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Serum Protein and Serum Electrolyte Levels in Myeloproliferative Disorder Patients

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Abstract

The serum protein and serum electrolyte levels in 50 people confirmed to be suffering from myeloproliferative disorder in UNTH was assessed. For serum protein; Total protein, Albumin for and globulin were determined. For electrolytes; sodium ion, potassium ion, bicarbonate ion and chloride ion were also determined. For myeloproliferative disorder subjects, 26 were males 24 were females, for the non- myeloproliferative disorder, 10 were males and 10 were females. The mean for serum proteins were; For total protein 5.89 + 0.23, Albumin 2.83 + 1.0, globulin 2.29 + 0.23, for non-myeloproliferative subjects total protein 7.09 +_0.54, Albumin 4.11 + 0.59 globulin 2.98 + 0.58. The mean value for serum electrolyte; sodium ion 137.56 + 4.47, potassium ion 3.73 ± 0.53, Bicarbonate 21.90 ± 2.22, chloride 94.78 ±11.80. For non-myeloproliferative disorder subjects 140.09 + 3.09, 4.18 + 0.51, 25.90 + 1.56, 101.40 + 177. The mean value of myeloproliferative disorder subjects to non myeloproliferative disorder subjects were significantly low P(<0.05) from this research, the myeloproliferative disorder has affected these value by causing their decrease except for globulin which fall within the range.

Keywords: Protein; Electrolytes; Myeloproliferative disorders

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Introduction

Myeloproliferative disorders are diseases of several postulations of aetiology characterized by an uncontrolled abnormal and wide spread proliferation of the leucocytes cells of the body, which infiltrate the bone marrow and other tissues. This proliferation is usually, but not invariable accompanied by the appearance in the peripheral blood of immature leucocytes, which are often morphologically abnormal [1]. In some cases there is an abnormal proliferation of red cell precursors or platelets. As well as leucopioetic cells. Leukaemia has, in the past, been invariably fatal, now a significant number of patients with acute proliferative disorders have remission, lasting many years and some of these may have been effectively treated of their disease, however it may be seen that great majority of patients with acute proliferation disorder and all with chronic myeloproliferative disorders may ultimately die of their disease or its complications although active treatment may greatly improve the quality of their lives whilst the disease runs its course, or may give a significant respite once remission has been obtained by active treatment [2]. Myeloproliferative diseases account for about 4 per cent of all death from malignant disease. Myeloproliferative disorder occurs spontaneously in a number of animals including fowls and mammals such as mice, rats and cattle. The infective theory derive its main support from experimental observation of myeloproliferative disorder in animals. In fowls the disease can be transmitted by cell-free filtrates and virus has been demonstrated by election microscope [3]. Similarly, mouse leukaemia resembles myeloproliferative disorder in man more than does fowl myeloproliferative disorder [4]. Highly inbred strains of mice have been produced which have a very high incidence of spontaneous proliferative disorder. Gross 1:3 has shown that this is due to a virus transmitted from one generation to the next via the ovum or sperm,In some nice, virus may remain inactive. It is likely that these animals have three factors which are necessary for the development of myeloproliferative process namely a predisposing genetic constitution, an infective agent and a conditioning factor; the later factors vary and includes the

cellular and humoral immune status of the body, possibly the humoral regulating systems of cell proliferation, nutrition and endocrine status, effect of Ionizing radiation are also important under some circumstances [3]. Despite the strong evidence for the infective theory of myeloproliferationis animals the evidence with respect to human myeloproliferatiion remains incomplete. No convincing evidence of contact between cases or of epidermics of human myeloproliferation has been reported [5].

Materials and Methods

Collection of sample: 5ml of blood was collected intravenously from patients, the samples were allowed to clot in a test tube and were spun, the serum was separated from the cell and serum was used.

Method

Determination of serum total protein (**Table 1**).

(Biuret method)

It was mixed well.

And allowed at 37°c for 10mms

It can also be allow at room temperature for 30 minutes. CALCULATION

Total protein gl = Absorbance of test or control

Absorbance f 60gl stand x 60.

Albumin

Method of Determination of Albumin (**Table 2**).

(Bromocresol green method)

Procedure

Pipette in three tubes labeled as follows

This was mixed thoroughly and kept at room temperature for exactly 10mins. The intensity of the test and standard measured by setting blank at 100%-T, by using 640nm (red filter).

Calculation

Serum albumni.gldl = oD Test x4o.DStd

Normal range 3.3 - 4.8 g/dl

Globulins

Determination of globulin

Serum globulins, g/dl = Total proteins-Albumn g/dl

Normal Rage = 1.8-3.6 gldl

Albumin / Globulin ratio = Serum albmin g/dl

Serum globulin, g/dl

Normal Range = 1.2:1 -2:1

Procedure

0.1ml of serum was added to 9.9 ml deionized distilled water, mixed.

Sodium

Sodium filter was used to zero the mark on the flame photometer and was adjusted by spraying deionized water. The working standard was also sprayed and adjusted to 80 marks on the photometer. The serum was sprayed and reading on the flame photometer was taken.

Potassium

Potassium filter was used to zero the mark on flame photometer, this was adjust by spraying demonized water. The working standard was sprayed and adjusted to 70.

Chloride

Determination chloride content is the samples:

Procedure

1. 0.5ml of serum or standard was placed respectively, into an Erlenmeyer flask, or use test tube. It was added in succession, 3.5ml of water, 0.5ml of 0.36 molar sulfuric acid and 0.5ml of sodium tungstate reagent it was mixed well, allowed to stand for 5min and centrifuge. (this procedure gives a modified filinwu protein -free filtrate)

2. 2ml of clear supernatant fluid was transferred into a suitable titration vessel and added 0.1ml

Bicarbonate

Determination of serum Bicarbonate

Procedure

In a 5ml conical flask, 0.25ml of (02 free distilled and mixed, 1.2 ml of cone Hcl was added to the mixture and mixed (2 drops) of diphenylcarbazone solution. Titrated with mercuric nitrate solution from a microburet, calibrated in intervals of 0.05ml

Table 1. Determination of serum total protein.

	STD Blank B	*STD S*	*Con C*	*Con Blank CB*	*Test*	*Test Blank*
Biuret reagent	2.5ml	2.5ml	2.5ml	-	2.5ml	-
Biuret B. reagent	-	-	-	2-5ml	-	2.5ml
Distilled water		-	-	-	-	-
STD 60g/l	-		-	-	-	-
Control Serum	-	-		50 ul	-	-
Pat.Serum/plasma	-	-	-	-		50ul

Table 2. Determination of albumin.

	Test	STD	Blank
Albumin reagent	5.0	5.0	5.0
Serumi ml	5.0	-	-
Albumin Std ml	-	5.0	-
Distilled H20 , ml	-		5.0

and capable of delivering drops equal to not more than 0.02ml. Burets with a fine glass tip are satisfactory but hypodermic needles should not be used as tips, since the metal react with mercuric nitrate solution when approaching the end point (the appearance was a faint blue-violet colour), add the mercuric nitrate solution was added in amounts not greater than 0.02ml at a time. Approximately 2.0ml of reagent was used to titrate a serum sample with normal chloride concentration.

Calculation

Chloride Concentration in nmol/1 = titration of unknown

Titration of standard x0.02 x 1000=0.2

OR

Titration of unknown (In mc)

Titration of standard (In ml) x 100

Where 0.02 = mmol chloride ml of standard

02 = ml of sample used

1000= ml/litre

Results

A total number of 70 samples were used for both the test and control. 50 samples (subjects) myeloproliferative disorder patients in UNTH, aged between 20 years to 50 years - Among these patients were both male and female (26 male and 24 female).

Serum protein levels were first carried out on subjects (50 samples) and non myeloproliferative (20 samples) with biuret method. Serum electrolyte levels also were carried out on the same subjects (50- samples and non myeloproliferative (20 samples) with flame photometric method. In the non myeloproliferative sample, (using normal persons) their age were between 20 years to 50 years, both male and female were involved (10 male & 10 female) The test (subjects) were compared with the control and also male were compared with female. From both subjects and non myeloproliferative, male and female their mean and standard deviation were determined and their levels of significance were obtained (**Tables 3 and 4**).

Discussion

From the observation made so far, the mean total protein and albumin were found to be 5.89 ±0.23 and 2.83 ± 1.0 respectively, with non myeloproliferative levels of 7.09 ±.0.54 and 4.11 ±0.59. This comparison shows that the total protein and albumin fall below the non-myeloproliferative, showing that there is a low significance P (< 0.05) Globulin, level fall within the non

Table 3. Mean and standard deviation of control and test.

	Control	Test	T- Test
T. Protein	7.09 ± 0.54	5.89 ±0.23	P (<0.05)
Albumin	4.11 ±0.59	2.83±1.0	P (<0.05)
Globulin	2.98 4^0.58	3.29 ±0.52	P (<0.05)
Na+	140.09 ±_3.09	137.56 ±4.47	P (<0.05)
K+	4. 18 ±0.51	3.73±_0.53	P (<0.05)
Hcoz	4.18 ±0.51	3.73 ±0.53	P (<0.05)
Hcoz	25. 90 ±_1.56	21.90 ±2. 22	P (<0.05)
Cl	101.40± 1.77	94.78 ± 12.80	P (<0.05)

Table 4. Mean and standard deviation of male and female.

	Test	Control	Test	Control
Total protein	5.90 ± 0.33	7.10 ±0.60	5.90 ±0.31	7.02 ± 0.55
Albumin	3.63 ±0.63	3.96 ±0.51	3.58 ±0.54	4.26 ± 0.64
Globulin	2.26 ± 0.50	3.20 ±0.45	2.18^0.49	2.76 ±0.56
Sodium	133.96 ±2.76	140.4 ±3.44	135.29 ±3.03	139.7±3.19
Potassium	3.62 ± 0.49	4.23 ±_0.58	3.85 ±0.55	4.13 ±0.46
Bicarbonate	22.46 ± 1.91	25.80 ± 1.48	23.13 ± 1.98	26.00±0.46
CL	95.69 ±_20.28	101.70 ±4.62	89.38 ± 18.47	101.10±2.75
Cl	101.40± 1.77	94.78 ± 12.80	P (<0.05)	

myeloproliferative if 2.29 ± 0.52 and 2.98 + 0.58 respectively. In the cause of these decreased levels of total protein and albumin - clinically acute change in concentration, like those of all proteins, reflect the ratio of protein to fluid in the vascular compartments. A raised total plasma protein free fluid from normal cell to uncontrolled growth cell. Also since the liver take part in the formation of erythrocytes, these uncontrolled cells coming to the liver might cause liver cirrhosis because the liver can only produce erythrocytes from the normal cells and the protein concentration in / from the liver will change. Albumin is being synthesized by the liver from normal cells. There will be less production of albumin from the liver- Homoestatic levels are to be affected since albumin also maintains homeostatic [5].

Globulin, the proliferation of these cells is mostly white blood cells in this disease state but there are still normal population of these globulins that make them to fall between the normal ranges. Also immunoglobulin being synthesized by the B-Lymphocytes in response to the sum of immunogeic stimulation. Since B-Lymphocytes are bone marrow products, myeloproliferative disorder will affect the normal production of B- Lymphocytes for syntheses of globulin, which supposed to be higher than its level in this disease [5].

Serum electrolytes, the mean for sodium ion, potassium ion, bicarbonate ion and chloride ion were found to be 137.56 ± 4.47, 3.73 ± 0.53, 21.90 ±2.22, 94.78 ± 12.80 with their control; 140.09 ± 3.09, 4.18 ± 0.51, 25.90 ±1.56, 101.40 ±1.77- from the results observed the electrolytes levels are significantly low P (< 0.05) to the control. This low level of sodium and potassium from the investigation was found to be the inability of the cell to exchange sodium from potassium etc, due to uncontrolled growth of cells. The mean serum bicarbonate level which is significantly low,

clinically bicarbonate is filter through the glomeruli at a plasma concentration of about 25 mmol/l, if there is any effect on plasma concentration it will affect the bicarbonate level.

In chloride, mean serum is also significantly low as others: Generally, this investigation was observed that the uncontrolled proliferative of cells prohibits then normal functions of the electrolytes. Some of the likely abnormalities are improper exchange of sodium at the differential concentration is maintained by cell surface energy dependent sodium/potassium ATPase pump. Haemoglobulin is an important blood buffer, this works effectively in cooperation with bicarbonate system. Ph= + log [Hb-]/HHb so this uncontrolled cell growth in the bone marrow will not help in poorer formations of erythrocytes which work better with bicarbonate an important blood buffer. In turn if there is low erythrocytes concentration, there will be low concentration of carbonate dehydratase which catalysed the dissociation of carbonic acid from co_2 and H_2o to produce bicarbonate $co_2 + H_2o \quad H_2co_3\ H^+ + Hco_3$

For the exchange of bicarbonate to chloride, if there is bicarbonate depletion it will lead to hyper chloraemic acidosis. Secondly, the male and female mean and standard deviation with their control were determined-

For male serum protein= total protein 5.90 ±.0.33, Albumin 3.63 ± 0.63, Globulin 2.26 ±0.50, controls; 7.16 ± 0.60, 3.96 ± 0.5, 3.20 ±0.45 respectively. For female serum protein, total protein total protein 5.90 + 0.31, Albumin 3.58 ± 0.54, Globulin 2.18 ± 0.49, control; 7.02 ± 0.55, 4.26 ± 0.64, 2.76 ± 0.56 respectively. This male and female mean results has no significant for both P>0.05). From the observation the disease does not really affect adult sex. Serum electrolytes level for male; sodium 133.96 ± 2.76, potassium 3.62 ± 0.49, bicarbonate 22.46 ±1.91, chloride 95.69 ± 20.23, control; 140.4±3.44, 4.23 ±0.58, 25.80+.1.48, 101.70 ±4.62 respectively.

For female sodium 13.50 ± 3.03, potassium 3.85 ± 0.55, bicarbonate 23.13 ± 1.98, chloride 89.58 ± 18.47.control; 139.7 ±3.19, 4.13 ±0.46, 26.00 ± 1,76, 101.10 ± 2.75. From the results compared with the control. There is no significance (P>0.05) for both male and female electrolyte in myeloproliferative disorders patients. To project this research work (example) sodium ion and potassium. 75% of their activities or concentrations are based on the formation and condition of the cells although malnutrition or disease state might cause their low or high level of concentrations.

Conclusion

This investigation shows the relationship between the formation of uncontrolled cells growth, serum electrolytes and serum protein level. Some of the proteins and electrolytes are either synthesized or absorbed from by the cells for their normal function. There is a probability that any interference (myeloproliferative disorder) or effect on their production or absorbing, will affect their normal activity which is considered harmful to the system.

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