ORIGINAL ARTICLE

Association Between Hemoglobin Levels and Quality of Life in Patients Undergoing Chronic Hemodialysis

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ABSTRACT

Introduction: Anemia is a global problem that can be found almost all over the world. Anemia is the most common complication in patients undergoing chronic hemodialysis which can affect quality of life. Health-related quality of life is a factor that correlates with morbidity, mortality, and patient care costs. This study aimed to assess the correlation between hemoglobin levels and quality of life in patients undergoing chronic hemodialysis.

Methods: This study was a cross-sectional study with consecutive sampling of 92 research subjects conducted in November-December 2022 at the hemodialysis installation at Dr. Soetomo General Academic Hospital. This study used the SF-36 questionnaire instrument which was divided into 8 quality of life domains.

Results: Of the 92 samples that have been collected, 54 were male patients (58.7%) while 42 were female (41.3%). The average age of the subjects in this study was 47.55 years old. The highest level of education was senior high school graduates with a total of 40 people (43.5%). Hemoglobin levels in 92 research subjects were in the range of 7–3.9 g/dl with an average of 9.70±1.63. Fifty subjects (54.4%) had a poor quality of life and 42 subjects (45.6%) had a good quality of life. The range of total quality of life values was 22.98–89.75 with an average of 59.87±14.16.

Conclusion: There was a significant relationship between hemoglobin levels with quality of life of the patients at Dr. Soetomo General Academic Hospital. The higher the hemoglobin level, the higher the total quality of life of the patients. It is recommended to the hemodialysis unit at Dr. Soetomo General Academic Hospital to increase hemoglobin level in hemodialysis patients.

Keywords: Hemoglobin; quality of life; hemodialysis; mental health; human & health

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INTRODUCTION

End-stage chronic kidney disease (CKD) is a condition in which the patient's kidneys cannot work properly and require kidney replacement therapy. According to the Kidney Disease Outcomes Quality Initiative (K/DOQI), stage 5 CKD (GFR, 30 mL/min/1.73 m^2) is an indication for therapy in the form of hemodialysis until a kidney donor is obtained. Patients undergoing chronic hemodialysis have various complications, most of which are caused by the malfunction of the kidney. One of the most common complications is anemia. Anemia is a condition in which the number of red blood cells or the concentration of hemoglobin in the blood is lower than normal count. Hemoglobin is needed to carry oxygen and if the hemoglobin is too low, there will be a decrease in the capacity of blood to carry oxygen to the body's tissues. This causes symptoms such as fatigue, weakness, dizziness, and shortness of breath, which can impact patient's quality of life.

Health-related quality of life (HRQoL) is a multidimensional concept used to assess a person's quality of life from medical perspective. The dimensions commonly used are physical, psycological, and social. According to study conducted by Finkelstein et al. (2009), chronic hemodialysis patients with anemia complication and patients with lower hemoglobin have a lower quality of life. This happens because of the decrease in functional capacity in the patients will cause the patient's daily activities to be limited. According to Cantelmo et al. (2016), HRQoL has been shown to affect patient medical conditions in the form of morbidity and mortality, and the patients' care costs might also get worse. Therefore, the quality of life of the patients is important to study because it can reduce the risk of the patients' morbidity and mortality. A decrease in every 10 HRQoL points on the SF-36 questionnaire is considered to increase mortality by 11-25% (Mapes et al., 2003). In this research on the quality of life, we assessed the quality of life using the SF-36 questionnaire. Then, we linked the result of the questionnaire with the hemoglobin level of the patient.

METHODS

This research was a cross-sectional study in which the hemodialysis patients at Dr Soetomo General Academic Hospital, Surabaya, Indonesia, filled out questionnaires at one time. The population of this study was all patients with stage 5 CKD undergoing chronic hemodialysis and met the inclusion and exclusion criteria. Sampling in this study was

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carried out using consecutive sampling.

This study had a sample size of 92 research subjects. The instruments used in this study were patient's medical record data and the SF-36 questionnaire. This questionnaire has 8 domains which are physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, and mental health. This research was conducted at the Hemodialysis Unit at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, in July 2021-December 2022.

RESULTS

During the study period, 92 subjects' data were obtained that matched the research criteria (including hemodialysis adequacy). In Table 1, the number of male patients is more than female patients with a percentage of 58.7% compared to 41.3%. Average age of the patients was 47.55 years. With the largest age distribution is the age of 51-55 years with a presentation of 25%. The educational level of the patients at the unit was dominated by those with high school graduation or higher with a percentage of 70%, which might have affected the patients' quality of life.

Table 1. Subject characteristics

	Data	N	%
Gender	Male	54	58.7
	Female	38	41.3
Age	26-30 years	6	6.5
	31-35 years	6	6.5
	36-40 years	10	10.9
	41-45 years	19	20.7
	46-50 years	10	10.9
	51-55 years	23	25
	56-60 years	11	12
	61-65 years	5	5.4
	>65 years	2	2.2
Education	Never went to school	3	3.3
	Not completed Primary School	7	7.6
	Graduated Primary School	3	3.3
	Graduated Junior High School	9	9.8
	Graduated Senior High School	40	43.5
	Graduated College	30	32.6
Total		92	100

Out of a total of 92 patients who had hemoglobin data taken, the largest sample population was moderate anemia with a hemoglobin range of 8 g/dl– 0.9 g/dl for men and women with a total of 47 people (51.1%), followed by subjects with mild anemia with a hemoglobin range of 11 g/dl–11.9 g/dl for women and 11 g/dl–12.9 g/dl for men with a total of 24 subjects (26.1%). Next were subjects with severe anemia with a hemoglobin range of <8 g/dl with a total of 19 subjects (20.7%). Out of a total of 92 subjects, only 2 subjects were non-anemic patients or 2.2% of the total subjects (Table 2).

Determination of the quality of life value of the subjects in this study was by the SF-36 questionnaire instrument, which has 8 main domains. The highest average was obtained in the social function domain of 75.42 ± 26.49 (Table 3). It was found that the average total quality of life for the 92 research subjects was 59.87 ± 14.16 with a distribution of 50 subjects with poor quality of life (54.4%) and 42 subjects with good quality of life (45.6%). The percentage of subjects with poor quality of life was greater than the percentage of good quality of life (Table 4).

Table 2. Distribution of anemia

Anemia Classification	N	%
Non-Anemia	2	2.2
Mild Anemia	24	26.1
Moderate Anemia	47	51.1
Severe Anemia	19	20.7
Total	92	100

Table 3. Domain of SF-36

	N	Minimum	Maximum	Mean
Physical functioning	92	5	100	63.21±25.41
Role-physical	92	0	100	39.67±24.63
Bodily pain	92	0	100	67.46±29.33
General health	92	0	87.50	55.08±15.58
Vitality	92	20	100	54.08±18.43
Social functioning	92	0	100	75.42±26.49
Role-emotional	92	0	100	47.83±31.76
Mental health	92	36	100	73.89±16.11

Table 4. QoL- Anemia Distribution

	Non-Anemia	Mild Anemia	Moderate Anemia	Severe Anemia	Total
Poor QoL	1	12	26	11	50
Good QoL	1	12	21	8	42

Table 5. Hb-QoL Correlation

		Hemoglobin	QoL
Hemoglobin	Pearson Correlation	1	.206*
	Sig. (2 tailed)		.049
	N	92	92
QoL	Pearson Correlation	.206*	1
	Sig. (2 tailed)	.049	
	N	92	92

This study correlated the subjects' Hb level with a range of 7–14.9 g/dl and an average of 9.70±1.63 with the subjects' quality of life as measured by the SF-36 questionnaire. The data analysis process for the relationship between these two variables used normality test to determine whether the residual values of the two variables were normally distributed or not. The residual value was then measured using the Kormogolov-Smirnov normality test and obtained a value of p=0.200, which means that the residual value was normally distributed. The correlation test used was the Pearson correlation test. In this test, a significance value of p=0.049 was obtained with the Pearson correlation value, r =0.206, which means that there is a weak significant correlation of the two variables (Table 5).

DISCUSSION

This study found that the number of male patients was higher than female patients. This distribution can be possible because the average man in Indonesia consumes more

protein and has higher muscle mass, making it possible to increase creatinine and accelerate the CKD progression. USRDS in 2012 stated that the incidence of CKD increased at the age of 45-64 years and slowed down at the age of 65-74 years. This study also found that the range of hemoglobin levels in patients with CKD stage 5 undergoing chronic hemodialysis ranged from 7–4.9 g/dl. Meanwhile, normal hemoglobin levels are in the range of 14-18 g/dl (WHO, 2022). This indicates that the hemoglobin level of hemodialysis patients at Dr. Soetomo General Academic Hospital had a hemoglobin level below the standard normal hemoglobin level. The main cause of decreased hemoglobin levels usually are iron deficiency and deficiency of the hormone erythropoetin (Akhdiyat, 2019). From the research data, it was found that the hemoglobin range for women was 7–12.9 g/dl, and for men it was 7.1–14.2 g/dl. This proves that gender has an effect on hemoglobin levels in the subject.

This average percentage is quite high when compared to research conducted at Siti Khodijah Hospital, Palembang, which averaged 8.01±1.50 g/dl (Garini, 2018). Another study conducted at the Karsa Husada Hospital, Batu, Malang, also showed an average hemoglobin in the sample = 7.38 g/dl (Agustina and Wardani, 2019). The level of hemoglobin in this study was almost similar to a research study conducted at the Jombang Hospital in 2018 with 30 samples. This study showed that the average hemoglobin in hemodialysis patients was 8.66±3.91 g/dl. Another study that had almost similar results was a study conducted by Dwitarini et al. (2017) at Sanglah Hospital, Denpasar, Bali, in 2017. The research was taken from data from 2016 to 2016 with a sample of 76 people. This study produced data in the form of an average hemoglobin in 76 research subjects of 9.0195 g/dl[8]. It was found that the range of hemoglobin in the male patients would be higher than that of the female patients. It was also found that the average hemoglobin in 92 research subjects was 9.7 g/dl which was still classified as moderate anemia and had same average value as research conducted by Garini in 2018 and Dwitarini in 2018 (Dwitarini et al., 2017; Garini, 2018).

Quality of life determination in this study revealed that the highest average was found in social function domain. This was in accordance with research that was conducted by Jos in 2016 at Tarakan Hospital, where the highest domain was in social functioning with an average value of 75.89±24.52 (Jos, 2016). The same thing was also found in the comparison of the domains of physical functioning, bodily pain, general health, vitality, and also role-emotional. While the lowest domain was in the role-physical domain with a value of 39.67±24.63. This data was quite different from Winson Jos' research with a role-physical domain value of 58.33±25.71 (Jos, 2016). There were also quite different scores in the mental health domain, where in this study the average mental health domain score was 73.89±16.11, while the average mental health domain in Jos' study was 55.14±21.45. Both of these differences can occur due to various factors such as age and level of education. A study conducted by Wua et al. showed that the higher the patient's age, the lower the value of the quality of life and the higher the patient's education level, the higher the value of the quality of life (Wua et al., 2019). These factors are in accordance with the comparison of our study with Winson Jos. The average age of Winson's study was 53.5 years, while the average age in our study was 47.55 years. According to literature, this difference can cause differences in the quality of life that has been measured. As with the education level data, in the research conducted by Jos, there were 17.9% of subjects who had a minimum undergraduate education level, while in this study there were 32.5%, there were 28.5% of high school graduates equivalent, while in this study there were 43.5%, and for elementary school graduates there were 25% of the subjects in Winson Jos' research, while for this study there were only 14.2% of the subjects. The difference in education level can also affect the patient's quality of life. In addition to these two factors, another factor that can be used as a comparison between the two studies was hemoglobin levels, where the average hemoglobin level in Jos' study was 8.01 g/dL while in our study it was 9.7 g/dL. The higher the hemoglobin level in the patient, the higher the patient's quality of life (Jos, 2016).

In this study, subjects with poor quality of life is greater than those with good quality of life. This was the same as the results of a study conducted at Dr. Zainoel Abidin Hospital, Banda Aceh, where hemodialysis patients with poor quality of life were found in 45 subjects (69.2%) and subjects with good quality of life in 20 subjects (30.8%) (Apriandini and Bahri, 2017). Meanwhile, in a study at Dr. Saiful Anwar Hospital, Malang in 2019, there were more hemodialysis patients with a good quality of life than a low quality of life with a ratio of 3 to 2 out of a total of 30 subjects (Soelistyoningsih et al., 2019). Similar to the comparison of this study with Jos' research, the differences between Soelistyoningsih's research and this study can occur due to age and education level factors. In Soelistyoningsih's study, the average age of the subjects was 53.1 years and the subject's level of education for undergraduate graduates was 23.3%, high school graduates was 30.1%, and elementary school graduates was 23.3%. Another possible factor was due to the differences of methods used in both studies. In one study, the questionnaire instrument used was KDQoL-SF36, while in the other one used SF-36 questionnaire. Another study using WHOQOL-BREF instrument at Ambarawa Hospital obtained similar results to our study in which 25 patients (61%) had poor quality of life and 16 patients (39%) had good quality of life. Differences in the comparison of these studies can occur due to various factors such as age, education level, duration of hemodialysis, comorbid diseases, and hemoglobin levels (Wua et al., 2019).

Correlation between hemoglobin and quality of life in chronic hemodialysis patients

There are many factors that affect the quality of life in the health sector, including physiological function, individual character, support received, and environment. There are also other factors such as disease effects, family dynamics, dietary constraints, time constraints, functional limitations, costs, employment status, and sexual function (Puspitasari et al., 2019).

The test results stated that there was a relationship between the two variables. The results of the Pearson correlation test revealed that the higher the hemoglobin level, the higher the total quality of life value in patients. This was in accordance with the literature which states that anemia that occurs in patients undergoing chronic hemodialysis can cause a decrease in the quality of life. Decreased quality of life in anemia patients can occur due to fatigue, reduced physical capacity resulting from lack of oxygen carried to body tissues, impaired immunity, and reduced cognitive abilities (Senduk et al., 2016). The conclusion of this relationship was in accordance with the research conducted by Finklestein et al. regarding the relationship between hemoglobin levels and quality of life using the SF-36 questionnaire to 1200 respondents. In this study, the results showed that increasing hemoglobin levels could significantly increase the total

score of the SF-36 questionnaire (Finkelstein et al., 2009). Similar results were found in a study by Pupsitasari et al. (2019) at Universitas Gajah Mada Hospital and Dr. Sardjito Hospital using the KDQoL-SF36 questionnaire where an increase in hemoglobin levels affected all 4 domains of the questionnaire. However, research conducted in 2013 by Ayoub and Hijjazi showed different results. In this study, 130 subjects were examined using the same SF-36 instrument, and concluded that there was no significant relationship between hemoglobin levels and the total value of the questionnaire (Ayoub and Hijjazi, 2013).

CONCLUSION

There was a weak significant correlation between between hemoglobin levels and the patients quality of life at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia. The higher the hemoglobin level, the higher the patients' total quality of life. The Hemodialysis Unit should try to increase the hemoglobin level of each patient to improve the quality of life.

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CONFLICT OF INTEREST

None.

ETHICS CONSIDERATION

This study had received ethical clearance from Ethical Committee for Health Research Dr. Soetomo General Academic Hospital, Surabaya (no.0509/KEPK/X/2022).

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AUTHOR CONTRIBUTION

All authors have contributed to all process in this research, including preparation, data collection and analysis, drafting and approval for publication of this manuscript.

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