

**CHARACTERISTIC OF CHRONIC KIDNEY DISEASE (CKD) PATIENTS
ROUTINELY TREATED WITH HEMODIALYSIS
IN DR TJITROWARDOJO LOCAL HOSPITAL, PURWOREJO,
CENTRAL JAVA, INDONESIA**

Wiwit Sugiarti¹, Sri Nabawiyati Nurul Makiyah²

¹Master of Nursing Program, Post Graduate University of Muhammadiyah Yogyakarta,
Yogyakarta

²Medical Study Program, Medical and Health Sciences Faculty,
University of Muhammadiyah Yogyakarta, Yogyakarta

Correspondence Email: nurul_makiyah@umy.ac.id

Abstract: *Chronic Kidney Disease (CKD) is the main cause of hemodialysis therapy. This research aims to study the characteristic of the Chronic Kidney Disease patients who routinely undergo hemodialysis (HD) therapy. Observational research with the cross-sectional design is conducted to the chronic kidney disease patients routinely treated with hemodialysis in the Dr Tjitrowardojo Hospital in Purworejo. The respondents' characteristics include demography, vital sign, chronic kidney disease causes, lifestyle, pain, and insomnia. Product Moment Pearson correlation test is used to test the data. The research's result shows that the majority of the respondents are men 22 people (61.1%), aged 40-55 years old 17 people (38,9%), High School graduate 18 people (50%), working 25 people (69,4%), and are married 34 people (88,9%). The majority of the respondents do not smoke 33 people (91,7%), do not drink coffee 25 people (69,4%), do not exercise 32 people (88,9%), and suffered CKD due to hypertension 25 people (69,4%). The majority of the respondents, 24 people, have undergone HD for 1-5 years and every HD treatment, the duration is 4,5 hours. They have low Hb level (< 12 gr/dl), normal albumin level (3,5 – 5,2 g/dl), suffered moderate pain and insomnia (28 people). Respondents' characteristics correlated strongly are the habit of drinking medicine, pain and insomnia. The conclusion is a smoking habit, pain, and insomnia is the closest characteristics linked to chronic kidney disease patients who routinely undergo hemodialysis.*

Keywords: *Characteristic, Chronic Kidney Disease, Hemodialysis, Pain, Insomnia*

INTRODUCTION

Chronic Kidney Disease (CKD) is the main cause of hemodialysis (HD) therapy. HD is the main alternative therapy replacing the kidney's function of CKD patients due to the cost factor that hemodialysis therapy is cheaper than other therapy. Also, it has a lower risk of bleeding compared to the peritoneal dialysis.¹

In Indonesia, the number of patients who routinely treated with hemodialysis from 2007 until 2014 is increasing. In 2007, the number of HD patient was 140.972 people, and in 2014, the number of the increasing of HD patients reached 703.139 people.¹ The total of new HD patient in 2010 is 9.649 people, and the active HD patients are 5.184 people. Based on the Dr Tjitrowardojo Hospital, the increasing number of HD patients on each year are; 556 people in 2011, 836 people in 2012 and 918 people in 2013.

The patients treated with hemodialysis have some complication such as, tiredness, pruritus, constipation, anorexia, pain, sleep disorder, anxiety, dyspnea, depression, nausea, and sleep disorder affecting the life quality which can cause death.^{2,3,4} Insomnia disorder and musculoskeletal pain, such as joint pain, back pain, and muscle cramp related to minerals and bone disorders resulted by CKD which influences the high level of parathyroid hormone though there are other factors such as demographic, lifestyle, biology, psychology, and dialysis.⁵ The chronic pain felt by the HD patient will have an impact on the sleep disorder, namely, insomnia.

Patients treated with hemodialysis experience complication symptoms such as pain which affects the quality of life, even can cause death.^{6,7,8} Musculoskeletal pain disorder is joint pain, back pain, and muscle cramp related with minerals and bone disorder caused by the high of CKD which influences the high parathyroid hormone though other factors are influencing such as

demographic, lifestyle, biology, psychology, and dialysis.⁹

This research aims to study the characteristic of Chronic Kidney Disease patients who routinely undergo hemodialysis therapy in Hemodialysis Unit of Dr Tjitrowardojo Hospital Purworejo, Central Java, Indonesia.

RESEARCH METHOD

This research is nonexperimental research with a *cross-sectional* design. The population of this research is the patient who routinely undergoes the hemodialysis in Dr Tjitrowardojo Hospital, Purworejo, as many as 70 people. The number of the sample is 36 respondents. The sampling of this research is by *quota sampling*. The inclusion criteria are patients who routinely undergo HD and are minimum age of 18 years (adult). Patients who at least have already undergone HD in 3 months routinely. Patients who undergo HD twice a week for 3 or 4 hours of each treatment and did not experience any problem of AV fistula. The patients are conscious, cooperative and well communicated, patients without femoral access, not the HD inpatients, and able to stand up for at least 30 minutes without any help.

The exclusion criteria are HD patients with unstable hemodynamic, heart problem patients, patients with the musculoskeletal disorder and fracture risk, patients with neurology disorder. While the drop-out respondents are the patients, who deaths during the research period.

This research is conducted in Hemodialysis Unit of Dr Tjitrowardojo Hospital, Purworejo Regency, Central Java Province. This research is conducted starting from June 2017 in Hemodialysis Unit of Dr Tjitrowardojo Hospital Purworejo Regency, Central Java Province.

The research is conducted by determining the respondents who meet the

criteria of inclusion and exclusion, asking the respondents to be the participants who have given the research explanation, asking the respondents to sign the participant consent sheet. Collect the data of characteristic respondents, including demographics, vital sign, the cause of chronic kidney disease, lifestyle, pain, and insomnia. *Visual Analog Scale* (VAS) is used to measure the pain score of the respondents. Insomnia Rating Scale from *KSPBJ (Kelompok Studi Psikiatri Biologi Jakarta / Group Study of Psychiatry Biologi Jakarta)* is to measure the respondents' insomnia score.

The data are examined their reliability with alfa-Cronbach. The data of respondents' characteristic with kidney failure who routinely undergo the hemodialysis are analyzed statistically by using univariate analysis. Their validity is tested by using Product Moment Pearson correlation test.

RESULTS AND DISCUSSION

The result of data collecting on the second week of August 2006 in Hemodialysis Unit of DR. Tjitrowardojo Hospital, Purworejo regency, the province of Central Java is that the number of CKD patients who undergo hemodialysis therapy on the second week of August 2006 is as much as 57 people. From those number of patients, the patients who meet the inclusion criteria are 34 patients. The research's result includes the respondents' characteristics, namely demographic, vital sign, the cause of chronic kidney disease, lifestyle, pain and insomnia.

Respondents grouping according to demographics (gender, age, education, working status, married status) can be seen in Table 1. Based on the gender, the majority of the respondents are male with the number of 22 people (61,1 %) while the female is 14 people (38,9%). Data of respondents age are the majority in the age range of 40-55 years old; they are 17 people (38, 9%) and the

respondents aged above 55 years old are 12 people. That range age with the tendency of various complications of kidney failure is compared to the respondents aged under 40 years old who are seven people. Based on the educational background, the majority of the respondents have graduated from high school; they are 18 people. Meanwhile, the majority of the respondents who are working are 25 people (66, 7%). Furthermore, the majority of the respondents married is 34 people (88,9%) and those who are unmarried are two people (11,1 %).

Table 1. Respondents Distribution According to Demographic Condition.

Demographic Condition	F	%
1. Gender:		
Male	22	61,1
Female	14	38,9
Total	36	100
2. Age:		
- <40 years	7	16,7
- 40-55 years	17	38,9
- >55 years	12	44,4
Total	36	100
3. Educational Background:		
- Basic (SD)	22	55,6
- Middle (SMP, SMA)	7	27,8
- Higher (D3, S1)	36	100
Total		
4. Working Status		
- Worked	25	66,7
- Unemployed	11	33,3
Total	36	100
5. Marital Status		
- Married	34	88,9
- Unmarried	2	11,1
Total	36	100

The respondents grouping according to their lifestyle (smoking habit, coffee addict, exercises) can be seen in Table 2. Based on the smoking habit, the majority of the respondents do not smoke; they are 33 people (91, 7%). The majority of the respondents who don't drink coffee are 25 people (69,4%). And the majority of the respondents who don't have the exercise habit are 32 people (88,9%).

Table 2. Respondents Distribution According to Lifestyle.

Lifestyle	F	%
1. Smoking Habit		
Yes	3	8,3
No	33	91,7
Total	36	100
2. Drinking Coffee		
Yes	11	30,6
No	25	69,4
Total	36	100
3. Exercise Habit		
Yes	4	11,1
No	32	88,9
Total	36	100

The respondents grouping according to biological conditions causing chronic kidney

disease, can be seen in table 3. The table shows that the majority of the respondents are having chronic kidney disease caused by hypertension. They are 25 people (69, 4%).

Table 3. Respondents' Distribution According to the Cause of Chronic Kidney Disease (CKD)

The cause of CKD	F	%
Hypertension	25	69,4
Urinary Stone	5	13,9
DM	2	5,6
Others	4	11,1
Total	36	100

The respondents grouping according to hemodialysis condition undergone by the respondents (shift HD, how long undergoing HD, duration of each HD treatment) can be seen in table 4. All the respondents undergo hemodialysis, both on morning shift and in evening shift, with the number of each shift as many as 18 people. Majority of the respondents have undergone HD for 1-5 years. They are 24 people. For each HD treatment, the duration is 4,5 hours in maximum with the number of the respondents are 21 people.

Table 4. Respondents Distribution According to Hemodialysis Condition

Hemodialysis Condition	F	%
1. Shift HD		
Morning	18	50
Evening	18	50
Total	36	100
2. how long undergoing		
< 1 year	4	11,1
1-5 years	24	66,7
> 5 years	8	22,2
Total	46	100
3. Duration of Each HD		
4 hours	15	41,7
4,5 hours	21	5,3
Total	36	100

Respondents grouping according to vital signs (blood pressure, pulse, respiration, temperature) can be seen in table 5. Majority of the respondents have hypertension (having high blood pressure above 139/89 mmHg), they are 25 people. And those who have normal blood pressure are 11 people. The respondents who have normal pulse, 60-100

times per minute, are 34. Majority of the respondents have the normal breathing rate (respiration), 12-20 times per minute as many as 23 people. In addition, the majority of the respondents who get hypothermia (having low temperature under 36, 5°C) are 28 people.

Table 5. Respondents Distribution According to Vital Signs

Vital Signs	F	%
1. Blood Pressure		
<90/60 MmHg (low/hypotension)	-	-
90/60 – 139/89 (normal)	11	30,6
>139/89 MmHg (high/hyphertension)	25	69,4
Total	36	100
2. Pulse		
<60 times/minute (slow)	-	-
60-100 times/minute (normal)	34	94,4
>100 times/minute (fast)	2	5,6
Total	36	100
3. Respiration		
<12 times/minute (low)	-	-
12-20 times/minute (normal)	23	63,9
>20 times/minute (fast)	13	36,1
Total	36	100
4. Temperature		
<36,5 °C (low/hypothermia)	28	77,8
36,5-37,5 °C (normal)	8	22,2
>37,5°C (high)	-	-
Total	36	100

Respondents grouping according to used drugs (anti-hypertension, CaCO₃, vitamin, EPO) can be seen in Table 6. Table 6 is about the drugs used by the respondents as a hemodialysis patient in Dr Tjitrowardojo Hospital, Purworejo. It can be seen that the majority of the respondents are given the anti-hypertension drug. The respondents for the intervention group are 12 people (66,7%), and the respondents of the control group are 16 people (88,9%). Also, Majority of the respondents are given CaCO₃ for the intervention group, the number of respondents is 12 people (66,7%), and the

number of respondents of the control group is ten people (55,6%). Majority of the respondents, both of the intervention group and control group, are given vitamin. For the intervention group, the number of the respondents are nine people (50%) and for the control group are 11 people (61,1%). Majority of the respondents are given Erythropoietin (EPO), for the intervention group, the number of the respondents are 16 people (88,9%), and the number of the respondents of the control group is 15 people (83,3%).

Table 6. Respondents' Distribution According to Routine Drugs Taken at Home

Drugs	Intervention		Control		Total	
	f	%	f	%	f	%
1. Anti Hypertension						
Drugs						
Yes	12	66,7	16	88,9	28	77,8
No	6	33,3	2	11,1	8	22,2
Total	18	100	18	100	36	100
2. CaCO ₃						
Yes	12	66,7	10	55,6	22	61,1
No	6	33,3	8	44,4	14	38,9
Total	18	100	18	100	36	100
3. Vitamin						
Yes	9	50	11	61,1	20	55,6
No	9	50	7	38,9	16	44,4
Total	18	100	18	100	36	100
4. Erythropoietin						
Yes	16	88,9	15	83,3	31	86,1
No	2	11,1	3	16,7	5	13,9
Total	18	100	18	100	36	100

Source: Primary Data, 2017

Respondents grouping according to Hb and albumin level from the research in the laboratory can be seen in Table 7. Majority

of the respondents, 34 people, have low Hb level (under 12 gr/dl). And the majority of the respondents, 32 people, have normal albumin level (3,5 – 5,2 g/dl).

Table 7. Respondents' Distribution According to Hb and Albumin Level

Criteria	F	%
1. Hb Level		
-<12 gr/dl (low)	34	94,4
-12-18 gr/dl (normal)	2	5,6
Total	36	100
2. Albumin Level		
-<3,5 g/dl (low/hypoalbumin)	3	8,3
-3,5 – 5,2 g/dl (normal)	32	88,9
->5,2 g/dl (high/hyperalbumin)	1	2,8
Total	36	100

Score 0 is categorized as no pain, score 1-3 is categorized as mild pain, score 4-6 is a moderate pain, score 7-9 is severe pain, and

score 10 is a very severe pain. The result categorization of respondents' pain score can be seen in Table 7.

Table 7. Frequency Distribution of Respondents' Pain Category

Category	F	%
Pain:		
-Mild	2	5,6
-Moderate	24	66,7
-Severe	10	27,8
Total	36	100
Insomnia:		
-No insomnia	8	22,2
-Insomnia	28	77,8
Total	36	100

The Table 7 shows that majority of the respondents suffered moderate pain; they are 24 people. Meanwhile, the respondents who suffered severe pain are ten people, and respondents who suffered mild pain are two people. In the insomnia category, respondents with insomnia category are 28 people, and respondents with no insomnia are eight people.

The research result shows that the majority of routine hemodialysis patients in Hemodialysis Unit of Dr Tjitrowardojo Hospital Purworejo suffered moderate pain and suffered from insomnia.

The condition of so many of the respondents having pain and insomnia complication, basically, is a common thing among the hemodialysis patients. According to¹⁰, most of the hemodialysis patients have a sleep disorder and have bad sleep quality. According to¹¹, patients undergone HD tends to have several complication symptoms such as, fatigue, pruritus, constipation, anorexia, pain, sleep disorder, anxiety, dyspnea, nausea, depression, and sleep disorder which affects to the life quality, even can cause death.

Pain and insomnia complication happened to the CKD with HD patients are caused by patients condition and hemodialysis process. Important sources arise. Causing pain and insomnia among other are disruption of calcium and phosphate

balance in bone, high uric acid level in blood, a disorder of bone mineral metabolism, high levels of uremia.

The four conditions above are the important factors causing pain and insomnia complication to the CKD with HD patients. Besides, the respondents' characteristic which majority of the respondents are 40-55 years old and above 55 years old, also causes pain and insomnia complication. According to¹², the age is closely related to the prognosis of disease and life expectancy of CKD with HD patients.

CKD with HD patients aged 40 years old or more tend to have various complication which burdened kidney function compared to the patients under 40 years old. The tendency of complication to the CKD with HD patients will rise on the age of above 55.

The factor of a long time of the majority of the respondents undergone HD is also a supporting factor for pain and insomnia complication. That the majority of the respondents have been in a long time of having HD (1-5 years), is the factors of the risk of various pain and insomnia complication. According to Sabbatini *et al.*¹³, the high risk of complication including pain and insomnia happen to the patients who undergo dialysis in the long term. It is related to the more progressive of symptoms and the disease which underlies dialysis therapy or because the complications such as cardiovascular and neurological problem which often to the long-term dialysis patients. According to Hamzi *et al.*¹⁴, the factor of long-term HD has a high risk of having insomnia. Sleep disorder which can happen to the HD patients includes awake in the middle of the night (90%), difficult to sleep (60%), sleepy all day long (60%).

A factor which can worsen insomnia is a lifestyle.¹⁵ Factors of lifestyle which is observed are smoking habit and coffee consumption.¹⁶ Smoking habit is related to sleep quality in which there is the effect of

nicotine stimulant that can cause the individual experiencing “nicotine withdrawal” every night so it can cause sleep disorder or insomnia.¹⁷ Meanwhile, the behaviour effect of caffeine includes the feeling of energy increase, stay alert, less fatigue and less sleepy.¹⁸ The caffeine action mechanism related to its ability in hindering the adenosine release.¹⁹ Caffeine causes the increase of the released norepinephrine, epinephrine, dopamine, and serotonin so that it can make the consumer stay alert.²⁰ If it is consumed more than 250 mg (>250mg), it can cause the intoxication syndrome which includes the symptoms of anxiety, tense, diuresis, tachycardia, agitation and insomnia.²¹

Drugs usage of the respondents is the routine drugs which should be consumed by the HD patients, i.e., antihypertension, CACO3, vitamin, and erythropoietin hormone. Each drug has a different function. However, from all of those drugs, there is no side effect which results is sleepiness.

The level of Hb and albumin are tested because nutrition adequation is one of the causes of insomnia.²² In this research, the majority of the respondents have a low level of Hb (<12gr %) so, respondents suffered anaemia that caused insomnia. The result of the research by Randy (2017) proved that there is a significant relation between anaemia and the strength of muscle grip ($p=0,001$, $r=0,748$) of the chronic hemodialysis patients in ZA Banda Aceh Hospital. In this research, the respondents with anaemia have weaker grip strength compared to the respondents with mild anaemia. So, the low level of Hb also weakens the muscle strength. This is a disruption in the area of musculoskeletal which can cause musculoskeletal pain.

The result of this research shows that the majority of the respondents undergo HD in 1-5 years²³ stated that the high risk of insomnia happens to the patients who undergo dialysis

in a long time. It is related to the more progressive of the symptoms and disease that underlie dialysis therapy or because of complication, such as cardiovascular and neurologic problem which often there in the long term dialysis patients.

HD shift also affects insomnia. This thing is related to the research by Sabbatini *et al*²⁴ which proved the high of the insomnia frequency of the patients who undergo hemodialysis in the morning. On the contrary, Al-Jahdali *et al*.²⁵ reported that insomnia is more often suffered by the patients who undergo hemodialysis in the evening compared to in the morning. Another finding, according to Potter *et al*²⁶, showed that HD shift is not related to insomnia. In the characteristic of HD shift, some of the research’s result is still diverse the researcher hasn’t got any clear explanation related to this relation.

The result of this result shows that respondents have stable blood pressure. Insomnia is related to the increase in hypertension. In other words, the blood pressure increase in times with the occurrence of sleep disorder.²⁷

Pain is an unpleasant sensory and emotional experience and is related to the actual or potential tissue damage.²⁸ The pain felt by the HD patients will affect their sleep disorder, namely insomnia.²⁹ Through the physical exercise such as *Intradialytic exercise* which is conducted according to SOP (Standart Operation Procedure), the balance of calcium and phosphate in the bone increases so the pain decreases which automatically also affects to the decrease of patients’ insomnia. Another important pain source of CKD patients who undergo HD is the high level of uric acid in the blood. In the chronic kidney disease, there is a reduction of kidney mass and a decrease of kidney function which disrupts physiological kidney process, especially in excretion of residual substances, one of them is uric acid.³⁰

In the beginning, the process can be compensated by the renal reserve which substitutes the broken renal nephrons, but this process is only temporary, and finally, there will be maladaptation process of the nephrons which compensate. On the glomerulus filtration rate <50%, the increase of serum uric acid begins to happen and will keep increase along with the decrease of LFG in the kidney. Thus, the hyperuricemia because of secondary PGK/hyperuricemia happens.³¹ Hyperuricemia will start the forming of monosodium uric (MSU) in the tissues and joints.

Those pile then is recognized by the immune system as strangers, so it is activated the inflammation mediator. This mediator causes damage and activates various inflammatory cells resulting in the inflammatory leading to pain³², which later, will also affect the sleep disorder or insomnia.

Another important pain source of the CKD patients who undergo HD is the disruption of bone minerals metabolism. The disruption of bone mineral metabolism especially calcium, PTH, and 25 (OH) D₃ have a strong connection relation with the pain suffered by the hemodialysis patients. To keep the calcium balance, kidney must excrete the same amount of calcium of the small intestine absorbed. Bone not only serves the structural function but also provides the system of calcium changing to adjust the minute-to-minute of calcium level in the plasma and ECF. The disruption of bone metabolism will cause the hemodialysis patients suffered the pain bone³³ which later, will affect the sleep disorder, insomnia. Then, the cause of insomnia except for pain is the stacking of urea in the blood (uremia). It is because the kidney can't get rid of urea out from the body. The last stage CKD patients often undergo uremia resulted from metabolism waste stacking.

Uremia causes the impaired function of the nervous system and *Restless Leg Syndrome*³⁴. *Restless Leg Syndrome* is one of the forms of sleep disorder and the cause of insomnia in the hemodialysis patients^{35, 36}. Other factors which influence insomnia and pain is anxiety. ³⁷proved that there is a correlation between psychological factors such as anxiety and the decrease of sleeping quality of the chronic hemodialysis patients. Besides, the social effect which affects insomnia is the good relationships among family members and able to do the social role³⁸. Family support also influences the motivation to obey all the deed in the management of *self-care* CKD patients and affect the decrease of anxiety and increase life quality of the CKD patients, so it decreases the risk of insomnia.^{39,40,41}

CONCLUSION

The majority of respondents' characteristic of the chronic kidney disease who routinely undergo hemodialysis in hemodialysis unit of Dr Tjitrowardojo Hospital, Purworejo are men, aged of 40-55 years old, high school graduate, and married. Majority of the respondents do not have a smoking habit, do not drink coffee and don't exercise. Majority of the respondents undergo chronic kidney disease caused by hypertension. Majority of the respondents have low Hb level (under 12 gr/dl) and normal albumin level (3,5-5,2 g/dl). Majority of the respondents suffered moderate pain and insomnia.

REFERENCES

1. Indonesia, P. N. 4th Report of Indonesian renal registry. Jakarta: Pernefri. 2011. <http://www.indonesianrenalregistry.org/data/INDONESIAN%20RENAL%20REGISTRY%202014.pdf>.
2. Septiwi, C. Pengaruh Breathing Exercise Terhadap Level Fatigue Pasien Hemodialisis Di RSPAD Gatot Subroto

- Jakarta. *Jurnal Keperawatan Soedirman*. 2013. 8 (1):14-21. <http://www.jks.fikes.unsoed.ac.id/index.php/jks/article/view/461>.
3. PERNEFRI, Fift Report Of Indonesian Renal Registry 2012. <http://www.pernefri.iasn.org/gallery.html>.
 4. Murtagh, F. E., J. Addington-Hall, and I. J. Higginson. The prevalence of symptoms in end-stage renal disease: a systematic review. *Advances in chronic kidney disease*. 2007. 14 (1):82-99. [http://www.ackdjournal.org/article/S1548-5595\(06\)00163-7/abstract](http://www.ackdjournal.org/article/S1548-5595(06)00163-7/abstract).
 5. Sabbatini, M., A. Crispo, A. Pisani, A. Ragosta, A. Cesaro, F. Mirengi, B. Cianciaruso, and S. Federico. Zaleplon improves sleep quality in maintenance hemodialysis patients. *Nephron Clinical Practice* 94 (4):c99-c103. 2003. <https://www.karger.com/Article/Abstract/72493>.
 6. Septiwi, C. Pengaruh Breathing Exercise Terhadap Level Fatigue Pasien Hemodialisis Di RSPAD Gatot Subroto Jakarta. *Jurnal Keperawatan Soedirman*. 2013. 8 (1):14-21. <http://www.jks.fikes.unsoed.ac.id/index.php/jks/article/view/461>.
 7. PERNEFRI, Fift Report Of Indonesian Renal Registry 2012. <http://www.pernefri.iasn.org/gallery.html>.
 8. Murtagh, F. E., J. Addington-Hall, and I. J. Higginson. The prevalence of symptoms in end-stage renal disease: a systematic review. *Advances in chronic kidney disease*. 2007. 14 (1):82-99. [http://www.ackdjournal.org/article/S1548-5595\(06\)00163-7/abstract](http://www.ackdjournal.org/article/S1548-5595(06)00163-7/abstract).
 9. Sabbatini, M., A. Crispo, A. Pisani, A. Ragosta, A. Cesaro, F. Mirengi, B. Cianciaruso, and S. Federico. Zaleplon improves sleep quality in maintenance hemodialysis patients. *Nephron Clinical Practice*. 2003. 94 (4):c99-c103. <https://www.karger.com/Article/Abstract/72493>.
 10. Hamzi, M. A., K. Hassani, M. Asseraji, and D. El Kabbaj. Insomnia in hemodialysis patients: A multicenter study from morocco. *Saudi Journal of Kidney Diseases and Transplantation*. 2017. 28 (5):1112. <http://www.sjkdt.org/article.asp?issn=1319-2442;year=2017;volume=28;issue=5;page=1112;epage=1118;aulast=Hamzi>.
 11. Septiwi, C. Pengaruh Breathing Exercise Terhadap Level Fatigue Pasien Hemodialisis Di RSPAD Gatot Subroto Jakarta. *Jurnal Keperawatan Soedirman*. 2013. 8 (1):14-21. <http://www.jks.fikes.unsoed.ac.id/index.php/jks/article/view/461>.
 12. Handayani, R. S., and E. Rahmayati. Faktor faktor yang berhubungan dengan kualitas hidup pasien Chronic Kidney Disease (CKD) yang menjalani hemodialisis. *Jurnal Keperawatan*. 2017. 9 (2):238-245. <http://ejurnal.poltekkes-tjk.ac.id/index.php/JKEP/article/view/363>.
 13. Sabbatini, M., B. Minale, A. Crispo, A. Pisani, A. Ragosta, R. Esposito, A. Cesaro, B. Cianciaruso, and V. E. Andreucci. Insomnia in maintenance haemodialysis patients. *Nephrology Dialysis Transplantation*. 2002. 17 (5):852-856. <https://academic.oup.com/ndt/article-abstract/17/5/852/1818645>.
 14. Hamzi, M. A., K. Hassani, M. Asseraji, and D. El Kabbaj. Insomnia in hemodialysis patients: A multicenter study from morocco. *Saudi Journal of Kidney Diseases and Transplantation*. 2017. 28 (5):1112. <http://www.sjkdt.org/article.asp?issn=1319-2442;year=2017;volume=28;issue=5;page=1112;epage=1118;aulast=Hamzi>.

- 2442;year=2017;volume=28;issue=5;spage=1112;epage=1118;aulast=Hamzi.
15. Shochat, T. Impact of lifestyle and technology developments on sleep. *Nature and science of sleep*. 2012. 4:19. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3630968/>.
 16. Sumirta, I. N., and A. Laraswati. Faktor yang Menyebabkan Gangguan Tidur (Insomnia) pada Lansia. Politeknik Kesehatan Denpasar. 2014. <http://www.poltekkes-denpasar.ac.id/files/JURNAL%20GEMARA%20KEPERAWATAN/JUNI%202015/I%20Nengah%20Sumirta.pdf>.
 17. Zhang, L., J. Samet, B. Caffo, and N. M. Punjabi. Cigarette smoking and nocturnal sleep architecture. *American Journal of Epidemiology*. 2006.164 (6):529-537. <https://academic.oup.com/aje/article-abstract/164/6/529/129824>.
 18. Roehrs, T., and T. Roth. Caffeine: sleep and daytime sleepiness. *Sleep medicine reviews*. 2008. 12 (2):153-162. [https://www.smrjournal.com/article/S1087-0792\(07\)00093-7/fulltext](https://www.smrjournal.com/article/S1087-0792(07)00093-7/fulltext).
 19. Bakuradze, T., N. Boehm, C. Janzowski, R. Lang, T. Hofmann, J. P. Stockis, F. W. Albert, H. Stiebitz, G. Bytof, and I. Lantz. Antioxidant-rich coffee reduces DNA damage, elevates glutathione status and contributes to weight control: Results from an intervention study. *Molecular nutrition & food research*. 2011. 55 (5):793-797. <http://onlinelibrary.wiley.com/doi/10.1002/mnfr.201100093/full>.
 20. Landolt, H.-P., J. V. Rétey, K. Tönz, J. M. Gottselig, R. Khatami, I. Buckelmüller, and P. Achermann. Caffeine attenuates waking and sleep electroencephalographic markers of sleep homeostasis in humans. *Neuropsychopharmacology*. 2004. 29 (10):1933. <https://www.nature.com/articles/1300526>.
 21. Bakuradze, T., N. Boehm, C. Janzowski, R. Lang, T. Hofmann, J. P. Stockis, F. W. Albert, H. Stiebitz, G. Bytof, and I. Lantz. Antioxidant-rich coffee reduces DNA damage, elevates glutathione status and contributes to weight control: Results from an intervention study. *Molecular nutrition & food research*. 2011. 55 (5):793-797. <http://onlinelibrary.wiley.com/doi/10.1002/mnfr.201100093/full>.
 22. Unruh, M. L., D. J. Buysse, M. A. Dew, I. V. Evans, A. W. Wu, N. E. Fink, N. R. Powe, and K. B. Meyer. Sleep quality and its correlates in the first year of dialysis. *Clinical Journal of the American Society of Nephrology*. 2006. 1 (4):802-810. <http://cjasn.asnjournals.org/content/1/4/802.short>.
 23. Sabbatini, M., B. Minale, A. Crispo, A. Pisani, A. Ragosta, R. Esposito, A. Cesaro, B. Cianciaruso, and V. E. Andreucci. Insomnia in maintenance haemodialysis patients. *Nephrology Dialysis Transplantation*. 2002. 17 (5):852-856. <https://academic.oup.com/ndt/article-abstract/17/5/852/1818645>.
 24. Sabbatini, M., B. Minale, A. Crispo, A. Pisani, A. Ragosta, R. Esposito, A. Cesaro, B. Cianciaruso, and V. E. Andreucci. Insomnia in maintenance haemodialysis patients. *Nephrology Dialysis Transplantation*. 2002. 17 (5):852-856. <https://academic.oup.com/ndt/article-abstract/17/5/852/1818645>.
 25. Al-Jahdali, H. H., H. A. Khogeer, W. A. Al-Qadhi, S. Baharoon, H. Tamim, F. F. Al-Hejaili, S. M. Al-Ghamdi, and A. A. Al-Sayyari. Insomnia in chronic renal patients on dialysis in Saudi Arabia.

- Journal of Circadian Rhythms. 2010. 8 (1):7
<https://jcircadianrhythms.biomedcentral.com/articles/10.1186/1740-3391-8-7>.
26. Hamzi, M. A., K. Hassani, M. Asseraji, and D. El Kabbaj. Insomnia in hemodialysis patients: A multicenter study from morocco. *Saudi Journal of Kidney Diseases and Transplantation*. 2017. 28 (5):1112. <http://www.sjkd.org/article.asp?issn=1319-2442;year=2017;volume=28;issue=5;spage=1112;epage=1118;aulast=Hamzi>.
27. Potter, P. A., and A. G. Perry. *Buku ajar fundamental keperawatan: konsep, proses, dan praktik*. Jakarta: 2005. Egc 1. [http://www.scirp.org/\(S\(351jmbntvnsjt1aadkpozje\)\)/reference/ReferencesPapers.aspx?ReferenceID=1722085](http://www.scirp.org/(S(351jmbntvnsjt1aadkpozje))/reference/ReferencesPapers.aspx?ReferenceID=1722085).
28. Tamsuri, A. *Konsep dan penatalaksanaan nyeri*. Jakarta: 2007. Egc:1-63. <http://qittun.blogspot.com/2008/10/konsep-dasar-nyeri.html>.
29. Sabbatini, M., A. Crispo, A. Pisani, A. Ragosta, A. Cesaro, F. Mirengi, B. Cianciaruso, and S. Federico. Zaleplon improves sleep quality in maintenance hemodialysis patients. *Nephron Clinical Practice*. 2003. 94 (4):c99-c103. <https://www.karger.com/Article/Abstract/72493>
30. Silbernagl, and Lang. *Gagal Ginjal Kronis: Gangguan Fungsi, Dalam : Teks & Atlas Berwarna Patofisiologi*. 2012. EGC:108-113. https://books.google.com/books/about/Atlas_patofyziologie.html?id=h2f9N6BKbVQC.
31. Putra, T. R. Hiperurisemia. In *Buku Ajar Ilmu Penyakit Dalam*. Jakarta: 2009. FKUI, 2550-2555. <https://ejournal.unsrat.ac.id/index.php/clinic/article/view/7392>.
32. E.S, T. Arthritis Pirai (Arthritis Gout). In *Buku Ajar Penyakit Dalam*. Jakarta: 2009. FKUI, 2556-2560. <http://jurnal.uii.ac.id/index.php/JKKI/article/view/3396>. http://www.academia.edu/download/38750711/kti_nilam.docx.
33. Huang, T., S. Lin, F. Chang, S. Hsieh, S. Liu, and R. Yang. Effects of different exercise modes on mineralization, structure, and biomechanical properties of growing bone. *Journal of applied physiology*. 2003. 95 (1):300-307. <http://www.physiology.org/doi/abs/10.1152/jappphysiol.01076.2002>.
34. Smeltzer, S. C., and B. G. Bare. *Buku ajar keperawatan medikal bedah*. Jakarta: 2002. Egc 1223:21. <http://onsearch.id/Author/Home?author=Suzanne+C.Smeltzer+%26+Brenda+G.Bare>.
35. Al-Jahdali, H. H., H. A. Khogeer, W. A. Al-Qadhi, S. Baharoon, H. Tamim, F. F. Al-Hejaili, S. M. Al-Ghamdi, and A. A. Al-Sayyari. Insomnia in chronic renal patients on dialysis in Saudi Arabia. *Journal of Circadian Rhythms*. 2010. 8 (1):7
<https://jcircadianrhythms.biomedcentral.com/articles/10.1186/1740-3391-8-7>.
36. Sabry, A. A., H. Abo-Zenah, E. Wafa, K. Mahmoud, K. El-Dahshan, A. Hassan, T. M. Abbas, A. E.-B. M. Saleh, and K. Okasha. Sleep disorders in hemodialysis patients. *Saudi Journal of Kidney Diseases and Transplantation*. 2010. 21 (2):300. <http://www.ijdr.in/article.asp?issn=1319-2442;year=2010;volume=21;issue=2;spage=300;epage=305;aulast=Sabry>.
37. Sabry, A. A., H. Abo-Zenah, E. Wafa, K. Mahmoud, K. El-Dahshan, A. Hassan, T. M. Abbas, A. E.-B. M. Saleh, and K. Okasha. Sleep disorders in hemodialysis patients. *Saudi Journal of Kidney*

- Diseases and Transplantation. 2010. 21 (2):300.
<http://www.ijdr.in/article.asp?issn=1319-2442;year=2010;volume=21;issue=2;epage=300;epage=305;aulast=Sabry>.
38. Turana, Y. Gangguan Tidur: Insomnia: 2007. Diambil dari: <http://medikaholistik.com> diakses pada tanggal.
39. Tokala, B. F., L. F. Kandou, and A. E. Dundu. HUBUNGAN ANTARA LAMANYA MENJALANI HEMODIALISIS DENGAN TINGKAT KECEMASAN PADA PASIEN DENGAN PENYAKIT GINJAL KRONIK DI RSUP PROF. Dr. RD KANDOU MANADO. *e-CliniC*. 2015. 3 (1).
<https://ejournal.unsrat.ac.id/index.php/eclinic/article/view/7395>.
40. Ratnawati. Tingkat kecemasan pasien dengan tindakan hemodialisa di BLUD RSU dr. M. M. Dunda kabupaten Gorontalo. *Jurnal Health & Sport*: 2011. 285-362.
<https://ejournal.unsrat.ac.id/index.php/eclinic/article/view/7395>.
41. Romani, N. K., S. Hendarsih, and F. Lathu Asmarani. Hubungan Mekanisme Koping Individu Dengan Tingkat Kecemasan Pada Pasien Gagal Ginjal Kronis Di Unit Hemodialisa Rsup Dr. Soeradji Tirtonegoro Klaten. Artikel Ilmiah. Yogyakarta: Universitas Respati Yogyakarta. 2013.
<https://anzdoc.com/hubungan-mekanisme-koping-individu-dengan-tingkat-kecemasan-9ca0743e6044132270908fc2557139df33262.html>.
-

