

Research Article

Quality of Life in End-Stage Renal Disease Patients Undergoing Hemodialysis and Its Affecting Factors in a Hemodialysis Unit of General Hospital Denpasar

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Abstract

End-stage renal disease (ESRD) patients undergoing hemodialysis (HD) repeatedly can affect their quality of life (QOL). Its QOL value can vary according to the patient's characteristics amid health conditions that may make it difficult for them. This study aimed to analyze the QOL of ESRD patients undergoing HD and its affecting factors. This cross-sectional study was conducted in a Hemodialysis Outpatient Unit of General Hospital, Denpasar, Bali, from April to May 2021. A sample of 103 respondents was obtained by using the purposive sampling technique. Inclusion criteria were ESRD patients undergoing HD aged ≥ 8 years old, completing questionnaires thoroughly, and communicating well. Data was collected through the KDQOL-36 questionnaire to measure the QOL and medical records for completeness of patient identities. Data were analyzed using Spearman's ρ , η , Mann-Whitney, and an Independent sample t-test (CI 95%). Findings showed the majority of respondents were aged < 60 years (75.7%), had secondary education (41.7%), were working (50.5%), were diagnosed with ESRD, and undergoing HD < 3 Years (81.6%), the duration of each HD > 4 hours (85.4%), three times a week (91.3%), having a BMI > 29 kg/m² (89.3%), and hypertension (42.7%). The respondents experienced major problems in their QOL on the burden of ESRD (33.50 \pm 24.64), physical (39.57 \pm 8.94), and mental component summary (52.62 \pm 10.39) dimensions. Respondent's characteristics, including education level, duration of each HD, and diagnosis with ESRD undergoing HD, contributed to their QOL ($p < 0.05$). The patient's QOL needs to be improved through the family and health worker's support.

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INTRODUCTION

End-stage renal disease (ESRD) is one the chronic kidney diseases that is of global concern because of its high impact on mortality, morbidity, and treatment costs. In addition, this chronic kidney disease also impacts social life and individual productivity¹. In Indonesia, based on the National Basic Health Research Report in 2018, the proportion of ESRD nationally reached 713,783 patients. When viewed from the percentage of provinces in Indonesia, from the diagnosis of the population aged 15 years, the province of Bali is in second place with a percentage of 37.04%. In addition to impacting the morbidity and mortality rates, it also impacts finances; national health financing by the National Health Insurance (JKN) insurance in 2015 was recorded at 2.68 trillion IDR, both inpatient and outpatient².

End-stage renal disease (ERSD) is caused by structural and functional abnormalities of the kidney and a decrease in the glomerular filtration rate (GFR) with a value of < 15 mL/minute/1.73m² for three months. In other words, there is a loss of

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half or more of normal kidney function in adults³. Therefore, it is necessary to treat therapy in the form of dialysis. In Indonesia, based on the 2018 Indonesian Renal Registry (IRR) showed that 98% of ESRD patients undergo hemodialysis (HD) therapy⁴. Hemodialysis therapy cannot cure ESRD, and the patient must undergo HD throughout their life or until they get a new kidney from a transplant. Undergoing HD takes a long and repeated time, and complications can also arise in ESRD patients, which can cause stress and have an impact on a decreased quality of life (QOL)⁵.

The results of the study by Barzegar *et al.*⁶ stated that of 57 patients with HD duration <36 months had a low QOL (65.7%), and for patients who received HD >36 months, only 35.8% had a good QOL. However, the results of other studies have revealed that the overall QOL of ESRD patients undergoing HD is in a good category (69.5%)⁷. Based on the results of the research described, the results of the QOL are varied. This is influenced by several factors or characteristics inherent in the patient. For example, age has a significant relationship with the QOL of ESRD patients. With age, physical function will decline due to comorbidities and the inability to carry out activities that affect a person's physical health. In addition, patients with a higher education level have a better understanding of the disease and awareness about undergoing treatment and can make lifestyle modifications to live better. Then, marital status is also considered to affect the QOL; married patients tend to have a better QOL because of the presence of a partner who will provide support in the form of motivation and solutions and help them realize that this disease will affect emotional conditions so that they can maintain QOL. As another example, patients with high-income levels can improve their diet and improve the quality of treatment, thereby helping to improve their QOL⁶⁻⁹. On the other hand, in terms of health conditions, ESRD patients undergoing HD for >3 years who had more complications, thus requiring the patient to take three or more drugs, were a factor causing decreased physical function and ultimately resulted in poor QOL¹⁰.

In the province of Bali, Indonesia, several research results are showing that the QOL of patients with kidney disease in several areas far from the city center, such as Tabanan and Buleleng, have a poor QOL, especially when compared to patients who do not suffer from kidney disease. Specifically, in Denpasar, the center and capital of the Province of Bali, with easier access to healthcare, it was found that the low QOL of ESRD patients and those undergoing HD is associated with the patient's mental, cognitive, and emotional condition. Based on the results of previous studies, it is suggested to look at other factors in more detail, such as the sociodemographic character and especially the HD condition of the ESRD patient, which might affect the patient's QOL¹¹⁻¹³. Based on all background descriptions, this study aimed to analyze the QOL of ESRD patients undergoing HD and the factors that could influence it, especially among ESRD patients in Denpasar, Bali.

MATERIALS AND METHODS

Materials

This study was conducted at a Hemodialysis Outpatient Unit of General Hospital in Denpasar, Bali, Indonesia, in May 2021, and data collection was carried out for two weeks. Data was collected through questionnaires and patient medical records, which were recapitulated in data collection form.

Methods

Study design, population and sample

This observational study with a cross-sectional design involved 103 respondents obtained during May 2021 using purposive sampling techniques based on the inclusion and exclusion criteria that have been set. The inclusion criteria were ESRD patients undergoing HD aged ≥ 18 years and willing to participate in the study (filling in the informed consent). The exclusion criteria were patients who filled out the questionnaire incompletely, could not communicate well, or were in a weak condition. This research has obtained a certificate of passing the ethical review from the Health Research Ethics Committee of Bina Usada Bali Health College with No. 040/EA/KEPK-BUB-2021 on April 21st, 2021.

Research instrument

The research instrument used Kidney Disease Quality of Life (KDQOL)-36TM to measure QOL respondents in five dimensions such as physical component summary (PCS) and mental component summary (MCS) for general QOL measures, then the burden of kidney disease (BKD), symptoms and problems of kidney disease (SPKD), and effects of

kidney disease (EKD) to assess problems specific to ESRD patients. The original version of this questionnaire was in English, but this study used a questionnaire translated into Indonesian from previous research by Supriyadi *et al.*¹⁴. Also, this questionnaire has met the validity and reliability test in a large population in Indonesia and showed internal consistency with Cronbach's α value of 0.7 (0.706-0.886) for all dimensions. Then, the validity test showed the results of the r value >0.600 , and the results were statistically significant ($p < 0.001$). This study also conducted a re-validity test in the form of face validity and showed that the questions on the KDQOL-36™ questionnaire had met the validity ($>80\%$) of each question sentence that was well made, clear, and also not confusing, ambiguous, and too long. In addition, data collection forms were also used to complete and ensure the patient identities from medical records, such as duration of suffering ESRD and undergoing HD, treatment history, and comorbidities.

Filling in the questionnaire was carried out using the direct interview method, in which the researcher asked questions according to those in the questionnaire to the respondents. The questionnaire consisted of 36 questions divided into five dimensions, including questions number 1 to 12, which were questions from the first two domains (PCS and MCS domains) to measure general QOL; questions number 13 to 16 were related to the burden of kidney disease experienced by patients (BKD domain); questions 17 to 28 about symptoms and problems of kidney disease (SPKD domain); and questions 29 to 36 about the effects of kidney disease (EKD domain). The three domains, BKD, SPKD, and EKD, precisely assess the problems experienced by ESRD patients or the early stages of chronic kidney disease. The answer choices for these questions were categorized using a Likert scale, which has several different choices for each question per domain, both positive and negative questions¹⁵.

Data analysis

Quality of life data based on the KDQOL-36™ questionnaire was obtained by entering the answers given by respondents into the Excel file format provided by RAND corporation with the following website address: www.rand.org/health/surveys_tools/kdqol. The assessment in the KDQOL-36™ questionnaire on each question per dimension was converted to a number from 0 to 100. Respondents who scored higher reflected a better QOL¹⁵. Then, patient characteristics data were analyzed descriptively, such as socio-demographics and disease profile respondents, as well as QOL in percentage of frequency and mean \pm SD (standard of deviation). The relationship between patient characteristics and QOL was analyzed by statistical tests with 95% confidence levels, such as Spearman's ρ test (ordinal-ratio data), η test (nominal-ratio data), Independent-t-test and Mann-Whitney test to provide a significant value (p-value) in the η test which only has a correlation coefficient value (r-value).

RESULTS AND DISCUSSION

Patients characteristics overview

The characteristics of respondents in this study were dominated by age <60 years (75.7%), male (66.0%), working status (50.5%), and secondary education level (junior-senior high school) (41.7%), as shown in **Table I**. Previous studies also showed that the majority of ESRD patients undergoing HD are aged <60 years, especially in 45-59 years ($>40.0\%$), male ($>60.0\%$)^{16,17}. Generally, with increasing age, the glomerular filtration rate (GFR) will decrease, which is referred to as "normal aging" of the kidney, which is unable to regenerate nephron cells. Typically, the decline in GFR values begins to occur when a person reaches the age of 18-29 years, which is 0.82 mL/minute/1.73 m² per year in women and men¹⁸. In patients with chronic kidney disease, the decline was faster, from 1.03 to 4.5 mL/minute/1.73 m² per year. This drastic decrease in GFR is triggered by various risk factors such as lifestyle, metabolic disorders, and DM conditions¹⁹. In addition, gender is also considered to be a risk factor for kidney disease. Men tend to have an unfavorable lifestyle, for example, smoking, drinking coffee, alcohol, and drinking supplements that can trigger systemic disease, causing a decrease in kidney function, which will have an impact on QOL²⁰. The female population has a higher amount of the hormone estrogen than the male. This hormone can affect kidney function through inhibition of angiotensin II (AT II), reduction of oxidative stress, and through the renin-angiotensin system (RAS), also maintaining a balance of calcium levels to prevent the absorption of oxalate which causes kidney stones as a cause of chronic kidney disease^{21,22}. Previous studies^{16,23} also showed the result in line with this study that most respondents had secondary education levels ($>34.0\%$) and still working ($>60.0\%$). The education level

makes a person better able to cope with changes in his health status. Patients with low education levels need more understanding of diseases affecting their QOL²⁴. Patients who are still working tend to have stable financial conditions to survive prolonged therapy such as HD and can maintain social conditions and self-productivity²⁵.

Based on the ESRD profile, most of the respondents were diagnosed with ESRD and undergoing HD for less than three years (81.6%), HD schedule with an interval of ≤ 2 days or ≤ 3 times a week (91.3%), with HD duration >4 hours per visit (85.4%). The implementation of HD takes 10-15 hours/week with Quick Blood (QB) 200-300 mL/minute. However, if the average patient undergoing HD two times a week is >4 hours (4.5 hours) per visit, then patients undergoing HD two times a week mean doing HD for nine hours per week; this does not meet the time standard HD for 1-15 hours/week. Hemodialysis therapy that has not been fulfilled will impact an inadequate process and is considered capable of reducing the patient's QOL²⁶.

Other ESRD profiles stated that most of the respondents suffered from comorbidities (75.4%). A cohort study²⁷ reporting that comorbidities that often appear in chronic kidney patients are hypertension (66.4%), DM (33.2%), and hyperlipidemia (11.4%), so this is in line with this study that the most common comorbidities in ESRD patients were hypertension (42.7%), followed by DM (20.4%) either as a single disease or a combination of both (12.6%). Then, the dominant respondent has a body mass index (BMI) of >29 kg/m² (89.3%), which leads to obesity, which is a risk factor for kidney disease. It causes renal vasodilation and glomerular hyperfiltration, which acts as a compensatory mechanism to maintain sodium balance due to increased sodium reabsorption. However, this compensation and increased arterial blood pressure and metabolic disturbances ultimately cause glomerular injury²⁸.

Table I. Characteristic of ESRD patients undergoing HD.

Characteristic	n (103)	%
Age (years)		
<60	78	75.7
≥ 60	25	24.3
Gender		
Male	68	66.0
Female	35	34.0
Occupation		
Working	52	50.5
Not working	51	49.5
Education level		
No education	11	10.7
Elementary school	21	20.4
Junior-senior high school	43	41.7
Diploma/bachelor degree	28	27.2
Duration of suffering ESRD undergoing HD (years)		
<3	84	81.6
3-5	6	5.8
>5	13	12.6
Schedule receiving HD (interval in days)		
≤ 2	94	91.3
3	6	5.8
4	2	1.9
>4	1	1.0
Length of HD per visit (hours)		
4	15	14.6
>4	88	85.4
Comorbidity		
No comorbidity	25	24.3
With comorbidities:		
a. Hypertension	44	42.7
b. DM	21	20.4
c. Hypertension + DM	13	12.6
BMI (kg/m²)		
<18.5	0	0.0
18.4-24	2	1.9
25-29	9	8.7
>29	92	89.3

Note: HD: Hemodialysis; BMI: Body mass index; DM: Diabetes mellitus

The QOL of ESRD patients undergoing HD showed the lowest mean QOL in BKD (33.50 ± 24.64), PCS (39.57 ± 8.94), followed by MCS (52.62 ± 10.39) (**Figure 1**). Previous studies by Cohen *et al.*¹⁵ and Kustimah *et al.*²⁹ support the results of this study that the dimensions of PCS (<37.0), MCS (<50.0), and BKD (<52.0) are dimensions that have a low QOL value in ESRD patients undergoing HD. The ESRD patients undergoing HD experience symptoms that can reduce their QOL, such as fatigue, dizziness/headache, muscle cramps, constipation, and decreased appetite. This condition makes the patient feel uncomfortable, so this will also affect daily activities and reduce the QOL³⁰. Then, an increase in the burden of kidney disease in the patient's life generally causes the patient to feel disturbed by the presence of kidney disease, and much time is spent on treatments (dialysis, medication, fluid, and diet restrictions), which triggers frustration³¹.

In addition, the physical dimension also affects the patient's QOL. Generally, patients feel disturbed by moderate physical activity such as climbing stairs; they experience limitations in physical activity, which results in feeling tired easily³². The patients at the beginning of HD had a lot of negative feelings, such as sadness and anxiety, caused by the HD therapy they were undergoing because there was no other choice. This situation can cause stress and trigger depression. As time goes by, the physical condition often declines to make the patient have to go back and forth to visit the hospital, exacerbating his mental condition²⁹.

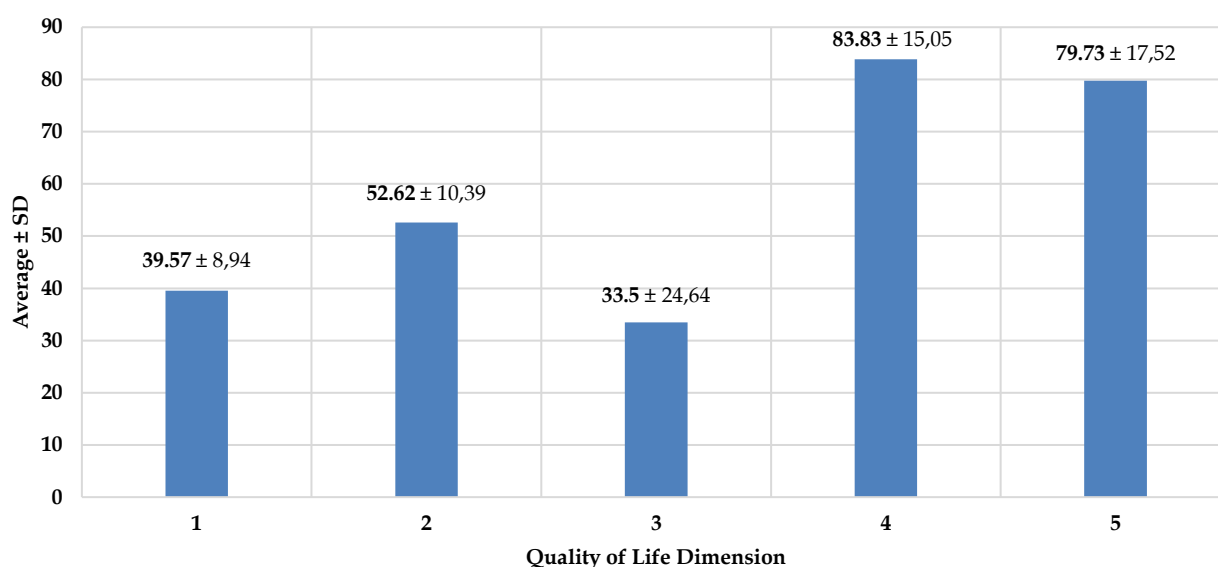


Figure 1. Quality of life ESRD patients undergoing HD.

Relationship between patient characteristics and quality of life

The results of the correlation test between the patient characteristics and QOL are shown in **Table II**. This study highlights that education level has a significant relationship with QOL on the PCS dimension ($p=0.042$) with a strong positive correlation ($r=0.676$). A higher education level makes their QOL in physical health higher. A previous study conducted by Manavalan *et al.*⁸ obtained similar results that there was a significant relationship between education level and QOL regarding physical health dimensions ($p=0.01$). This is because patients with higher education have a better understanding of their disease and its effects. After all, they can access better information related to the disease and treatment of the disorder. In addition, patients with higher education levels are aware to make lifestyle modifications so that the QOL is better^{9,33}.

Patient characteristics in the duration of suffering ESRD undergoing HD resulted in a significant relationship with QOL on the physical, mental, symptomatic, and effect dimensions ($p < 0.05$), but the correlation was weak ($r < -0.350$). This means that the longer the patient experiences ESRD and undergoes HD, the QOL decreases. Previous research by Wahyuni *et al.*³⁴ in line with this study, stated that there was a significant relationship between the length of HD and the QOL ($p < 0.05$). The QOL of ESRD patients undergoing HD often decreases because patients feel compelled to change their routine living habits. In addition, HD therapy takes a long time, so it can cause various complications that can cause physiological and

psychological stress³⁵. Then, a person diagnosed with ESRD must undergo lifelong HD, which can have negative impacts, such as undergoing fluid and dietary restrictions. This can cause limitations for patients, then can reduce their QOL³⁶.

Table II. Relationship of patient characteristics with QOL in ESRD patient undergoing HD.

Characteristic	Quality of life (average±SD)				
	PCS	MCS	BKD	SPKD	EKD
Age (years)					
<60	39.04± 8.70	52.70± 10.38	34.13± 24.12	82.24±16.00	79.20±17.53
≥60	41.20± 9.64	52.33±10.60	31.50± 26.60	88.75±10.38	81.37± 17.75
p-value	0.145	0.933	0.458	0.083	0.418
r-value	0.145	-0.008	-0.074	0.172	0.081
Gender					
Male	38.85± 9.50	52.10± 10.50	31.80± 24.16	83.58±16.10	79.30± 18.30
Female	40.90± 7.70	53.60± 10.18	36.80± 25.60	84.30± 13.03	80.60± 16.07
p-value	0.265 ^b	0.480 ^b	0.327 ^c	0.804 ^c	0.791 ^c
r-value ^d	0.928	0.928	0.369	0.479	0.397
Occupation					
Working	37.94± 8.80	51.19± 11.67	36.17± 25.37	81.46± 16.95	77.58± 17.65
Not working	41.20± 8.87	54.10± 8.76	30.75± 23.81	86.23± 12.54	81.92± 17.29
p-value	0.063 ^b	0.161 ^b	0.244 ^c	0.305 ^c	0.188 ^c
r-value ^d	0.943	0.943	0.292	0.520	0.470
Education level					
No education	35.66± 7.22	50.90± 10.84	27.30± 15.60	85.00± 11.60	80.10± 10.85
Elementary school	41.80± 7.96	56.84± 8.97	30.65± 27.00	87.20±14.55	86.46± 1370
Junior-senior high school	39.40± 9.60	51.54± 10.17	36.00± 24.80	83.80± 13.36	79.80± 15.90
Diploma/bachelor degree	39.66± 9.00	51.77± 11.20	34.15± 26	80.80± 18.77	74.30± 22.60
p-value	0.042 [*]	0.341	0.418	0.351	0.195
r-value	0.676	-0.095	0.081	-0.093	-0.129
Duration of suffering ESRD undergoing HD (years)					
<3	40.60± 8.80	54.05±10.40	35.41±25.37	85.87±13.82	82.66± 15.38
3-5	33.00± 9.36	50.19± 6.50	23.95±10.00	86.10± 9.56	81.77± 9.56
≥5	35.97± 7.90	44.45± 7.80	25.48±22.88	69.55±17.70	59.85± 21.10
p-value	0.032 [*]	0.001 [*]	0.113	0.022 [*]	0.000 [*]
r-value	-0.212 [*]	-0.317 ^{**}	-0.157	-0.306 ^{**}	-0.348 ^{**}
Schedule receiving HD (interval in days)					
≤2	39.75± 8.70	52.70±10.30	34.40±24.40	84.10±15.00	79.95± 17.70
3	37.00±13.90	50.90±11.50	19.80±12.10	74.40±16.10	74.50± 17.40
4	40.44± 8.80	46.30± 14.00	43.75± 61.87	90.60± 7.36	76.60± 15.46
>4	52,34± 0.00	49,91± 0.00	12,50± 0.00	90,63± 0.00	85,42± 0.00
p-value	0.774	0.906	0.180	0.548	0.503
r-value	-0.029	-0.012	-0.133	-0.060	-0.067
Length of HD per visit (hours)					
4	39.90± 9.00	51.20± 11.36	37.50± 23	78.50± 14.50	76.00± 14.90
>4	39.50± 9.00	52.85± 10.30	32.80± 24.96	84.70± 15	80.36± 17.90
p-value	0.724	0.597	0.326	0.038	0.166
r-value	-0.035	0.053	-0.980	0.205 [*]	0.137
Comorbidity					
No comorbidity	40.30± 8.16	52.90± 9.80	35.75±25.40	83.90± 15.20	81.25± 15.20
With comorbidity	39.33± 9.21	52.50±10.60	32.77±24.50	83.80± 15.10	79.20± 18.30
p-value	0.653 ^b	0.862 ^b	0.583 ^c	0.805 ^c	0.799 ^c
r-value ^d	0.940	0.940	0.246	0.527	0.370
BMI (kg/m²)					
<18.5	NA	NA	NA	NA	NA
18.4-24	44.80± 3.71	47.00± 7.10	3.10± 4.40	85.40± 0.00	82.80± 11.00
25-29	44.70± 9.10	55.70± 7.30	36.80± 19.60	81.00± 19.55	83.30± 18.70
>29	38.90± 8.85	52.40± 10.70	33.83± 25.00	84.10± 14.80	79.30± 17.60
p-value	0.059	0.662	0.774	0.778	0.385
r-value	-0.187	-0.044	0.029	0.028	-0.086

Note: (*) significance (p <0.05); (**) significance (p <0.01); SPKD; symptoms and problems of kidney disease; EKD: effects of kidney disease; BKD: burden of kidney disease; PCS: physical component summary; MCS: mental component summary; (a) Spearman-ρ test; (b) Independent sample t-test; (c) Mann-Whitney U test; (d) η test; HD: hemodialysis; BMI: body mass index; SD: standar of deviation; NA: not applicable

In addition, the length of HD per visit showed a significant relationship with the QOL on the symptom/ problem dimension (p=0.038) in a weak positive correlation (r=0.205), which means that the longer the patient undergoes HD, the QOL on the symptom dimension is better. A study by Garg *et al.*³⁷, who compared patients undergoing HD for 2 hours and >2 hours, reported that patients who received a longer duration of HD experienced better physiological function. The main goal of

HD therapy is to eliminate uremic products; one of the factors that influence the clearance of uremic substances is the HD frequency and the duration of HD in the body, thereby lowering blood pressure and improving QOL³⁸. Substances resulting from metabolism that can be removed from the body through HD also help balance fluids and ions in the body, thereby reducing symptoms of chronic kidney disease, such as fluid buildup that can potentially cause heart failure and pulmonary edema, which can lead to death^{39,40}.

This study has limitations that cause other characteristics such as age, gender, occupation, schedule receiving HD, comorbidities, and BMI, which show different results (no relationship with QOL), such as the presence of other variables beyond the reach of researchers, for examples positive family support and health workers that can contribute to the patient's QOL⁴¹. Then, the limited access to research during the COVID-19 pandemic made the number of samples obtained in small quantities and could not take data longitudinally that followed the course of the patient's illness, which might give discrepancies in the results. This study could not find a comparison group to measure causality relationships as in the cohort study design. In addition, because this research is qualitative and uses questionnaires, research bias can still occur because the answers from respondents who may feel that there are questions that are considered sensitive and do not want themselves to be seen as bad, then there is a possibility that patients want to be considered healthy and provide answers that lead to on a good QOL.

CONCLUSION

It was concluded that patient characteristics, including education level, duration of each HD, and diagnosis with ESRD undergoing HD contributed to their QOL ($p < 0.05$). Further research is needed to analyze other factors, such as family support and health workers, that contribute to the patient's QOL.

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AUTHORS' CONTRIBUTION

Agustina Nila Yuliawati: study design, methodology, data management, statistical analysis, and writing the original draft. **Pande Made Desy Ratnasari**: data management, visualization, editing, and writing the original draft. **Ni Luh Putu Satria Maharani**: data collection and validation.

DATA AVAILABILITY

None.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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