الالبومين في الحالات الحادة من مرض الكساح.

اما بالنسبة للامهات فقد اوضحت النتائج انخفاض في البروتين الكلي وانخفاض معنوي في الكلوبيولين مع زيادة عدد الاطفال الذين ارضعتهم وانخفاض معنوي في الكلوبيولين عند الامهات ذوي الحالة الاقتصادية الجيدة واخيرا لوحظ عدم وجود تاثير للرضاعة.

Introduction

Rickets is a term signifying a failure in mineralization of growing bone or osteod tissue [1]. Rickets occurs mainly in children as a result of calcium or phosphate deficiency in the extra cellular fluid, ordinarily, rickets is not due to lack of calcium or phosphate in the diet but instead to a deficiency of vitamin D [2].

[+] **Received on 2006/5/2 , Accepted on 2006/11/7**

[*] Lecturer , Mosul Technical institute , Medical Laboratory Technology Department

Vitamin D is synthesized in the skin by the ultra violet catalyzed conversion of 7- dehydrocholesterol to vitamin D3 (Cholchalciferol), which is slowly released in to the blood stream bound to an α- globulin (transcalciferin) [3].

Vitamin D increase calcium absorption by promoting active transport of calcium through the epithelium of the ileum. It especially increases the formation of calcium binding protein in the epithelial cells that aid in calcium absorption [4].

The rate of calcium absorption seems to be directly proportional to the quantity of this calcium-binding protein [2].

The major serum metabolite of vitamin D is 26-hydroxy vitamin D which is carried in the serum by vitamin D binding protein (DBP) and measurement of this metabolite level provide the best indicator of vitamin D status. The DBP is albumin like protein; the A.A sequence shows strong homology with human serum albumin and α- fetoprotein [5].

About half of calcium is present as free ions and half is bound to plasma albumin. If plasma albumin is low, total calcium value is also low [6].

Changes in plasma albumin concentration also have an effect on the relative amount of bound and free concentration of certain ligands and therefore, the tissue receptors which interact with these ligand (eg. Calcium, bilirubin, fatty acids, drugs &hormones) [7].

With the rising incidence of breast feeding and the increasing use of human milk for the term and preterm infant, it has become more important to have accurate data on lactating mothers and their nursing infants [8].

On the light of studies mentioned above and to determine if total protein, albumin & globulin levels in serum affected in rickets and to continue the study started by [9], so the idea of this research have been developed.

Patients and Methods

Venous blood was drawn from 26 normal healthy children were used as control, 90 rachitic patients and 115 healthy mothers, all children attended the outpatient department of Alulweya hospital for children in Baghdad during the period from March to May 2003.

Diagnosis of vitamin D deficiency rickets was based on clinical, radiological & biochemical manifestation. Each child and his/her mother were studied for total protein, albumin & globulin.

Serum total protein was measured by biuret method, and serum albumin was measured by bromocresol green (BCG). Kits for determination were obtained from Randox (U.K), standard statistical methods was used to calculate the mean X, standard deviation (SD) and standard error (SE). Z-test was used to differentiate data obtained from P- value.

Results and Discussion

1- Effect of order for rachitic patients:

Table 1 indicate that total protein and globulin was increased while albumin decreased as order of the patient increased, this result was in direct support with the result obtained previously, as albumin is the principal binding protein for calcium and protein malnutrition may be associated with rickets [10].

2- Effect of feeding for rachitic patients:

Total serum protein concentration was increased in breast fed infants and a rise in total protein concentration may have increased the protein- bound calcium [11], while [12)show that none of the dietry factors examined appears to influence the affinity of DBP for its major ligand.

It was reported previously that no statistically significant difference in serum concentration of albumin between those fed human milk and those fed a formula [13]. All of the above results shown were found to be compatible with the results shown in Table 2. In breast fed infants serum total protein and globulin was increased and in those infants fed human milk in addition to other type of food total protein& albumin was increased, the increase in both types was non significant.

However the results for other groups were ignored due to a lower sample number.

3- Effect of skin pigment for rachitic patients:

If the child is properly exposed to sunlight, the U.V rays will form enough vitamin D3 in the skin to prevent rickets by promoting calcium and phosphate absorption from intestine [2].

Vitamin D3 increases the formation of calcium – binding protein [4]. The rate of calcium absorption seems to be directly proportional to the quantity of this calcium- binding protein [2]. The rate of synthesis in the skin is determined by the degree of exposure to U.V light and probably by the amount of pigment. A highly pigmented child is probably more susceptible to rickets, because the melanin reduces penetration of U.V light and less 7- dehydro cholesterol is irradiated [14].

The results shown in Table 3 predicted that total protein and globulin decreased in dark patients when compared to white patients, which is consistence with the results obtained by others.

4- Effect of rickets cases:

On studying the type of rickets cases and their effect on protein level, it was noticed in Table 4 that albumin decreased in severe cases when compared to mild cases, while total protein and globulin was increased in all groups.

This result was compatible with the result obtained previously, it was noticed that if plasma albunin is low, serum calcium is also low.

The patient of severe rickets persisted with a tendency to have higher values of PTH, Alp, urinary cyclic/creatinine, P/creatinine. The difference is significant only for Ca, P & Alp in serum [15,16,17].

5- Effect of number of siblings breast fed & socioeconomic state:

The typical profile of an infant at risk for the development of neonatal hypocalcemia is a boy born to a multigravida mother from low socioeconomic state [18]. The greater risk of infants born with in the lower socioeconomic state classes reflect the poorer diet of their mothers [19]. Afall in plasma albumin concentration may roughly be balanced by a rise in immunoglobulin levels [20].

The results shown in table 5 was in complete agreement with the results obtained by others, total protein and globulin was decreased but the decrease was not gradually as parity increase, and the decrease in globulin was significant in those of number 2,4 & 5. While albumin increased in all groups as parity increased. A fall in globulin level is balanced by a rise in albumin level.

Table 6 indicate that total protein and globulin decreased while albumin increased in all groups. The decrease in globulin in those of good socioeconomic state was significant for unknown causes, and the decrease in globulin in low socioeconomic state was higher than others while albumin is higher.

6- Effect of lactation:

On study lactation effect on total protein, albumin and globulin levels in serum, the results shown in Table 7 indicate that no difference were shown between lactating and non lactating mothers, total protein and globulin decreased while albumin increased in each of them, and the decrease in globulin in non lactating was significant.

These results was compatible with the results obtained previously, that no change were detected in hemoglobin level or in serum protein and albumin in lactating and non-lactating mothers [21].

Table (1) effect of the order of the patient on the level of the serum parameters assayed.

Sample		Parameters assayed								
		Total protein (g/dl)			Albumin (g/dl)			Globulin (g/dl)		
		N	Mean	% increase	N	Mean	% change	N	Mean	% increase
Control		26	6.4		26	4.17		26	2.18	
Order of the baby	1	16	7.13	11.4	17	4.9	17.50	17	2.49	14.22
	2	19	6.67	4.21	20	4.42	5.99	18	2.35	7.79
	3	16	6.74	5.31	15	4.12	-1.19	16	2.40	10.09
	4	10	6.49	1.40	9	4.04	-3.11	9	2.28	4.58
	5	7	6.55	2.34	8	4.47	7.19	8	2.74	25.68
	6	5	6.56	2.5	5	4.1	-1.6	5	2.46	12.89

Table (2) effect of the type of infant feeding on the level of serum parameters assayed.

Sample		Parameters assayed								
		Total protein (g/dl)			Albumin (g/dl)			Globulin (g/dl)		
		N	Mean	% change	N	Mean	% change	N	Mean	% change
Control		26	6.4		26	4.17		26	2.18	
Group number	1	42	6.67	4.21	42	4.17	0	40	2.59	18.80
	2	22	6.96	8.75	21	4.93	18.22	22	2.2	0.91
	3	6	5.93	- 7.34	6	4.45	6.71	6	2.29	5.04
	4	2	6.05	- 5.46	2	4.95	18.70	2	1.10	-49.5
	5	3	7.06	10.31	3	4.12	- 1.19	3	2.6	19.26

Group1 are breast feeding infants, Group2 are breast fed infants in addition to other type of food, Group 3 was formula fed infants, Group 4 was those infants supplied human and formula and any other food, Group5 depended on any food except milk.

Table (3) effect of skin pigmentation on the level of infant serum parameters assayed.

Sample		Parameters assayed								
		Total protein (g/dl)			Albumin (g/dl)			Globulin (g/dl)		
		N	Mean	% change	N	Mean	% increase	N	Mean	% change
Control		26	6.4		26	4.17		26	2.18	
Skin pigment	White	74	6.74	5.31	74	4.40	5.51	73	2.45	12.38
	Dark	4	5.82	- 9.06	3	4.66	11.75	3	1.40	- 35.77

Table (4) Effect of rickets cases on the level of infant serum parameters assayed.

Sample		Parameters assayed								
		Total protein (g/dl)			Albumin (g/dl)			Globulin (g/dl)		
		N	Mean	% increase	N	Mean	% increase	N	Mean	% increase
Control		26	6.4		26	4.17		26	2.18	
Rickets cases	M	37	6.85	7.03	36	4.62	10.79	37	2.48	13.76
	S	37	6.61	3.28	37	4.21	0.95	36	2.44	11.92

Table (5) Effect of number of siblings breast fed on the level of the serum parameters assayed.

Sample		Parameters assayed								
		Total protein (g/dl)			Albumin (g/dl)			Globulin (g/dl)		
		N	Mean	% change	N	Mean	% increase	N	Mean	% decrease
Control			7.65			4.1			3.55	
No.of siblings breast fed	1	27	7.90	3.2	26	4.67	13.90	26	3.17	10.70
	2	33	7.29	- 4.7	33	4.76	16.09	33	2.50	29.57*
	3	16	7.80	1.96	16	4.88	19.02	16	2.87	19.15
	4	12	7.17	- 6.27	12	4.91	19.75	12	2.26	36.33*
	5	10	7.38	- 3.52	10	4.98	21.46	10	2.4	32.39*
	8	3	7.44	- 2.74	3	4.4	7.31	3	3.03	14.64

* Significant at P≤ 0.05

Table (6) effect of socioeconomic state on the level of serum parameters assayed.

Sample		Parameters assayed								
		Total protein (g/dl)			Albumin (g/dl)			Globulin (g/dl)		
		N	Mean	% decrease	N	Mean	% increase	N	Mean	% decrease
Control			7.65			4.1			3.55	
socioeconomic state	Good	53	7.61	0.52	52	4.96	20.97	52	2.61	26.47*
	Medium	45	7.30	4.57	46	4.51	10	45	2.82	20.56
	Low	12	7.62	0.39	11	4.99	21.7	11	2.50	29.57

* Significant at P≤ 0.05

Table (7) Effect of lactation on the level of serum parameters assayed.

Sample	Parameters assayed

	Total protein (g/dl)			Albumin (g/dl)			Globulin (g/dl)		
	N	Mean	% decrease	N	Mean	% increase	N	Mean	%decrease
Control		7.65			4.1			3.55	
lactating	93	7.50	- 1.96	93	4.78	16.58	92	2.71	23.66
non lactating	17	7.38	- 3.52	16	4.74	15.6	16	2.58	27.32*

*Significant at P≤ 0.05

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