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Research Article

Weekly therapeutic effectiveness of different doses of Eprex; Epoetin alfa® in the treatment of anemia of chronic kidney disease adult patients

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ABSTRACT

Anemia in patients with chronic kidney disease (CKD) is very common and its severity is usually proportional to the degree of renal insufficiency. The purpose of this study is to weekly evaluate the effectiveness of short acting erythrocyte stimulating agent; Eprex; Epoetin alfa® for managing anemia in CKD patients. Adult CKD patients undergoing hemodialysis at King Abdulaziz Medical City from December 2014-March 2015 who were treated for the first time with different doses of short acting erythrocyte stimulating agent; Eprex; Epoetin alfa®. The administration frequency of Eprex was 3 times/week, i.v. (QTIW) at doses 3000, 4000, 6000 and 40.000 IU QTIW. Data on several hematological parameters including red blood corpuscle indices, Mean corpuscular volume (MCV), Mean corpuscular hemoglobin (MCH), Mean corpuscular hemoglobin concentration (MCHC), Red blood corpuscular (RBCs) count, hemoglobin (HB), Hematocrit (Hct), serum iron, ferritin and calculated T.SAT were collected prior to treatment (week 0) and at the end of every week for 7 weeks. Statistical comparisons between measured blood parameters over the follow up time were made using one-way repeated measures analysis of variance (ANOVA). A total of 50 were treated with Eprex; Epoetin alfa® (23 male and 27 female). Mean (SD) initial HB, RBCs and Hct for patients treated with Eprex; Epoetin alfa® was 82.38 (13.3) mg/dl, 2.88 (0.7) (×106/mm3) and 0.257 (0.05) (%, × 100), respectively. Treatment with Eprex; Epoetin alfa® 3000 IU QTIW induced a significant elevation in HB and Hct start from week 3 through week 7, while a marked increase in RBCs count in week 3,4, 6 and 7. A significant increase in MCV and MCH were noticed in week 7 and week 5 and 6 respectively. Administration of Eprex; Epoetin alfa® 4000 IU QTIW induced a remarkable increase in HB and Hct from week 5 through week 7 and from week 3 through week 7 respectively. While RBCs count were markedly elevated in week 7. MCV was elevated significantly in week 7 and MCHC was downloaded in week 6 and 7. However, Eprex; Epoetin alfa® 6000 IU QTIW did not significantly modified the investigated hematological parameter in the first 7 weeks. Treatment with the higher dose of Eprex; Epoetin alfa® 40.000 IU QTIW can markedly elevated both HB and Hct significantly during last three weeks and RBCs count last two weeks. No modification in MCV, MCH and MCHC were noticed This study revealed that Eprex; Epoetin alfa® 3000 start to enhance significantly hematological parameters earlier from week 3 while Eprex; Epoetin alfa® 4000 and 40.000 start from week 5 in HB and week 7 in RBCs. Our findings suggest that Eprex; Epoetin alfa® 3000 QTIW seems to be effective than other doses in terms of boosting blood indices (RBCs, HB, Hct). Further studies are highly warranted to evaluate the effect of Eprex; Epoetin alfa® for longer follow-up periods.

Key words: *Chronic Kidney disease, Anemia, Eprex; Epoetin alfa®*

INTRODUCTION

Erythropoietin (EPO) is a renal glycoprotein hormone directed to regulate erythropoiesis, thus keep red blood cell mass at an optimum level.[1,2] With a sharp decrease in the oxygenation of the tissues, EPO production by the interstitial fibroblast cells of the kidney increase. EPO enhances the production of red blood corpuscle (RBCs) via interaction with its specific receptor expressed on RBCs precursors in the bone marrow leading to proliferation, differentiation and maturation.[3,4] Recombinant human EPO is 35 KD protein hormone with glycosylated part.[5,6] It is composed of single polypeptide chain of 165 amino acid with two disulfide bonds.[7,8] The carbohydrate moiety is post-translational modification that results from specific asparagine (N-linked) or serine/threonine (O-linked). There are three N-linked sugars chain and one O-linked chain.[9,10] EPO is also produced by the liver in the fetal perinatal period; however, renal production is predominant during adulthood.

Chronic kidney disease (CKD) is the consequence of destruction of sufficient number of nephrons which causes progressive and irreversible decline in renal function that may lead to reduced quality of life and eventually death[11] and consequently deterioration of kidney function.[12] Several diseases are involved in the deterioration of kidney function, the most likely are high blood pressure, diabetes mellitus, kidney stone and infection.[13,14] Low renal erythropoietin (EPO) secretion is usually associated with high degree of renal impairment. Therefore, anemia in chronic kidney diseases is very common. It has been reported that lower hemoglobin (HB) level and higher prevalence and severity of anemia were strongly associated with CKD and lower kidney function.[15-16] In addition to low EPO level, there are other causes for induction of anemia in CKD including uremia, chronic blood loss, and hemolysis and bone marrow suppression.[17] Accordingly, anemia is a major complication of CKD,[18] which is mainly due to lower levels of EPO secreted by the damaged kidney together with low serum iron.[19]

In the late 1980s, recombinant human erythropoietin (rhuEPO) was considered the standard of care for the treatment of anemia in CKD patients. It is highly effective and beneficial as it reduces fatigue, improves the physical activity and also restores energy level and enhances a broad spectrum of physiologic functions.[20] Therefore, treatment with EPO could improve CKD patient's well-being and quality of life as it raises HB concentrations and thus diminishes symptoms of anemia.[21-23]

In addition to amelioration of anemia by stimulating erythropoiesis, it has been shown that recombinant human erythropoietin improves anemia in CKD patients by down-regulating one of the negative regulators of erythropoiesis transforming growth factor beta[24]. It has been shown that CKD patients have a significantly lower hematological index including RBCs count, HB, packed cell volume (PCV) and platelets while the total leukocyte count is normal[25]. Erythrocyte membrane protein in CKD patients with stage 5 is altered due to their interaction with hemodialysis membrane.[26] Also, elevation of serum creatinine is negatively correlated with all hematological parameters. The previous results have been recently reaffirmed by Dorgalaleh et al.,[27] who reported a deficiency of EPO secretion with the accumulation of toxic metabolic product in acute and CKD lead to a significant decrease in RBCs count, HB and hematocrit (Hct) compared to normal controls. The optimal administration schedule of Eprex; Epoetin alfa® is three times weekly because of its relative short half-life (6-8 hours i.v and 19-24 hours s.c). However, the direct effect of recombinant human erythropoietin (Eprex; Epoetin alfa®) on RBCs indices as mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentrations (MCHC), RBCs count, HB and Hctin the initial 7 weeks is not clear.Therefore, the aim of the present study is to examine the efficacy of Eprex;Epoetin alfa® on selected hematological parameters in the first 7 weeks in relation to iron status.

MATERIALS AND METHODS

Study Design and Study Subjects

All clinical data were collected from the Nephrology unit and the King Abdulaziz Medical City at the National Guard Health Affairs from September 2012to January 2015. This was an observational study of 50adult patients with were diagnosed CKD and undergoing hemodialysis. Patients with certain established diseases, active neoplasia or those using certain drugs or blood component or undergoing platelet transfusion was excluded from the study.

Informed consent was obtained from all individual participants included in the study before starting treatment with Eprex. Moreover, all procedures performed in this study as involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Patients were under medical treatment with Eprex; Epoetin alfa® for the first time. The week before starting treatment was considered week 0 (baseline). The administration frequency of Eprex; Epoetin alfa® was 3 times/week, i.v. (QTIW). The hematological parameters including red blood corpuscle (RBCs) count, HB, hematocrit (Hct), MCV, MCH, MCHC, serum iron, ferritin and total iron binding capacity (TIBC) were collected from medical record of the patients before starting treatment and at the end of every week for 7 weeks. Based on the data collected, T-SAT was calculated.

Statistical Analysis

Descriptive statistical analyses were performed for the study sample. Continuous data were expressed as mean± standard deviation (SD) or standard error of mean (SEM), median (interquartile range: IQR). Proportions were used for categorical variables. Comparison between Eprex; Epoetin alfa® doses in terms of baseline and demographic factors were made using one way analysis of variance (ANOVA)or Kruskal-Wallis test for continuous variables and the Chi-square test for categorical variables. Eprex; Epoetin alfa® doses measured bloods parameters over the follow up time were compared using

ANOVA followed by Tukey–Kramer multiple comparison tests. Statistical significance was considered at $p<0.05$. All statistical analyses were performed using SPSS 21.0 [Release 21.0.0.0, IBM, USA].

RESULTS

A total of 50 patients were included; characteristics of the study sample are displayed in Table 1. Average age was 59.8 years (SD = 15.8), with 54% males. Average body weight was 69.8 kg (SD = 20.9). Age was significantly different in the four Eprex; Epoetin alfa® dose groups ($p = 0.044$). No statistically significant differences were found between the four groups in terms of gender or body weight ($p>0.05$).

Tables 2 and 3 show results for hematological parameters at baseline and in the first 7 weeks of treatment. Eprex; Epoetin alfa® 3000 IU QTIW induced a significant elevation in MCVin week 7, compared to baseline, while a marked increase in MCH was observed in week 5 and 6 and in RBC count in week 3, 4,6 and 7. A parallel increment in both HB and Hct were also observed starting from week 3 through week 7. Administration of Eprex; Epoetin alfa® 4000 IU QTIW induced a remarkable increase in MCVand RBC countin week 7 and decrease in MCHC in week 6 and 7. A parallel significant increment in both HB and Hct starting from week 5 and week 3 through week 7 respectively. Except for a significant increase in RBC levels in week 6 and 7 and remarkable increase in both HB and Hct from week 5 through week 7 with Eprex; Epoetin alfa® 40,000 IU QW, no significant increase in any of the other hematological parameters were observed. Treatment with Eprex; Epoetin alfa® 6000 IU QTIW did not induce any significant elevation in all investigated hematological parameters. Statistically significant changes in mean hematological parameters by Eprex; Epoetin alfa®doses are displayed in Figures 1-5.

Table 1: Characteristics of the Study Sample. Total Number of Patients (n) = 50.

Factor	**All (N = 50, 100%)**	**3000 IU (N = 10, 20%)**	**4000 IU (N = 20, 40%)**	**6000 IU (N = 13, 26%)**	**40,000 IU (N = 7, 14%)**
Age (yrs.)*	59.8 ± 15.8	69.9 ± 8.8	58.1 ± 14.4	61.9 ± 20.2	48.9 ± 15.1
	63.5 (50.8-70.7)	70 (63-78.5)	63 (48.3-66.8)	65 (47.5-75.5)	45 (37.0-64.0)
Gender n (%)					
Female	23 (46.0%)	4 (40.0%)	10 (50.5%)	7 (53.8%)	4 (57.1%)
Male	27 (54.0%)	6 (60.0%)	10 (50.0%)	6 (56.2%)	3 (42.9%)
BW(kg)	69.8 ± 20.9	68.6 ± 21.4	72.6 ± 22.9	73.3 ± 21.1	59.4 ± 12.1
	65.5 (54.5-80.7)	62.5 (54.0-82.6)	67.5 (55.3-84.1)	78.1 (54.5-83.0)	57.5 (50.4-71.6)
Serum iron (µmol/l)		7.3 ± 3.3	11.3 ± 8.7	6.7 ± 6.2	13.0 ± 11.0
		6.5 (5.2-9.8)	8.9 (5.6-12.7)	5.0 (2.7-9.0)	11.2 (3.0-)
Ferritin		1577±2024	3080±8084	1154±1152	2730±1708
		405(1348-4009)	383(136-1117)	802(196-2454)	2730(1522-)
TSAT		20.4 ± 12.8	28.3 ± 18.7	73.3 ± 21.1	59.4 ± 12.1
		20.0 (10.4-30.6)	16.3 (0-29.5)	78.1 (54.5-83.0)	57.5 (50.4-71.6)
Dose/kg**		142.4 ± 41.3	195.5 ± 49.8	267.4 ± 88.7	696.5 ± 133.7
		144.8 (111.2-166.7)	178.3 (142.9-217.2)	230.5 (216.9-340.6)	695.7 (558.7-793.7)

Comparisons based on the t-test/Mann-Whitney U test or Chi-square test BW: Body weight *p = 0.044 **p<0.001 Data for continuous variables are expressed as mean ± SD and median (IQR)

Table 2: Descriptive Statistics and Comparison of Hematological Parameters between Week 0 (Baseline) and Week 1 through Week 7 by EPREX Dose.n = 50.

	3000 IU (n = 10, 20%)	**4000 IU (n = 20, 40%)**	**6000 IU (n = 13, 26%)**	**40,000 IU (n = 7, 14%)**
	Mean (SEM)	**Mean (SEM)**	**Mean (SEM)**	**Mean (SEM)**
MCV (fl/cell)				
Week 0	92.61 (2.4)	85.93 (2.2)	89.37 (1.8)	87.69 (4.4)
Week 1	91.97 (1.9)	85.92 (2.1)	87.91 (1.7)	89.46 (4.6)
Week 2	93.71 (2.0)	87.61 (2.0)	88.70 (1.7)	88.36 (4.0)
Week 3	94.68 (1.7)	88.46 (1.8)	88.97 (1.5)	90.14 (3.9)
Week 4	94.95 (1.9)	87.99 (1.6)	89.66 (1.2)	89.21 (4.4)
Week 5	95.86 (2.1)	88.35 (1.7)	90.15 (1.6)	91.03 (4.8)
Week 6	96.41 (2.1)	88.70 (1.6)	90.49 (1.8)	90.17 (4.6)
Week 7	96.33 (1.9)*	88.95 (1.5)*	89.97 (1.7)	90.41 (4.7)

MCH (Pg/cell)				
Week 0	29.92 (0.7)	27.55 (0.7)	27.92 (0.6)	28.40 (1.4)
Week 1	29.92 (0.5)	27.35 (0.7)	27.91 (0.6)	28.69 (1.4)
Week 2	29.87 (0.4)	27.51 (0.7)	28.03 (0.6)	28.63 (1.4)
Week 3	30.05 (0.5)	27.78 (0.6)	27.88 (0.5)	29.17 (1.3)
Week 4	30.27 (0.8)	27.75 (0.6)	28.13 (0.7)	28.53 (1.4)
Week 5	30.72 (0.7)*	27.67 (0.6)	28.02 (0.7)	28.47 (1.3)
Week 6	30.98 (0.7)*	27.53 (0.6)	28.18 (0.7)	28.61 (1.4)
Week 7	30.56 (0.6)	27.68 (0.6)	27.99 (0.7)	28.97 (1.6)
MCHC (g/l)				
Week 0	322.60 (4.7)	320.75 (5.2)	312.54 (3.5)	324.14 (4.1)
Week 1	323.60 (3.6)	317.57 (3.7)	317.58 (3.3)	318.29 (5.0)
Week 2	318.80 (3.4)	313.68 (3.4)	315.62 (3.9)	322.14 (7.1)
Week 3	318.30 (3.1)	313.79 (3.5)	314.29 (4.2)	321.00 (5.4)
Week 4	318.00 (4.0)	315.50 (3.6)	307.51 (7.6)	319.00 (6.8)
Week 5	320.65 (4.2)	313.44 (3.6)	309.21 (5.7)	313.43 (6.0)
Week 6	321.40 (2.8)	310.30 (2.9)*	310.94 (4.7)	314.14 (6.0)
Week 7	318.00 (2.8)	310.38 (3.2)*	310.04 (4.7)	319.43 (7.3)

*p<0.05, **p<0.001 compared to week 0 (baseline). SEM = Standard Error of the mean

Table 3: Descriptive Statistics and Comparison of Hematological Parameters between Week 0 (Baseline) and Week 1 through Week 7 by EPREX Dose.n = 50.

	3000 IU (n = 10, 20%)	**4000 IU (n = 20, 40%)**	**6000 IU (n = 13, 26%)**	**40,000 IU (n = 7, 14%)**
	Mean (SEM)	**Mean (SEM)**	**Mean (SEM)**	**Mean (SEM)**
RBC				
Week 0	2.67 (0.17)	2.85 (0.14)	3.01 (0.20)	3.00 (0.3)
Week 1	2.90 (0.12)	3.13 (0.13)	3.27 (0.19)	3.04 (0.3)
Week 2	3.04 (0.11)	3.22 (0.17)	3.15 (0.17)	3.12 (0.2)
Week 3	3.22 (0.15)*	3.27 (0.12)	3.36 (0.19)	3.14 (0.3)
Week 4	3.28 (0.15)*	3.48 (0.17)	3.27 (0.14)	3.44 (0.2)
Week 5	3.17 (0.14)	3.68 (0.71)	3.50 (0.25)	3.55 (0.2)
Week 6	3.25 (0.17)*	3.67 (0.22)	3.83 (0.12)	3.52 (0.2)*
Week 7	3.29 (0.09)**	4.27 (0.33)**	3.51 (0.23)	3.53 (0.3)*
HB (g/l)				
Week 0	79.50 (4.8)	82.61 (13.4)	80.82 (12.3)	84.63 (12.4)
Week 1	86.41 (3.1)	87.25 (7.1)	82.68 (12.5)	87.18 (9.5)
Week 2	89.94 (2.2)	86.14 (14.3)	81.56 (7.4)	90.58 (12.9)
Week 3	95.49 (3.5)*	89.73 (12.2)	87.43 (9.7)	96.89 (20.6)
Week 4	99.46 (4.1)*	91.39 (18.1)	89.99 (14.6)	100.99 (17.8)
Week 5	97.09 (4.2)*	95.69 (15.3)*	88.84 (14.9)	103.94 (16.7)*
Week 6	103.03 (4.0)*	95.57 (12.1)*	94.02 (14.8)	101.16 (16.6)*
Week 7	100.59 (1.6)*	97.21 (14.4)*	94.32 (15.5)	104.14 (18.5)*
Hct				
Week 0	0.25 (0.02)	0.26 (0.05)	0.26 (0.04)	0.26 (0.04)
Week 1	0.27 (0.01)	0.28 (0.03)	0.26 (0.04)	0.27 (0.04)
Week 2	0.28 (0.01)	0.28 (0.06)	0.26 (0.03)	0.28 (0.04)
Week 3	0.30 (0.01)*	0.29 (0.05)*	0.28 (0.03)	0.30 (0.06)
Week 4	0.31 (0.01)*	0.29 (0.07)*	0.29 (0.05)	0.32 (0.07)
Week 5	0.30 (0.01)*	0.31 (0.06)*	0.28 (0.05)	0.34 (0.06)*
Week 6	0.32 (0.01)*	0.31 (0.05)*	0.30 (0.05)	0.32 (0.06)*
Week 7	0.32 (0.01)*	0.31 (0.05)*	0.30 (0.06)	0.33 (0.06)*

*p<0.05, **p<0.001 compared to week 0 (baseline). SEM = Standard Error of the mean

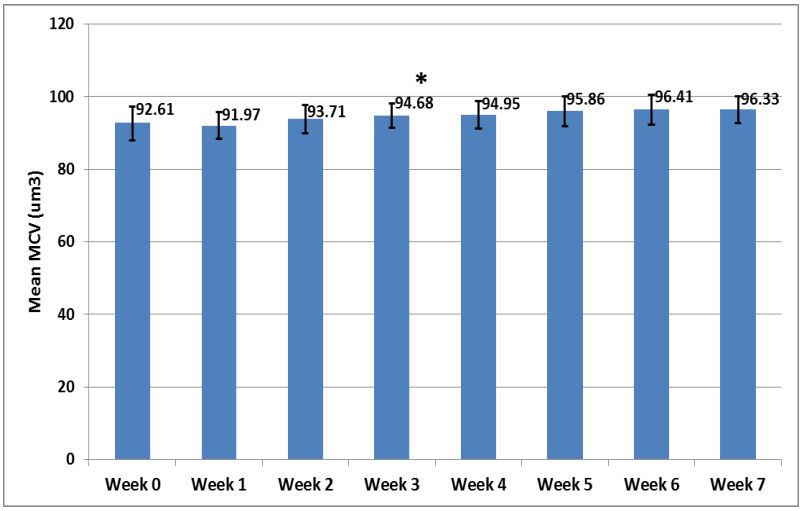

Figure 1: EPREX 3000 IU: Mean Corpuscular Volume (MCV) with 95% CI in Week 0 (Baseline) through Week 7.n = 50.

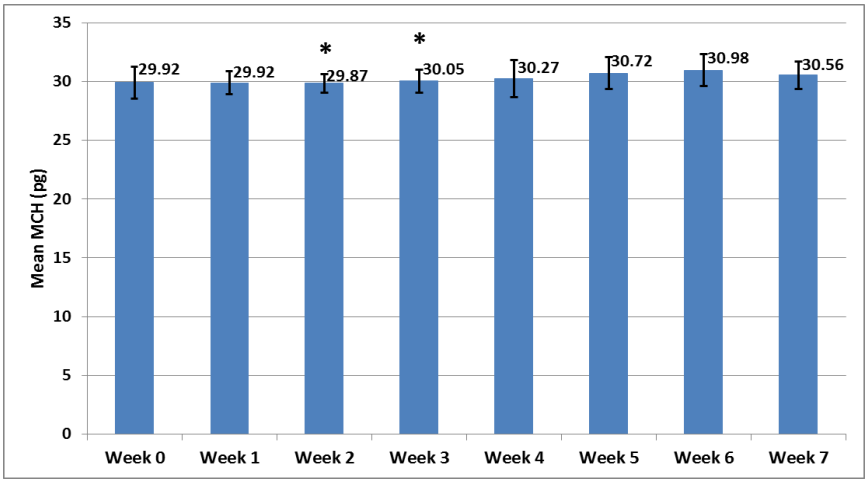

Figure 2: EPREX 3000 IU: Mean Corpuscular Hemoglobin (MCH) with 95% CI in Week 0 (Baseline) through Week 7.n = 50.

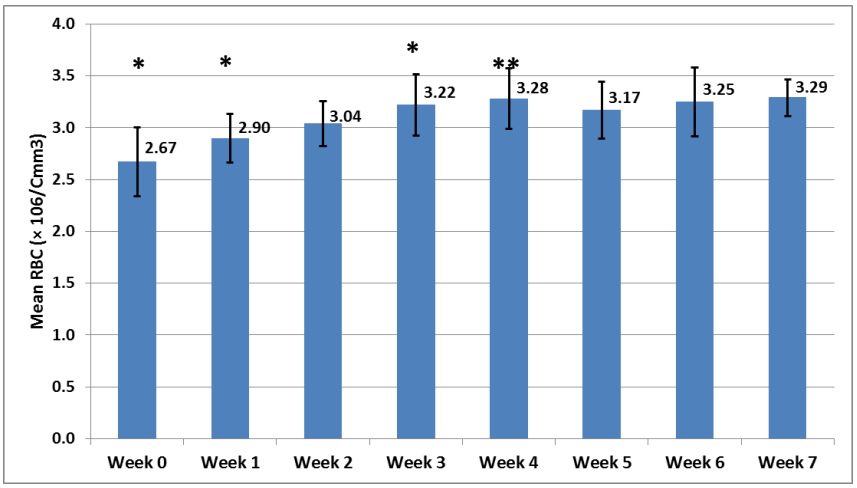

Figure 3: EPREX 3000 IU: Mean RBC count with 95% CI in Week 0 (Baseline) through Week 7.n = 50.

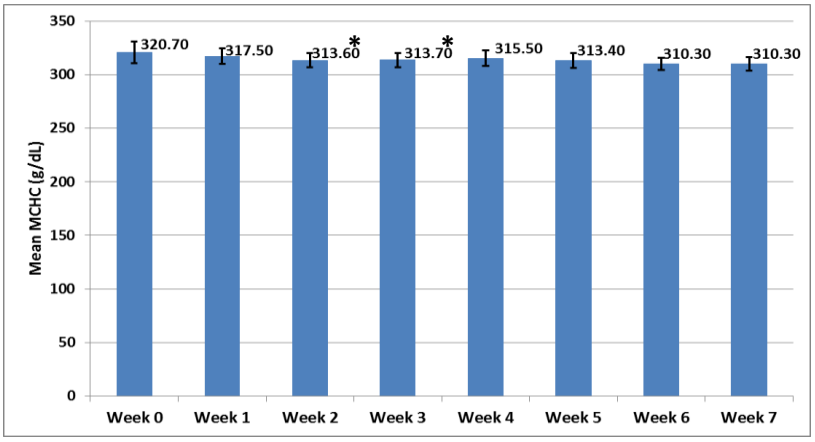

Figure 4: EPREX 4000 IU: Mean Corpuscular Hemoglobin Concentration (MCHC) with 95% CI in Week 0 (Baseline) through Week 7.n = 50.

DISCUSSION

CKD is a widespread health problem in the world and anemia is a common complication. Recombinant-Hu EPO represents the greatest pharmacological innovation of the last 20 years in the field of Nephrology and its use has made anemia secondary to CKD and much more manageable.[28,29,30] Based on the data of MCV, MCH and MCHC presented in the current study we could confirm that anemia associated with CKD is normocytic as MCV and MCH were within the normal range while MCHC had lower than normal values. The present study investigated the initial weekly assessment of therapeutic efficacy of different doses of Eprex; Epoetin alfa® for the treatment of normocytic anemia associated with CKD. Treatment of CKD patients with different doses of Eprex; Epoetin alfa®, 3000, 4000 IU QTIW or 40.000 IU QW lead to an improvement in RBCs indices, MCV, MCH and MCHC. In addition, there were ameliorations in anemia parameters; RBCs, Hct and HB. The present results are consistent with those reported in other studies which showed favorable improvements in hemoglobin in CKD patients.[22, 29,31] Treatment with lower dose of Eprex; Epoetin alfa® (3000 IU QTIW) during the initial 7 weeks, induced a parallel significant increase in HB and Hct from week 3 through week 7, and marked elevation in RBCs count in week 3,4,6 and 7. Moreover, there were a significant increase in both MCV and MCH during week 7 and week 6 and 7, respectively. A significant increase in Hct was observed starting from week 3 through week 7 and HB from week 5 to week 7 while a significant rise in RBCs count and MCV was recorded in week 7 after treatment with Eprex; Epoetin alfa® 4000 IU QTIW). A parallel increase in HB and Hct in last three weeks and a significant rise in RBCs count in last two weeks were noticed after administration of higher dose Eprex; Epoetin alfa® 40.000 IU QW. However, there were no changes in RBCs indices, MCV, MCH and MCHC during treatment with high doses of Eprex; Epoetin alfa®40.000 IU QW. Moreover, there were no noticed changes in all investigated parameters during the initial 7 weeks after treatment with Eprex; Epoetin alfa® 6000 IU QTIW.

The correction of anemia in CKD patients receiving abovementioned three doses of Eprex; Epoetin alfa® 3000, 4000 IU QTIWor 40.000 IU QW may be due to its stimulating effect on erythropoiesis as erythropoietin which is the major humoral regulator of red cell production that helps maintain the viability of RBC by retarding the cleavage of DNA that occurs normally in CFU-Es. In the absence of EPO, DNA cleavage is rapid and leads to cell death. In addition, due to its effect, it decreases one of the negative regulators of erythropoiesis transforming growth factor beta, Logofetov et al.[15] However, our results indicated that Eprex; Epoetin alfa® 6000 IU QTIW failed to induce any significant changes during the initial 7 weeks which may be due to hypo responsiveness of their bone marrow cells. The hypo responsiveness to Eprex 6000 IU QTIW was mainly due to iron deficiency and also decreased calculated T SAT which observed in 70% and 60% respectively of the total number of patients receiving 6000 IU QTIW. Thus, the numbers of patients complicated with potential iron deficiency were high. Correction of the iron status before starting treatment with Eprex; Epoetin alfa® may improve responsiveness.

Although the National Kidney Foundation Kidney Disease Outcome Quality Initiative (KDOQI) recommends targeting HB between 110 and 120 g/l, in our study no patients were within this range. Nevertheless, it has been reported that 30% of patients with CKD fall within this range.[32] Based on the risks associated with high HB targets in other studies [33,34],HB level between 100–120 g/l was suggested for patients with type 2 diabetes mellitus (T2DM) avoiding levels above 120 g/l, particularly for those at risk of stroke.[35] In the current study, we

have chosen the target of 100–120 g/l, in line with the current recommendations.[34] The results of this study showed that Eprex; Epoetin alfa® maintained HB target in almost 30% of the patients starting in week 4 through week 7 after treatment with the higher dose 40.000 IU QW, while the lower dose 3000 IU QTIW elevating HB to the target level during week 6 and week 7. This observation in achieving target HB was not mentioned before. The present results showed that treatment with Eprex; Epoetin alfa® 6000 IU QTIW failed to mitigate the investigated hematological parameters due to low serum iron and low calculated T SAT in more than 60% of the patients. Our results are disagree with previous study reported that iron deficiency during initial weeks is hardly present.[36]

Based on previous study reported that Darbepoietin alpha QW is more efficient than Eprex; Epoetin alfa® in achieving target HB level[37] and on our recent results showed that treatment with low dose Darbepoietin (DA) QW (40 and 60 µg) are more efficient in ameliorating blood indices (RBCs, HB, Hct) and maintaining HB level within recommended range starting from week 3 through week 7 compared to the equivalent doses of Eprex QTIW.[38]

The results of the present study were based on a small number of patients and the follow-up period was no longer enough. Therefore, further studies based on larger sample group and longer follow-up period are highly warranted to make our finding definitive.

CONCLUSION

Our finding suggests that low and high dose of Eprex; Epoetin alfa® 3000 QTIW and 40.000 IU QW can effectively maintain HB levels within recommended range starting from week 6 and week 4 respectively. Our analysis also suggests that response to treatment with different doses Eprex; Epoetin alfa® 3000, 4000 IU QTIW and 40.000 IU QW in the initial 7 weeks is associated with correction of anemia. In addition, we found that a hypo responsiveness to Eprex; Epoetin alfa®6000 IU QTIW may be due to iron deficiency.

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CONFLICT OF INTEREST

The authors of this manuscript declare that they have no conflict of interest to disclose.

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