Original Article

Quality of Life of Patients on Maintenance Hemodialysis in Relation to Hemoglobin Level: A Multicenter Study from a Developing Country

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Abstract

Background: *Anemia is common in patients with end stage renal disease (ESRD) and is associated with impaired quality of life (QOL). This study was done to evaluate the QOL of ESRD patients on maintenance hemodialysis (MHD) with different levels of hemoglobin (Hb).*

Methods: *This cross-sectional study was conducted from January to December 2013 on 135 adult ESRD patients on MHD for ≥4 months, at hemodialysis units of three tertiary care hospitals in Dhaka, Bangladesh. The patients were divided into three groups based on Hb levels (Group 1: Hb <9 gm/dl, n=45, 33%; Group 2: Hb 9-11 gm/dl, n=53, 39% and Group 3: Hb >11 gm/dl, n=37, 28%), provided their Hb levels were stable [ie. maintained with erythropoietin (EPO) or blood transfusion (BT) or both] over the previous four months. Subjects were interviewed by principal investigator using Kidney Disease Quality of Life Short Form Tool (KDQOL-SF-36 version 1.3) consisting of two domains with 38 questions with each item put on a 0 to 100 range, higher scores indicating better QOL.*

Results: *The mean age was 50+12 years with male predominance (male:female = 1.5:1). Mean duration of hemodialysis was 12±11.8 months (range 9 to 66 months). The average QOL score was 50. Comparison of QOL parameters between the three groups showed that symptoms/problems, effects of kidney disease, burden of kidney disease, cognitive function, quality of social interaction and sleep in the kidney disease specific domain as well as pain, emotional well-being, social function and energy/fatigue scale scores in the general health related domain were significantly higher in the group 2 and group 3 than group 1 patients (each with p<0.001). Comparison of QOL parameters between anemia correction measures like EPO (n=65, 48.2%), BT (n=42, 31.1%) or both (n=28, 20.7%) showed that the group receiving EPO alone had better QOL [symptom/ problem (p 0.043), burden of kidney disease (p 0.000), sexual function (p 0.000), pain (p 0.008) and energy/ fatigue (p 0.036)] compared to those getting BT or even BT plus EPO.*

Conclusion: *Patients were found to have better QOL with higher Hb levels. The overall QOL can be improved significantly by correction of anemia.*

Key words: *Hemodialysis, hemoglobin, quality of life.*

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Introduction

Patients with chronic kidney disease (CKD) are physically unwell, financially crippled and psychologically demoralized.[1] Anemia is associated with impaired quality of life (QOL), reduced energy and higher morbidity and mortality.[2] Physicians strive to improve the feeling of well-being of these patients, so that they may lead a meaningful life. Among the various ways to improve QOL, anemia correction was assumed to be an easy and effective method. Anemia correction in CKD patients is usually done by blood transfusion (BT), erythropoietin (EPO) or both. Health-related QOL refers to the measure of a patient's functioning, well-being and general health perception.[3,4] Along with survival, patients' QOL is an important indicator of the effectiveness of the medical care they receive.

QOL depends on multiple factors.[5] QOL is poor in patients on hemodialysis who are anemic. The actual target level of hemoglobin (Hb) which provides optimum QOL scores in Bangladeshi hemodialysis patients is not known. This study aimed to assess and compare the QOL for patients with different Hb levels in order to find out the target level of Hb at which our hemodialysis patients would attain a better QOL. In addition, the association of each QOL item within the kidney disease specific domain and general health related domain with different clinical and laboratory parameters were evaluated.

Methods

This cross-sectional study was conducted from January to December 2013 at hemodialysis units at National Institute of Kidney Diseases and Urology (NIKDU), Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM) and Square Hospital, Dhaka, Bangladesh. One hundred and thirty five adult (>18 years) end stage renal disease (ESRD) patients on regular maintenance haemodialysis (MHD) for ≥4 months and with stable hemoglobin levels were selected by purposive sampling. Patients with malignancy, dementia and psychosis were excluded.

To label the patients as having stable hemoglobin levels, each patient's past four months' records of Hb levels were collected. If a patient's Hb level at the time of enrollment was the same as the mean of hemoglobin levels at the first three months, then that patient was labeled to have stable Hb. The average units of BT per month as well as the average EPO used monthly (calculated over the first three of the last four months) were also recorded. The doses of EPO and BT per month were also considered to be constant if the average monthly dose administered over the first three months were the same as that instituted in the fourth or last month.

The patients were divided into three groups based on their average Hb level (mean of last three months tests) and QOL in each of these groups were compared. The groups were classified such as <9 gm/dl (group 1), 9-11 gm/dl (group 2), and >11 gm/dl (group 3). Subjects were interviewed once by the principal investigator using Kidney Disease Quality of Life Short Form Tool (KDQOL-SF-36 version 1.3) consisting of two domains with 38 questionnaires with higher scores indicating better QOL.[6]

In the kidney disease specific domain 11 scales (or areas) are used to assess the impact of renal impairment on the patient's life and in the general health domain there are 8 scales or areas of questioning. There are several questions or items within each of these nineteen areas. The Bangla version of the questionnaire was validated. Majority of the scales in the questionnaire showed good test–retest reliability.[7] Patient specific information like age, gender and clinical data like hemodialysis duration, blood pressure and the use of BT or EPO were collected at the time of the face to face interview in a predesigned case record form.

The data were analyzed with the statistical software SPSS 11.5.0. Statistical significance was set at $p<0.05$. Two tailed Student's t-test was used to compare quantitative difference between 2 groups. One-way analysis of variance (one way ANOVA) was used to compare quantitative difference between multiple groups. Association was seen by Pearson's correlation test.

Results

Total patients were 135 including 80 males. The mean duration of CKD in these patients was 4.9±5.1 years. The patients were divided into three groups based on haemoglobin levels [(Group 1: n=45, 33%); (Group 2: n=53, 39%) and (Group 3: n=37, 28%)].

Age, blood pressure and mean duration of dialysis were similar among the three groups as shown in Table I.

Majority of the study subjects were anemic with 45% of the patients being BT dependent but with only 36% being on EPO while 19% received both. BT was taken by 27, 20 and 3 subjects in group 1, 2 and 3.

Comparison of different biochemical parameters like serum albumin, total protein, creatinine and Kt/V (indicator of dialysis adequacy) were done between 3 Hb groups. It was found that there were no significant differences of all these parameters among the three groups (Table II).

Between the three groups transferrin saturation (TSAT) was also higher in group 3 (>11 g/dl) than group 1 (<9 g/dl), (p< 0.001) (Table III).

Comparison of QOL score between the three groups showed majority of the scores for KDQOL-SF-36 were higher in group 3 than in group 1 (Tables IV and V).

Table I. Clinical parameters of different hemoglobin groups

Clinical parameters	<9 gm/dl (Mean±SD)	9-11 gm/dl (Mean±SD)	>11 gm/dl (Mean±SD)	Total (n=135)	P value
Age (years)	48±12	48±11	52±12	50±12	0.160
Systolic BP (mmHg)	159±9	160±10	158±10	160±10	0.086
Diastolic BP (mmHg)	87±4	90±6	89±3	89±5	0.607
Dialysis Duration (months)	18.5±10	22±14	20 ±11	12±11.8	0.235
Blood transfusion (unit per month)	0.97±0.96	1.0±0.97	0.33±0.68	0.84±0.94	0.001
Erythropoietin dose (unit/week)	-	-		2208±2135	-

Note BT= Blood transfusion, BP= Blood pressure

Table II. Biochemical parameters of the different hemoglobin groups

Biochemical parameter	<9 gm /dl (n=45)	9-11 gm /dl (n=53)	>11 gm /dl (n=37)	P value
Serum albumin (g/dl)	3.2±0.4	3.2±0.4	3.3±0.3	0.545
Serum total protein (g/dl)	6.4± 0.8	6.4± 1.1	6.4±0.8	0.962
Serum creatinine(mg/dl)	8.9±1.9	9.3±3.2	8.2±2.1	0.114
Kt/V	0.99±0.2	0.98±0.3	1.1±0.28	0.062

Table III. Hematological parameter of different hemoglobin groups

Hematological parameter	<9 gm /dl (n=45)	9-11 gm /dl (n=53)	>11 gm /dl (n=37)	Total (n=135)	P value
Hemoglobin (g/dl)	8.1 ±.55	9.6±.4	11.5 ±.32	9.6±1.3	0.000
Serum ferritin (ng/ml)	511±322	589±373	576±379	557±358	0.536
TSAT (transferrin saturation) %	35±13	37±14	48 ±23	39±19	0.004

Table IV. Quality of life parameter in Kidney disease specific domain between 3 hemoglobin groups

Items of quality of life	<9 gm /dl (n=45)	9-11 gm /dl (n=53)	>11 gm /dl (n=37)	Mean Score±SD	P value
Symptom/problem	62±8	69±8	72±8	67±9	0.000
Effect of Kidney disease	56±9	58±8	63±9	59±9	0.002
Burden of Kidney disease	5±9	12±11	21±11	12±12	0.000
Cognitive function	52±11	65±15	68±11	62± 14	0.000
Quality of social interaction	70±13	76±12	84±11	77± 13	0.000
Sexual function	23±37	37±43	53±44	36±43	0.012
Sleep	47±10	53±9	56±9	52±9	0.000
Social support	60±16	62±18	67±19	62±18	0.224

Table V. Quality of life parameter in General health related domain between 3 hemoglobin groups

Items of quality of life	<9 gm /dl (n=45)	9-11 gm /dl (n=53)	>11 gm /dl (n=37)	Mean Score±SD	P value
Physical functioning	43±29	44±37	45±31	43±33	0.957
Role Physical	18±39	24±43	12±33	18 ±39	0.402
Pain	33±16	48±16	65±20	48±21	0.000
General health	17±15	36±15	46±16	32±19	0.000
Emotional well being	67±20	77±20	91±21	78±23	0.000
Role emotion	15±7	8±16	12±16	8±14	0.002
Social function	34±11	49±17	61±19	48±19	0.000
Energy / fatigue	34±9	43±13	49±13	42±13	0.000
Overall score				50±17	

Comparison of quality of life parameters between the three hemoglobin groups

QOL parameters were compared between group 2 and group 1 and showed that symptom/problem, burden of kidney disease, cognitive function, sleep, pain, general health, emotional well-being, social function and energy/ fatigue were higher in group 2 than group 1. But the comparison in majority of scales between group 2 and group 3 were similar.

Evaluation of Association

Correlation between quality of life parameters in the three groups showed that all the kidney disease domain scale items score had a positive correlation with hemoglobin (Table VI).

Table VI. Correlation between quality of life parameter and 3 hemoglobin groups

Quality of life parameters in	R^2	P value
kidney specific domain		
Symptom/problem	0.166	0.000
Effect of Kidney disease	0.068	0.003
Burden of Kidney disease	0.219	0.000
Cognitive function	0.169	0.000
Quality of social interaction	0.197	0.000
Sexual function	0.69	0.003
Sleep	0.83	0.001
Social support	0.44	0.019

Correlation between quality of life parameters in the three groups showed all the general health related domain scale item score had positive correlated with hemoglobin except physical functioning and role physical (Table VII).

Table VII. Correlation between quality of life parameter and 3 hemoglobin groups

Quality of life parameters in general health domain	R^2	P value
Physical functioning	0.002	0.622
Role Physical	0.007	0.363
Pain	0.307	0.000
General health	0.301	0.000
Emotional well being	0.145	0.000
Role emotion	0.112	0.000
Social function	0.277	0.000
Energy / fatigue	0.168	0.000

[2] 0.166, p<.001

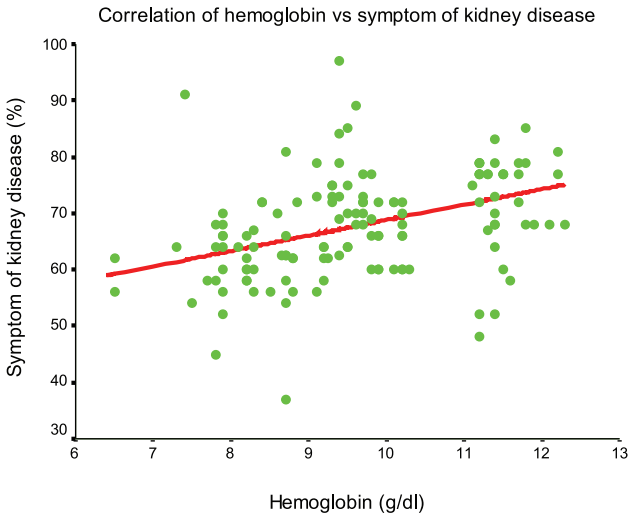

Figure 1. Higher hemoglobin is associated with higher symptom of kidney disease scale score.

Comparison of quality of life parameters between the three therapeutic groups

Comparison QOL parameters between anemia correction measures like EPO, BT and EPO plus BT showed significant differences in many areas (Table VIII).

Table VIII. Comparison of quality of life parameters between the three therapeutic groups

Items	Blood transfusion (BT) N=42	BT + EPO N=28	Erythropoietin (EPO) N=65	p value
QOL parameter for kidney disease specific domains				
Symptom/problem	66 ± 9	64 ± 10	69 ± 8	0.043
Effect of Kidney disease	58 ± 9	59 ± 8	59 ± 9	0.779
Burden of Kidney disease	7 ± 10	7 ± 9	17 ± 11	0.000
Cognitive function	60 ± 14	59 ± 17	64 ± 13	0.140
Quality of social interaction	74 ± 13	75 ± 14	78 ± 12	0.243
Sexual function	14 ± 29	25 ± 39	55 ± 43	0.000
Sleep	53 ± 10	48 ± 9	65 ± 9	0.076
Social support	60 ± 13	57 ± 20	66 ± 19	0.043
QOL parameters for general health related domains				
Physical functioning	41 ± 31	40 ± 32	46 ± 34	0.585
Role Physical	22 ± 42	12 ± 33	19 ± 39	0.577
Pain	42 ± 18	48 ± 21	53 ± 21	0.008
General health	42 ± 30	27 ± 21	65 ± 37	0.05
Emotional well being	73 ± 19	75 ± 25	82 ± 23	0.076
Role emotion	4 ± 12	7 ± 16	9 ± 14	0.274
Social function	43 ±14	41 ± 19	52 ± 20	0.007
Energy/ fatigue	39 ± 13	40 ± 11	45 ± 13	0.036

Discussion

In this study majority of our patients were above 50 years of age which is similar to MHD population in this subcontinent.[8] The average age of MHD patients in Europe is 60, Japan 58 and in USA 60 years which is higher than current study.[9] This may be due to better socioeconomic condition, increased life expectancy and longer survival on dialysis.

Mean Hb was <10 gm/dl in the present study. Only 36% patients were on EPO alone and mean dose was <3000 unit/week. A multicenter study on patients with similar characteristics from India showed 50% patients had similarly low Hb and their 84% patients were on EPO therapy getting mean dose around 4000 unit/week.[10] The DOPPS study based on 12 countries from the developed part of world showed that their 94% patients were on EPO therapy having mean haemoglobib 12gm/dl with their EPO dosages ranging from 5,200 to 17,000 units/week.[11] The low Hb of our study was most likely due to low EPO dose. The common causes of low Hb in dialysis patients is insufficient dialysis dose, reduced EPO dose and inflammation, uremic effect on bone marrow suppression and dialysis membrane defect.[12-16]

Kidney Disease Outcome Quality Initiative (KDOQI) Guidelines quoted studies when anemia correction was sub optimum the TSAT can be increased around 30-50% and ferritin around 1000. This can reduce EPO dose by 25-40%. In presenting study the TSAT and ferritin level was around the level of KDOQI recommendation but EPO dose was lower. So, an increase in intravenous iron can be an option where EPO dose cannot be increased.

The average QOL score in presenting study was 50. Higher score indicates better QOL. The DOPPS study showed that QOL score was around 60 for Japan, USA and Europe.[17] In this study the average Hb was around 10 g/dl. Another study found that normalization of Hb improved QOL score and decreased morbidity significantly.[18]

Comparison of QOL parameter between the three groups showed that symptom/problem, effect of kidney disease, burden of kidney disease, cognitive function, quality of social interaction, sexual function and sleep scale scores were higher in group 3 than group 1. A study in Thailand also compared QOL score between different Hb levels and showed higher Hb was associated with better QOL score in scales of general health, role emotion and social function which was similar to present study.[19] Higher Hb level provides better QOL. Study on patients with three Hb cut offs similar to our study, showed that heighest score in QOL for physical and mental component was achieved when Hb was between 11-13g/dl.[20]

Comparison QOL parameters between anemia correction measures like EPO, BT or EPO plus BT showed EPO group showed higher QOL score in scales of symptom/problem, burden of kidney disease, sexual function, social support, pain, general health, social function and energy/fatigue. EPO therapies, apart from improving dialysis quality by correction of anemia improve QOL significantly. EPO increases oxygen consumption by the tissue and increases exercise capacity. Increase exercise capacity positively affects many QOL parameters that include subjective and objective indicator. Patient experiences relief from many debilitated symptoms of anemia, it also improves emotional and social well-being, appetite and sleep pattern.[21]

Intervention to improve mobility and strength can improve physical functioning which is a common disability in ESRD population.[22] Correction of anemia, even suboptimum by the use of EPO improved physical functioning and energy.[23] Sexual dysfunctions exist at least in half of the ESRD patient which is often under recognized.[24] Also sleep is a problem may affect 80% of ESRD patients.[25] Significant improvement in sexual function and better sleep in EPO group is evident in presenting study.

Conclusion

Patients with higher hemoglobin have better quality of life and anemia correction is indeed one of the ways to improve QOL. EPO alone improved QOL than BT or even BT plus EPO group.

Limitations

This is a small scale study. A study with greater number of participants would have provided better results.

Conflict of Interest: None

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