A Comparative Study of Red Cell Folate and Serum Folate Levels in Patients on Regular Hemodialysis

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Sixty subjects were selected and were divided into two groups. Group A included 30 patients of end stage renal disease on regular dialysis and group B included 30 normal healthy subjects as control. Absolute values and Hb were done by hematology auto analyzer and serum and red cell folate were done by commercially available kits. Results were analyzed by using Student's 't' test and level of significance was done. A significant decreased in serum and red cell folate in end stage renal disease patients with regular dialysis as compared to control.
Key words: Folate, haemodialysis

Patients of end stage renal disease require dialysis therapy to stay alive, and during dialysis erythropoietin deficiency occurs. Erythropoietin therapy improves the quality of life, reduces the need for red-cell transfusions [1, 2]. Erythropoietin is an acidic single chain polypeptide that has two internal disulfide bonds that are necessary for their biologically activity[3]. Haemodialysis is an extracorporeal procedure, during which movement of solutes such as urea from one compartment (blood) to another (dialysate) across a semipermeable membrane. It helps in removal of dialyzable toxic products and reverses the abnormalities in uraemia[4,5]. Anaemia is one of the more constant clinical features of renal failure. During the haemodialysis anaemia is exacerbated due to haemolysis because of mechanical and thermal injury and folic acid deficiency[6]. Pathogenetic mechanisms of anaemia development in chronic renal failure patients on dialysis may be due to low level of erythropoietin and development of ineffective erythropoiesis and having a suppressive effect on haemopoiesis[7]. Folic acid is easily removed by dialysis and if not supplemented deficiency occurs which impairs DNA synthesis and result in a megaloblastic erythroid marrow and macrocytic red cells[8]. Haemodialysis patients may develop a water soluble vitamin deficiency which was found to be folic acid, caused by poor intake, interference with absorption by drugs, altered metabolism, and losses in dialysat[9]. Folate concentration is significantly decreased after haemodialysis, so folate supplementation is necessary during haemodialysis[10, 11]. In chronic haemodialysis patients total homocysteine levels depend on folate status and folate is significantly lost during haemodialysis and its supplement is necessary to prevent complications[12].

The purpose of this study was to measure serum folate level in patients on haemodialysis so that we can manage anaemia due to folate deficiency.

Subjects and methods

Sixty subjects were selected and were divided into two groups. Group A included 30 patients with regular dialysis group B included 30 normal healthy subjects as control Absolute values and Hb were done by hematology autoanalyzer and serum and red cell folate were done by commercially available kits[13]. Results were analyzed by using students 't' test and level of significance was done[14].

Results:

Results and level of significance of these groups are given in table 1 and 2

Table 1: Comparison of Hb, PCV, MCV, MCH, MCHC in groups A and B

Tests	Group B (Control)	Group A (Patients of ESRD with Dialysis)	Significance B Vs A
Hb	12.5 ± 1.33	8.6 ± 1.4	HS
PCV	40.6 ± 0.91	25.3 ± 3.3	HS
MCV	79.8 ± 11.9	106.6 ± 8.5	HS
MCH	30.6 ± 0.98	29.9 ± 2.02	NS
MCHC	31.4 ± 1.1	32.5 ±1.5	NS

Key: NS= Non-Significant HS = Highly significant

Table 2: Comparison of Serum and Red Cell folate levels in groups A and B

Tests	Group B (Control)	Group A (Patients of ESRD with Dialysis)	Significance B Vs A
Serum Folate	10.7 ± 2.9	3.1 ± 1.4	HS
Red Cell Folate	368.5 ± 119.8	51.4 ± 35.5	HS

Key: HS= Highly significant

Discussion

Hemoglobin:

Hb was found to be lower in patients of ESRD with dialysis (Group A) when compared with control (Group B) and the difference was highly significant ($p < 0.01$). The present study is consistent with the results of Bamonti Catera et al (1999)[9], Makoff (1992)[5] Jafee et al (1994)[20] and Aviles et al (2002)[15] who also observed decreased Hb levels in ESRD patients with dialysis.

Absolute Values:

PCV: PCV was found to be decreased in patients of with dialysis (Group A) when compared with control group (B). The present study is in favour of the results of Bamonti-catena et al (1999)[9] & Aviles et al (2002) [15] who also found decreased PCV in ESRD patients under going regular hemodialysis.

MCV: CV was found to be raised in patients of ESRD with dialysis (groups A) when compared with control group (B). The present study is consistent with the results of Hung et al (2001)[16] & Bamonti-Catena et al (1999)[9] who also observed same results. MCV is increased because of folic acid loss during dialysis which leads to megaloblastic anemia.

MCH and MCHC: MCH and MCHC were found to be comparable in all the groups & difference was non-significant.

Serum Folate Level: In the present study, serum folate levels were found to be decreased in patients of end stage renal disease (ESRD) with dialysis (group A) as compared to controls (group B). This decreased serum folate level may be due to toxic effects of uremia, hemodialysis as well as conditioned folate deficiency. This study is consistent with the results of Bamonti-catena et al (1999) [9], Hung et al (2001)[16], Armada et al (2001)[17] and Labelane et al (2000)[19], who also observed decreased serum folate levels in patients of ESRD with dialysis. Parathyroid hormone concentration is increased in uremia. It is due to hyperplasia of parathyroid gland and decrease clearance and degradation of PTH by the disease kidney. PTH is a uremic toxin because it produces anemia by inducing fibrosis of the bone marrow cavity and leads to decreased production of red cells. In the serum, folic acid is not bound with albumin and it is free, so easily lost during dialysis. Continuous loss of folate in dialysis ultimately causing decreased red cell folate.

Red Cell Folate levels: Red cell folate levels were significantly decreased in patients of end stage renal disease (ESRD) with dialysis (Group A). This decreased red cell folate level may be due to regular hemodialysis, conditioning folate deficiency and toxic effects of uremia. The present results are consistent with the study of Jafee et al (1994)[20], Bamonti-Catena et al (1999)[9] and Hung et al (2001)[16] who also observed decreased red cell folate levels in ESRD patients with dialysis.

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