

Contribution of Characteristics of End-Stage Renal Disease Patients with Hemodialysis on Knowledge and Medication Adherence

Kontribusi Karakteristik Pasien Gagal Ginjal Kronik dengan Hemodialisis pada Pengetahuan dan Kepatuhan Pengobatan

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Article Info	ABSTRAK
Article history: Received 08,24,2022 Revised 10,07,2023 Accepted 10,20,2023	Pengetahuan dan kepatuhan pasien gagal ginjal kronik (GGK) dapat bervariasi berdasarkan karakteristik yang melekat pada dirinya, kemudian berpotensi mempengaruhi keberhasilan terapinya. Tujuan penelitian ini untuk mengetahui kontribusi karakteristik pasien GGK yang menjalani hemodialisis terhadap pengetahuan dan kepatuhannya. Penelitian <i>cross-sectional</i> ini dilakukan di Unit Rawat Jalan Hemodialisis Rumah Sakit Swasta di Denpasar pada bulan April-Juni 2022. Sampel sejumlah 100 orang responden diperoleh berdasarkan pemenuhan kriteria inklusi, yaitu pasien GGK yang menjalani HD berusia ≥ 18 tahun, memiliki data rekam medis lengkap serta bersedia berpartisipasi dalam penelitian (mengisi informed consent). Pasien yang tidak mengisi kuesioner secara lengkap dieksklusikan dari penelitian. Data dikumpulkan dengan kuesioner Chronic Kidney Disease Knowledge Questionnaire (CKD-KQ), End-Stage Renal Disease-Adherence Questionnaire (ESRD-AQ), dan lembar isian identitas responden bersumber dari rekam medis. Hubungan karakteristik responden dengan pengetahuan dan kepatuhannya dianalisis dengan uji statistika bivariat. Hasil penelitian menunjukkan bahwa rerata responden memiliki skoring pengetahuan sebesar $18,12 \pm 3,40$ (maks.24) dan kepatuhan sebesar $1092,86 \pm 135,20$ (maks.1200). Karakteristik pasien mampu berkontribusi terhadap kepatuhan pasien, seperti usia serta lama menderita GGK dan menjalani HD ($p < 0,05$), namun tidak dengan pengetahuan pasien. Faktor lainnya seperti pemberian edukasi dari tenaga kesehatan dinilai mampu meningkatkan pengetahuan pasien, serta kemudahan menjalani terapi GGK berdampak pada tingginya kepatuhan pasien ($p < 0,05$).
Kata kunci Pengetahuan Kepatuhan Karakteristik pasien Gagal ginjal kronik Hemodialisis	
Keywords: Knowledge Adherence Patient characteristics End-stage renal disease Hemodialysis	ABSTRACT The knowledge and adherence of end-stage renal disease (ESRD) patients can vary based on their characteristics, which could influence their therapy's success. This study aimed to determine the contribution of ESRD patients' characteristics undergoing hemodialysis (HD) to their knowledge and adherence. Data were collected using questionnaires, including the CKD-KQ, the ESRD-AQ, and respondent identity sheets sourced from medical records. The relationship between respondent characteristics and their knowledge and adherence was analyzed using bivariate statistical tests. Findings showed that the average respondent had a knowledge score of 18.12 ± 3.40 (max.24) and adherence of 1092.86 ± 135.20 (max.1200). Patient characteristics contribution in adherence was found in the age and suffering from ESRD undergoing HD duration ($p < 0.05$), but not with patient knowledge. Other elements, such as providing education from health workers, are considered to increase patient knowledge, and the ease of undergoing ESRD therapy impacts high patient adherence ($p < 0.05$).

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1. INTRODUCTION

End-stage renal disease (ESRD) is a disease that is a serious health problem and is very important to pay attention to because the mortality and morbidity rates are increasing from year to year and require large medical costs [1]. In Indonesia, the incidence of ESRD increased from 0.2% in 2013 to 0.38% in 2018. DKI Jakarta Province (38.71%), Bali (37.04%), and Yogyakarta Special Region (35, 51%) are the top 3 provinces that have the proportion of ESRD (undergoing hemodialysis (HD)) in residents aged ≥ 15 years [2]. The death rate due to ESRD in Indonesia reached 2.93% of 41,000 people [3]. According to a report by the Health Social Security Administration (BPJS Health), the cost of treating ESRD was IDR 1.6 trillion in 2014, then increased sharply to IDR 2.5 trillion in 2016 [4].

Obstacles in managing ESRD that have an impact on increasing the burden of ESRD disease are lack of knowledge and patient adherence [5,6,7]. It is strengthened by an existing theory that knowledge itself is greatly influenced by the intensity of attention and perception of objects, then the basic knowledge that a person has will form an attitude and action in behaving towards certain things [8]. ESRD patients are also required to adhere to therapy such as HD to prevent the severity of ESRD, considering that ESRD is progressive [9]. Until now, low adherence is still considered to be the main problem in the successful therapy of ESRD patients undergoing HD [10].

The level of knowledge and adherence between ESRD patients can vary due to various characteristics inherent in each individual. Various studies link sociodemographic characteristics and treatment conditions with patient knowledge and adherence, such as age and education level [11,12]. Previous research states that the patient's sociodemographic characteristics such as age can influence knowledge and adherence because the older you get, the more knowledge will be formed from the many experiences the patient has had in carrying out treatment and the increasing maturity in making decisions so that they will be more obedient [13]. Education is considered one of the factors that influence knowledge and adherence because the higher the level of education, the easier it will be to receive various information and understand treatment instructions so that it can increase patient adherence [14]. The treatment conditions of ESRD patients, such as the duration of HD, are also related to patient adherence in undergoing HD therapy. The longer the patient undergoes HD therapy, the more knowledge will be gained and this will have an effect on increasing patient adherence [13,15].

Based on this background explanation, this study aims to determine the knowledge and adherence of ESRD patients undergoing HD at a hospital in Denpasar. These results are expected to help related parties, namely local hospital health workers, patients, and patient families in increasing the success of patient therapy, which in the long term can lead to a good quality of life for patients [10]. Specifically, this research also wants to analyze the contribution of characteristics inherent in the patient as a variable that has the potential to increase patient knowledge and adherence, namely based on sociodemographic characteristics, then the disease condition through the length of suffering from ESRD and the presence or absence of comorbidities, as well as the patient's HD treatment, detailed not only on the duration of HD during illness as in previous studies, but also involves the frequency of receiving HD within and every week of HD treatment, and the length (in hours) of undergoing HD in one patient visit [11,12,13]. This form of evaluation involving patient characteristic factors through preliminary studies has reportedly never been carried out at the local hospital in Denpasar.



2. METHODS

Study design, population, and sample

This research is an observational study with a cross-sectional design conducted in the Hemodialysis Inpatient Unit of a Private Hospital, Denpasar, Bali from April to June 2022 and has passed an ethical review from the STIKES Bina Usaha Bali, Health Research Ethics Commission with number 040/EA/ KEPK-BUB-2021. The sample size in this study was 100 respondents obtained through a purposive sampling technique by fulfilling the research inclusion and exclusion criteria. Inclusion criteria include ESRD patients undergoing HD who are ≥ 18 years old, have complete medical record data, namely at least complete data such as age, gender, disease diagnosis, and treatment therapy, and are willing to participate in the research as proven by filling out an informed consent form. Meanwhile, exclusion criteria include ESRD patients who do not fill out the questionnaire completely, are in a weak condition, or are unable to communicate well.

Research instrument

Data was collected using questionnaire instruments in the form of a Chronic Kidney Disease-Knowledge Questionnaire (CKD-KQ) to measure knowledge and an End-stage Renal Disease-Adherence Questionnaire (ESRD-AQ) to measure medication adherence. Apart from that, it also uses a data collection sheet to complete the respondent's identity from the medical record. The two questionnaires used have met the validity and reliability tests. The ESRD-AQ questionnaire received a content validity index (CVI) value of 0.96, then the correlation coefficient (r) reached 0.98, kappa value > 0.8 regarding the validity of adherence questions, and Cronbach's α value of 0.57 regarding reliability. [16]. The CKD-KQ questionnaire assessed the validity of the questionnaire with discriminant validity and it was obtained that the target respondents had knowledge scoring results that were significantly different from other groups of respondents as a comparison ($p < 0.001$), then the Cronbach's α value was 0.88 [6]. This research also carried out face validity with the results of $> 80\%$ of respondents stating that both questionnaires could be understood well and were clear, short, and unambiguous in terms of the sentences of the questions asked.

Evaluation and data analysis

The CKD-KQ questionnaire consists of 24 questions with answer options of "yes", "no", or "I don't know". Respondents' knowledge was assessed based on the number of items answered correctly. The correct answer is given a value of one (1), while an incorrect answer or choosing "I don't know" is given a value of zero (0). The high level of knowledge of the patient is converted from the value obtained by the patient in answering the questionnaire [17]. Meanwhile, the ESRD-AQ questionnaire consists of 46 questions with 6 of them used to measure adherence, namely questions number 14, 17, 18, 26, 31, and 76. Answer choices use a Likert scale which is then converted into scoring form, then added up so that the adherence score ranges between 0 and 1200. Based on this scoring, respondents' adherence is then divided based on the percentage of scoring achievement for each respondent with the highest score; low ($< 80\%$), medium (80-89%) and high ($\geq 90\%$) [18].

Data analysis to describe respondents' characteristics, knowledge, and adherence was processed descriptively in frequency, percentage, and mean \pm standard deviation (SD) and then presented in a table. Next, the relationship between respondents' characteristics and their knowledge and adherence was analyzed using statistical tests with a confidence level of 95%, namely the Cramer's V test (nominal-ordinal scale data), Kendall's tau b/c (ordinal-ordinal scale data), Spearman-rho (nominal-ordinal scale



data). ordinal-ratio), Eta (nominal-ratio scale data). However, the Eta test can only see the correlation coefficient value (r-value), so the Mann-Whitney U-test is needed to see the significance value if it does not meet the requirements of the Chi-Square test.

3. RESULT

This research resulted from a series of findings presented in the table. The first research result is information related to the description of the characteristics of the respondents in this study.

Table 1. Characteristics of Respondents

Characteristic (n=100)	%
Age (years)	
<60	77
≥ 60	23
Gender	
Male	67
Female	33
Education level	
No education	10
Elementary school	19
Junior high school	9
Senior high school	36
College	26
Occupation	
Working	49
Not working	51
Duration of suffering ESRD undergoing HD (years)	
<3	82
3-5	6
>5	12
Schedule receiving HD (interval in a weeks)	
≤2 days	92
3 days	5
4 days	2
>5 days	1
Length of HD per visit (hours)	
4	14
>4	86
Comorbidity	
No	32
Yes,	68
Hypertension	37
Diabetes mellitus	15
Hypertension + diabetes mellitus	16
Receiving treatment (drugs)	
1-3	19
4-6	41
>6	40

Note: ESRD, End-stage renal disease; HD, hemodialysis

This research also results in a description of respondents' knowledge and adherence. Based on Table 2, it is shown that the average respondent has a knowledge score of 18.12 ± 3.40 . This value reached 75.5% of all questions (24) answered correctly.



Table 2. Description of Knowledge of ESRD Patients Undergoing HD

No.	Question (n=100)	Correct response (%)
*1	A person can lead a normal life with one healthy kidney.	66.0
2	Herbal supplements can be effective in treating chronic kidney disease.	60.0
*3	Certain medications can help to slow-down the worsening of chronic kidney disease.	56.0
What functions do the kidneys perform in the body?		
*4	The kidneys make urine.	63.0
*5	The kidneys clean blood.	89.0
6	The kidneys help to keep blood sugar level normal.	73.0
*7	The kidneys help to maintain blood pressure.	80.0
8	The kidneys help to breakdown protein in the body.	68.0
*9	The kidneys help to keep the bones healthy.	59.0
Which of the following are commonly used to determine health of the kidneys?		
*10	A blood test.	92.0
*11	A urine test.	84.0
12	A faecal test.	41.0
*13	Blood pressure monitoring	83.0
What are the risk factors for chronic kidney disease?		
*14	Diabetes.	88.0
15	Being female.	61.0
*16	High blood pressure.	95.0
*17	Heart problems such as heart failure or heart attack.	79.0
18	Excess stress.	87.0
*19	Obesity.	78.0
What are the signs and symptoms that a person might have if they have advanced chronic kidney disease or kidney failure?		
*20	Water retention. (excess water in the body)	91.0
21	Fever.	53.0
*22	Nausea/vomiting..	94.0
*23	Loss of appetite.	90.5
*24	Increased fatigue (tiredness).	100.0
Skoring Pengetahuan (rata-rata±SD)		18.2±3.40 (75.5)

Note: (*), True items; SD, the standard of deviation

The research results regarding respondent adherence are presented in Table 3 based on the ESRD-AQ questionnaire, which includes the presence of HD, medication, dietary recommendations, and fluid restrictions [18]. The average adherence of respondents was 1092.86 ± 135.20 (maximum scoring 1200) with the majority of respondents in the high adherence category (64%).

Table 3. Description of Adherence with ESRD Patients Undergoing HD

Variable (n=100)	Category	%	Mean±SD
Adherence	Low (<80%)	16	833.82±102.68
	Moderate (80-89%)	20	1082.14±72.09
	High (≥90%)	64	1161.94±50.07
Total		100	1092.86±135.20

Note: ESRD, End-stage renal disease; HD, hemodialysis; SD, the standard of deviation

The final research results are related to the analysis of the relationship between respondents' characteristics and their knowledge and adherence, which are presented in Table 4.



Table 4. Relationship between Respondent Characteristics to Knowledge and Adherence

Characteristic (n=100)	Knowledge			Adherence		
	Mean±SD	p-value	r-value	Mean±SD	p-value	r-value
Age (years)						
<60	18.06±3.33	0.644 ^a	0.046 ^a	1076.25±145,99	0.015 [*]	0.171
≥ 60	18.32±3.71			1146.00±72,05		
Gender						
Male	18,07±3,52	0,992 ^b	0,398 ^c	1102,50±121,45	0.405 ^d	0.131
Female	18,23±3,22			1073,57±159,38		
Education level						
No education	17.40±2.88	0.717 ^a	0.036 ^a	1007.50±206.17	0.952 ^f	0.005
Elementary school	17.55±4.22			1107.50±116.16		
Junior high school	18.77±2.58			1044.4±155.01		
Senior high school	17.71±4.08			1101.97±128.2		
College	17.40±2.88			1007.50±206.17		
Occupation						
Working	18.10±3.03	0.609 ^b	0.323 ^c	1063.46±150.45	0.212 ^d	0.172
Not working	18.15±3.76			1121.70±112.45		
Duration of suffering ESRD undergoing HD (years)						
<3	18.08±3.58	0.900 ^a	-0.012	1127.35±88.78	0.002 ^e	-0.356
3-5	18.86±2.27			1085.71±110.73		
>5	18.00±2.80			871.15±188.15		
Schedule receiving HD (interval in a week)						
≤2 days	18.00±3.33	0.068 ^a	0.179 ^a	1095.31±134.13	0.943 ^f	0.003
3 days	19.00±4.98			1016.67±163.30		
4 days	21.50±0.71			1150.00±70.71		
>5 days	18.00±0.00			1200.00±0.00		
Length of HD per visit (hours)						
4	17.60±3.33	0.484 ^a	0.069 ^a	1091.67±154.01	0.764 ^f	-0.020
>4	18.21±3.43			1093.06±132.77		
Comorbidity						
No	17.85±2.54	0.247 ^b	0.384 ^c	1084.85±131.98	0.398 ^d	0.132
Yes	18.25±3.75			1096.53±137.39		
Receiving treatment (drugs)						
1-3	19.35±2.62	0.346 ^a	-0.093 ^a	1081.25±158,71	0.760 ^e	-0.028
4-6	17.60±3.69			1084.52±117,15		
>6	18.07±3.35			1106.40±142,49		

Note: (*) Significant (p<0,05); (a) Spearman-Rho test; (b) Mann Whitney-U test; (c) Eta test; (d) Cramer's V test; (e) Kendall's tau-b test; (f) Kendall's tau-c test; ESRD, End-stage renal disease; HD, hemodialysis; SD, the standard of deviation

Based on the results of statistical tests, it shows that the characteristics of respondents do not contribute to knowledge (p>0.05). However, several characteristics of respondents such as age and length of time diagnosed with ESRD and undergoing HD were significantly related to patient adherence (p<0.05). In terms of age characteristics, the correlation formed shows a positive direction (r=0.171), that is, the older the patient gets it makes the higher the patient's adherence, and the characteristics of the duration of being diagnosed with ESRD and undergoing HD form a correlation in the opposite direction to adherence (r=-0.356), that is, the longer a person suffers from ESRD it makes the lower the level of adherence.

4. DISCUSSION

Description of Characteristics of Respondents

It was found that the majority of respondents were <60 years old (77.0%), male (67.0%), had completed their highest education level of high school up to college (62.0%), and not working (51.0%), suffering from ESRD and undergoing HD <3 years (81.0%),



receiving HD schedule ≤ 2 days per week or ≤ 3 times a week (91.4%), as well as in per visit receiving HD for >4 hours (85.7%), suffering from comorbidities other than ESRD (68.0%), namely hypertension (37.0%), diabetes mellitus (DM) (15.0%), and a combination of both (16.0%), as well as receiving treatment with 4-6 drug items (41.0%) (table 1).

The research results related to respondent characteristics are listed in detail in Table 1 and are also supported by several previous studies. Regarding age characteristics, the results of this study are in line with research conducted by Yuliawati et al. (2022) which shows that the majority of CKD patients undergoing HD are <60 years old (66.3%), male (71.9%) [19]. In particular, the age range of 55-60 years is a transition period due to a decrease in physical strength and physiological body function, including a decrease in kidney function which can lead to kidney disease or disorders [20]. Normally, as people age, kidney function decreases, especially over the age of 40 to 70 years. This is characterized by a decrease in GFR of around 50% from the normal rate [21]. More specifically, at the age of 40-50 years, the normal GFR decreases around 0.75 to 1 ml/minute/1.73m² per year, for both women and men, due to loss of nephron function [22].

Apart from age, gender is also a risk factor for kidney disorders or disease. Men have less estrogen compared to women. The function of the estrogen hormone is to regulate calcium levels in the body which works by inhibiting the formation of cytokines to prevent osteoclasts from absorbing bone excessively. Calcium has a protective effect in preventing the absorption of oxalate to form kidney stones, where kidney stones are one of the causes of chronic kidney failure in men [15,23]. Other risk factors can affect health, such as smoking, alcohol, and drinking supplements which can trigger systemic disease, causing a decrease in kidney function and impacting the patient's quality of life [24].

The results of other research which are in line with this research also reveal that some ESRD patients undergoing HD have an educational background that tends to be high, namely high school ($>40\%$) and college ($>30\%$), and are no longer working ($>40\%$) [25,26,27]. Education is considered a predisposing factor that influences behavior and is related to health, such as improving and maintaining health, preventing disease, seeking treatment, and restoring health as well as selecting and deciding on actions or therapy to be undertaken to overcome health problems. Apart from that, most patients do not work because it is related to organ function failure in CKD patients undergoing HD resulting in physical changes such as fatigue, lethargy, and various other symptoms that prevent patients from working optimally [28,29].

Other characteristics of respondents are related to the history of the ESRD profile, in line with several previous research results that the majority of respondents suffer from ESRD and undergo HD for a duration of <3 years (67.4%), having the highest frequency of HD, namely 3 times a week (55.6%), undergoing HD is mostly carried out 2 times a week for >4 hours during each HD process (52%) [19,28,30]. The frequency of undergoing HD is carried out to rebalance abnormal salt, water, and pH levels due to CKD, but is still adjusted to the severity of kidney damage as an effort to improve the patient's quality of life to prolong life and prevent premature death [4,31]. Regarding comorbidities in CKD patients in the study, this is in line with research by Chukwuonye et al. (2019) which found that the comorbidities that many patients had were cardiometabolic diseases, namely hypertension (38%) and a history of DM (7.75%) [32]. The large number of drug items received by CKD patients is associated with comorbidities and long suffering from



the disease so ESRD treatment becomes complex with the number of drug items received by patients increasing [19,33].

Description of Respondents' Knowledge

Based on the 24 questions contained in the CKD-KQ questionnaire, several questions have a low percentage of correct answers below average (<75.5%), but the three lowest percentages are in a row in question number 12 (41.0 %), 21 (53.0%), and 3 (56.0%). Overall, measuring patient knowledge regarding the disease and its treatment is important for addressing changes in health status and treatment [34].

In question number 3, 56.0% of respondents answered correctly that certain drugs could help slow the severity of ESRD, the remainder (44.0%) still did not understand this. The lack of knowledge that ESRD patients have regarding this matter will have an impact on therapy failure due to changes in kidney function experienced by the patient and the impact of certain drugs that have the potential to harm or worsen the patient's ESRD condition [6]. Drugs that cannot be given without adjusting the dosage regimen to ESRD patients include antihypertensives, antibiotics, and non-steroidal anti-inflammatories (NSAIDs) because these drugs can potentially cause more severe kidney damage [35]. Then, in question number 12, 41.0% of respondents answered correctly that the stool test is not a health parameter used to assess kidney health. Parameters for assessing kidney health include blood tests, urine tests, and blood pressure. The patient's knowledge is related to the examination carried out to determine kidney health, which will have an impact on the health of the kidney organ (kidney function), as well as determining the treatment he will undergo [36].

In question number 21, 53.0% of respondents answered correctly that fever is not a sign and symptom that someone might experience if they suffer from advanced chronic kidney disease or kidney failure. In ESRD patients, decreased kidney function tends to cause symptoms of anemia, where anemia is caused by erythropoietin (EPO) deficiency. Anemia that occurs in ESRD patients can cause ESRD patients to tend to feel tired and weak easily. In addition, lack of appetite, nausea, and vomiting in ESRD patients is caused by disturbances in protein metabolism in the intestine and the formation of toxic substances caused by excessive urea in saliva, which is then converted into ammonia by bacteria, so that the breath of ESRD patients tends to smell like ammonia. Therefore, the lack of knowledge that ESRD patients have regarding the signs and symptoms they experience tends to have an impact on the patient's quality of life getting worse [37].

Description of Respondents' Adherence

A total of 49.0% of respondents who had high adherence gave the lowest response to question number 46 regarding following the respondent's dietary or dietary recommendations. ESRD patients undergoing HD must comply with the dietary recommendations recommended by health workers. Patients on HD tend to have high urea and creatinine levels, which will interfere with the production of the hormone erythropoietin, which will then result in decreased production of the number of red blood cells or anemia. In addition, ESRD patients who are on HD are susceptible to nutritional deficiencies caused by protein catabolism, so their appetite decreases and they are feared to be non-compliant with their diet. Non-adherence with dietary recommendations can worsen the patient's condition because of the potential for malnutrition which is one of the factors in increasing the risk of hospitalization and death [38].

However, other aspects that are no less important to pay attention to are adherence, namely hemodialysis, medication, and fluid restrictions. ESRD patients who do not comply with fluid restrictions will experience fluid accumulation, causing



pulmonary and heart edema which results in increasingly difficult heart and lung function. This makes patients quickly feel tired and short of breath and ultimately disrupts their daily activities [19,28]. Apart from that, it is related to treatment, especially in carrying out the treatment regimen. Non-adherence with the treatment regimen in ESRD patients is at risk of experiencing various other health conditions including pulmonary edema, excess fluid volume, cardiovascular disease, low hemoglobin levels, and high phosphorus, resulting in low health status and reducing the patient's quality of life [39,40,41,42]. Then, ESRD patients are very dependent on HD therapy to replace kidney function. If you do not comply with HD therapy, there will be a buildup of dangerous substances in the body that come from metabolism in the blood, namely an increase in urea and creatinine, causing the sufferer to feel pain throughout the body and if this is left unchecked, it will cause death [13].

Relationship between Respondent Characteristics to Knowledge and Medication Adherence

In the knowledge domain, based on the results of statistical tests, it is shown that the characteristics of the respondents do not contribute to knowledge ($p > 0.05$) (table 4). However, other factors are studied related to health behavior, such as the routine of health workers providing education to patients regarding the series of therapies that ESRD patients must undergo which are related to increasing patient knowledge such as fluid restrictions ($p = 0.012$; $r = -0.244$) and dietary recommendations ($p = 0.026$; $r = -0.217$). The closer the distance between health workers providing education to ESRD patients regarding the therapy they are undergoing, the more the patient's knowledge increases. In line with previous research, there is a relationship between providing education from medical personnel and knowledge ($p < 0.05$) [43,44]. Knowledge formed from the provision of education by health workers is also thought to originate from a person's ability/power to remember information provided over a certain period. Apart from that, a person's memory or memory is a relatively permanent record of the experiences they have experienced so that these experiences which contain a lesson can later influence a person's increasing knowledge [45]. Therefore, to improve patient memory related to education from health workers, it is necessary to carry out periodic outreach or counseling programs to prevent the information that has been explained from being lost [46].

In the adherence domain, based on the results of statistical tests, it was shown that the characteristics of the respondents, namely age and length of time diagnosed with ESRD and undergoing HD were significantly related to patient adherence ($p < 0.05$) (Table 4). These results are in line with research by Mukakarangwa et al. (2018) which states that there is a significant relationship between age and length of time undergoing ESRD and HD with adherence ($p < 0.05$) [18]. Age is considered to be able to influence a person's adherence because age is associated with the patient's level of maturity in terms of attitude, emotional and spiritual maturity, thereby increasing the ability to make decisions, be able to think rationally, control emotions, tolerate other people's opinions and be able to think critically in solving problems. his health [47,48].

Suffering from ESRD for a long time also has an impact on long-term treatment so that it can change the patient's habits, such as reducing fluid intake and implementing dietary recommendations. Apart from that, patients will feel muscle cramps, nausea, vomiting, and itching after treatment. Thus, patients will feel bored which makes patients not adhere to treatment or undergo HD [49]. While suffering from ESRD and undergoing HD (<3 years), the majority of respondents felt that it was easy to carry out the therapy



process (HD, medication, fluid restrictions, and diet recommendations) resulting in high adherence ($\geq 48.0\%$; $p < 0,05$). This is supported by research by Kurniasari et al. (2020) who explain that because patients are used to doing this, patients can have high adherence [49]. Each patient needs a different amount of time to improve their health behavior. Another factor that is thought to be able to increase patient adherence is family support. Having good family support can eliminate feelings of boredom and help deal with the negative impacts of completing HD. The family is considered the closest person who can pay attention to the patient at all times, so it can influence the patient's adherence to undergoing HD therapy [49].

Based on the research results that have been obtained, researchers are aware of several limitations in the research, namely that the results of this study cannot describe the ESRD patient population at large, because the samples were only taken from one research location in Denpasar. Then, research data was not taken longitudinally due to limited time for data collection during the Covid-19 pandemic which might result in differences in research results between data collection periods following the course of the patient's illness, as well as the absence of a comparison group that could describe in detail the causal relationship that was formed, between patient characteristics to knowledge and adherence.

5. CONCLUSION

Patient characteristics were able to contribute to patient adherence, such as age and length of time suffering from ESRD and undergoing HD ($p < 0.05$), but were not related to patient knowledge. Other factors such as providing education from health workers are considered capable of increasing patient knowledge, as well as the ease of undergoing CKD therapy which can have an impact on high patient adherence ($p < 0.05$).

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