

ORIGINAL ARTICLE

Title

Correlation between hemoglobin, serum albumin, body mass index, hemodialysis shift time and hemodialysis adequacy with quality of life in hemodialysis patients

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Editor:

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*Received 18 June 2018, revised 13 September 2018, accepted 12 October 2018, published 1 December 2018***Abstract**

Background CKD Patients on routine hemodialysis (HD) are prone to medical complications and conditions that are potentially detrimental to the quality of life (QoL), such as anemia, malnutrition, low body mass index (BMI), HD shift time, and HD adequacy measured by Kt/V. CKD patients undergoing routine HD mostly have lowered QoL and are at higher risk for malnutrition, inflammation, hospitalization, and mortality, compared to the general population. This study intends to find out whether there is a correlation between these factors and the quality of life of patients undergoing routine hemodialysis. **Methods** The design of this study is a cross-sectional analysis of observational data. Hemodialysis patients from general hospital Prof. dr. R. D. Kandou Manado for 3 months from August to October 2017 were included. Fifty-two patients meet the inclusion and exclusion criteria. The correlation between quality of life with anemia, serum albumin, BMI, adequacy of HD, using Pearson correlation test (if normality test fulfilled) or Spearman correlation test (if the normality test not fulfilled) and Independent Samples T-test to assess the quality of life with HD shift time. **Results** This study found no correlation between hemoglobin levels ($p=0.244$, $r=-0.098$), BMI ($p=0.473$, $r=-0.010$), HD timing ($p=0.082$) and quality of life of the patients, but a significant correlation between serum albumin ($p=0.020$, $r=0.286$), HD adequacy measured by Kt/V ($p=0.030$, $r=0.257$) and subjects' quality of life. **Conclusion** This study showed that serum albumin and Kt/V values had a significant correlation

with quality of life, while hemoglobin, BMI and dialysis shift time are not related to the quality of life.

Keywords quality of life, hemoglobin, BMI, albumin, hemodialysis adequacy

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BACKGROUND

Chronic kidney disease (CKD) is a pathological process with a multitude of underlying etiologies, marked by the progressive decline of renal function of chronic and irreversible nature, and generally ends up with end-stage renal disease (ESRD) requiring renal replacement therapy (RRT) such as dialysis or kidney transplantation.¹

Hemodialysis is still the primary modality of choice for RRT compared to peritoneal dialysis and kidney transplantation. National Kidney Foundation (NKF) USA data shows over 2 million patients with CKD received hemodialysis, while approximately only 15.000 patients in Indonesia, this number of patients shows a steady incline annually.²

Patients on routine hemodialysis are prone to medical complications and conditions that are potentially detrimental to the quality of life (QoL), such as anemia, malnutrition, low body mass index (BMI), HD time and adequacy.^{2,3}

Quality of life (QoL) is defined as a condition in which patients feel physically, mentally, socially, and spiritually comfortable and can lead a life for their own wellbeing and others'. CKD patients undergoing routine HD mostly have lowered QoL and are at higher risk for malnutrition, inflammation, hospitalization, and mortality compared to the general population. QoL is measured through patient's perception of their disease and used as an important clinical outcome to evaluate HD benefit. One of the modalities used to measure QoL is the Short Form Health Survey with 36 Questions (SF-36). SF-36 is a documented and validated system of evaluation for QoL, appropriate for the general population and HD patients.^{3,10}

Anemia has been known to be an important factor in QoL. The negative impact of anemia has been found in predialysis and dialysis patients.⁴ Moreno et al showed that the increase of hematocrit level nearing normal values in HD patients is related to an increase in QoL.⁵ A study by Beusterien et al showed patients on dialysis receiving erythropoietin (EPO) therapy have better QoL compared to those who didn't receive EPO.⁶

Nutrition is also an important factor affecting QoL, being related to the mortality rate in CKD patients especially those undergoing routine HD. A study from The Italian DIA-QOL group on 300 patients undergoing routine HD shows, patients with low serum albumin have lower SF-36 scores, specifically in the physical section.^{4,7,10} Normal BMI in ESRD patients on HD is associated with higher QoL and is also shown to have a protective effect resulting in a higher survival rate. An increase of BMI reduces 10% mortality rate in patients on routine HD.^{7,8}

The time spent on dialysis also cause problems in QoL. The assigned schedule for morning HD has been suspected to cause a higher rate of depression in patients. The adequacy of HD has also been linked to QoL.^{2,9}

The adequacy of HD can be measured by laboratory values formulated as urea reduction ratio (URR) and the ratio of the volume of blood dialyzed per time unit and post dialysis estimated blood volume, known as Kt/V. The Indonesian Society of Nephrology has established the ideal value for Kt/V should be ≥ 1.8 for patients scheduled for twice-weekly HD with 5 hours per session.^{10,11}

OBJECTIVES

To determine the correlation between anemia, serum albumin, BMI, HD adequacy and differences in HD shift time with QOL in subjects with chronic kidney disease undergoing regular HD.

METHODS

Design of the study is a cross-sectional analysis of observational data. Patients were selected among those attending hemodialysis unit of general hospital Prof.dr. R. D. Kandou Manado from August 2017 – October 2017. Inclusion criteria were patients of 18 years of age or older, who were on routine 5-hour hemodialysis sessions twice a week for a minimum of three months, with Hb > 5 g%, and dry weight already achieved, who are willing to participate in the study by signing informed consent letter. Dry weight is defined as weight without excess fluid that could be tolerated by the patient without any problems or hypotension and was measured at the time the patient did not experience dizziness or cramps between dialysis sessions, had no swelling in the feet, ankles, arms, hands, or around the eyes, and respiration was comfortable and easy. Exclusion criteria are patients with active bleeding and/or disturbance in consciousness. HD shift time was categorized into morning and afternoon HD shift. Quality of life was measured through the SF-36 questionnaire, with a normal score of ≥ 60 .

Patients who were the subject of the study underwent an examination process starting with anamnesis, standard physical examination, and had to answer questions in the SF-36 questionnaire. Laboratory examinations included hemoglobin, serum albumin levels, and Kt / V value calculated using Daugirdas formula.

RESULTS

The study was conducted in HD patients Prof. dr.R.D.Kandou Manado general hospital for three months, starting from August 2017 and ended in October 2017. The subjects eligible for the study consisted of 52 patients on routine hemodialysis; the demographic variables of the subjects were tested for normal distribution using the Kolmogorov-Smirnov test. (Table 1)

Hemodialysis was done on patients in the fifth decade in 19 subjects (36.5%), followed by the fourth decade in 14 subjects (26.8%), 2 subjects (3.8%) in the 2nd decade and one (9%) in the 8th decade. Most subjects were male 28 subjects (53.8%) while 24 subjects (46.2%) were women. Hb level of 8.0-9.9 gr% (mild anemia) was found in (50%) of subjects and no significant correlation ($p = 0.244$) was found with QOL. Albumin values in the range of 3.5-4.5 was found in as many as 37 subjects (71.2%) and a significant correlation ($p=0.020$) was found with QOL, BMI value in the range of 18.5-22.9 Kg/m² (normal weight) was found in 24 subjects (46.15%) and no significant correlation ($p=0.473$) with QOL. Kt/V $> 1,0-1,7$ was found in 40 subjects (76.92%) with a significant correlation with

Table 1. Subjects' baseline characteristics

Characteristic	N	Min	Max	Median	Mean	SD
Age (yrs)	52	27.00	82.00	51.50	51.23	11.82
SF-36	52	15.30	95.20	63.53	63.36	19.46
Hemoglobin (g%)	52	5.20	14.30	9.05	9.14	1.75
BMI (kg/m ²)	52	16.88	30.00	22.68	22.52	3.13
Serum Albumin (g/dL)	52	1.93	5.70	4.04	3.89	0.65
Kt/v	52	0.59	1.84	1.20	1.21	0.26
Duration of HD	52	0.03	6.06	1.030	1.42	1.51

Table 2. Correlation of QOL with Hb, albumin, BMI and Kt/V

	QOL (SF-36)		
	n	r	p
Hb	52	- 0.098	0.244
Albumin	52	0.286	0.020
BMI	52	- 0.010	0.473
Kt/V	52	0.257	0.033

QOL = Quality of life, Hb = Hemoglobin, BMI = Body mass index

QOL (p=0.033). (Table 2)

Twenty-six subjects (50%) had HD sessions in the morning and 26 subjects underwent HD session in the afternoon. To assess the difference between HD shift time and QOL, the data was initially tested with Kolmogorov-Smirnov normality test and a normal data distribution was obtained. The data was then tested with the Independent Samples T-test and no significant difference was found (p = 0.082).

DISCUSSION

Fifty-two patients consisting of more male patients (53.8%), is consistent with previous studies such as a study by Hecking in 2013, stating that male CKD and ESRD patients are more likely to receive hemodialysis compared to female patients.¹² The subjects of the study were mostly around the age of 50 – 59 years (36.5%), which is also consistent with the data from National Kidney Foundation (USA) in 2015 which stated that most CKD patients (44.3%) were 45 – 64 years old.¹³

The correlation between Hb level and subjects' QoL was not found to be significant (p=0.244). Half of the subjects had a Hb level of 8.0 – 9.0 g% (mild anemia), followed by Hb level of 10.0 – 13.0 g% in 25% of subjects. Study by Elwood et al in 1969 showed

that in 880 female patients, signs and symptoms of anemia such as palpitation, dizziness, dyspnea, and cephalgia usually developed when the Hb level reached 7-8 g%.¹⁴ Herbert et al in 1997, through systematic review, showed that 56% of patients with anemia developed compensatory mechanism such as redistribution of coronary and cerebral blood flow.¹⁵ A study by Drueke et al in 2006 showed that no significant reduction in QoL measured with SF-36, was found in patients with Hb level 11-12 gr% treated with immediate correction, compared to patients with < 10 g%.¹⁶

The correlation between QoL with serum albumin level tested using Pearson correlation test showed significance (p =0.020). Most subjects (71.2%) had albumin level in the normal range of 3.5 – 4.5 g/dL with a mean value of 3.89 g/dL. This result is consistent with the study conducted by Soleymanian et al (2017) stating a significant correlation between albumin level and QoL in 417 patients undergoing routine hemodialysis.¹⁷ The study used SF-36 to measure QoL and concluded that the increase of albumin level is related to the increase of QoL.¹⁷ Soleymanian et al also found that a decreased mortality rate was found with albumin level > 3.60 –

3.85 g/dL.¹⁷ Kubrusly et al classified patients on HD an albumin level of < 3.2 g/dL as malnourished and level of > 3.7 g/dL as normal.¹⁸ A study by Kalantar-Zadeh et al showed subjects with high serum albumin level had higher QoL.⁸

The correlation between QoL and body mass index was tested using the Pearson test and showed no significant correlation ($p=0.473$). Most patients (46.52%) had a BMI of 18.5 – 22.9 kg/m² (normoweight). Kalantar-Zadeh et al in 2001 found routine hemodialysis patients with high BMI classifications have lower QoL (measured with SF-36) compared to patients whose BMI lies in the normal range.¹⁰ The study by Feroze et al (2010) stated that a higher body fat percentage is linked to lower QoL.²⁰

The correlation between QoL and HD adequacy measured by Kt/V using the Pearson test showed significant correlations ($p=.082$). The mean Kt/V value of the subjects was 1.21, where dialysis was done twice weekly for 5 hours each session. This is markedly below the recommended Kt/V value of ≥ 1.8 for patients scheduled for twice-weekly hemodialysis session of 5 hours each session. This result is consistent with the study conducted by Ara et al (2013) in Ulin general hospital Banjarmasin were patients on routine twice weekly hemodialysis with $Kt/V \leq 1.8$ had significantly lower physical health. All subjects of the study by Ara et al were assumed to have developed mental adaptation to hemodialysis, having received routine hemodialysis 3 months prior to data collection.¹⁹

The HD shift time of hemodialysis showed no significant association with patients' QoL after being tested with the independent sample T-test ($p > 0.05$). Abassi et al stated that the timing of dialysis impact patients' sleeping pattern, especially patients scheduled to have morning dialysis.²¹ However, no association was found between the timing of hemodialysis with QoL.²¹ A study by Norozi et al in 125 patients who underwent routine chronic hemodialysis in 8 teaching hospitals in Iran showed no significant association between timing of HD and patients' QoL.²² According to Saad et al, morning dialysis is an independent factor for depression and sleeping disorder.²³ while Teles et al found that multiple factors affect the sleeping pattern and depression of routine HD patients other than the timing of HD, such as anemia, old age, and low serum phosphate.²⁴

CONCLUSION

No significant correlation was found between QoL and hemoglobin levels, BMI, and timing of HD in patients receiving twice-weekly HD lasting 5 hours per session.

A significant correlation was found between serum albumin, and Kt/V, with QoL.

The abstract of this original article has previously been displayed in 54th Annual Scientific Meeting of the Australian and New Zealand Society of Nephrology annual scientific meeting 2018 in the form of a poster and online which can be accessed in the Wiley Online Library: <https://doi.org/10.1111/nep.13442>

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