

Incidence And Characteristics Intradialytic Hypertension Among Chronic Hemodialysis Patients Caused By Chronic Kidney Failure At Rsmh Palembang Period November 2018

Ghina Kartika¹, Suprapti², Irfannuddin³

1. Medical student, Medical Faculty, Sriwijaya University, Jalan Dr. Moh. Ali Komplek. RSUP Dr. Mohammad Hoesin Palembang Km 3,5, Palembang, 30126, Indonesia

2. Nephrology Division, Medical Faculty, Sriwijaya University, Jalan Dr. Moh. Ali Komplek. RSUP Dr. Mohammad Hoesin Palembang Km 3,5, Palembang, 30126, Indonesia

3. Physiology Division. Medical Faculty, Sriwijaya University, Jalan Dr. Moh. Ali Komplek. RSUP Dr. Mohammad Hoesin Palembang Km 3,5, Palembang, 30126, Indonesia

Author email: ghinakartikakr@gmail.com .Address for correspondence : dr. Hj. Suprapti, SpPD, KGH. Nephrology Division Sriwijaya University, Mohd. Hoesin Hospital Palembang, 30126, South Sumatra, Indonesia. Email : praptislamet@yahoo.co.id. Dr. dr. Irfannuddin, Sp.KO. M.Pd. Ked. Physiology Division, Sriwijaya University, Mohd. Hoesin Hospital Palembang, 30126, South Sumatra, Indonesia. Email : irfan.md@unsri.ac.id

Abstract

Intradialytic hypertension have 5 – 15 % incidence among chronic hemodialysis patients caused by chronic kidney failure. But, mostly medical practician focused only at intradialytic hypotension than intradialytic hypotension as the most frequent cardiovascular complications. Intradialytic hypertension itself is one of the cause of mortality and morbidity hemodialytic patients, that's why patients should be aware of intradialytic hypertension. This study aims to know the frequencies of patients with intradialytic hypertension at RSMH Palembang period November 2018, and the characteristics of the patients based on patients sosiodemography, etiology of their chronic kidney disease, their hemodialysis period, and their activity during hemodialysis.

Method : This study is descriptive analysis with *total sampling*, with primary data from patients blood pressure measurement, and interview with patients in hemodialysis installation at RSMH Palembang. In this study, 305 samples were found, with 198 patients fulfilled inclusion criteria.

Result : The result of this study shows that from 198 subjects, there are 116 (58,6%) of them who suffer intradialytic hypertension. Intradialytic hypertension patients mostly in the group age 46 – 65 years old (51%), male patients (61,2%) are more likely develop intradialytic hypertension than female patients (38,8%), patients with high educational background also more likely to develop this complications. Their chronic kidney diseases cause are mostly hypertension (67,2%), and the higher activities patients during hemodialysis also more likely to develop intradialytic hypertension.

Conclusion : Patients in hemodialysis installation at RSMH Palembang with intradialytic hypertension are more than the patients without the intradialytic hypertension (normotension and intradialytic hypotension patients are included), patients in old age group, male patients, and the higher patients activities during hemodialysis process the more highly patients develop intradialytic hypertension as complication.

Keyword : Intradialytic hypertension, chronic hemodialysis, chronic kidney failure.

Abstrak

Kejadian dan Karakteristik Pasien dengan Hipertensi Intradialitik yang Menjalani Hemodialisis Kronik Akibat Gagal Ginjal Kronik di RSMH Palembang Periode November 2018. Hipertensi intradialitik memiliki insidensi 5 - 15% pada pasien gagal ginjal kronis yang menjalani hemodialisa rutin. Akan tetapi, komplikasi ini belum mendapat banyak perhatian. Hingga saat ini, tim medis dan paramedis lebih terfokus pada hipotensi hemodialitik sebagai komplikasi kardiovaskuler tersering. Hipertensi intradialitik merupakan salah satu penyumbang meningkatnya angka morbiditas dan mortalitas pasien hemodialisa, mengindikasikan pentingnya pemahaman pasien mengenai hipertensi intradialitik. Penelitian ini bertujuan menunjukkan prevalensi hipertensi intradialitik di RSMH Palembang periode November 2018 dan menunjukkan gambaran karakteristik pasien hipertensi intradialitik yang menjalani hemodialisis kronik berdasarkan sosiodemografi pasien, etiologi PGK pasien, lama pasien menjalani hemodialisis, dan aktivitas pasien selama menjalani hemodialisis.

Metode : Jenis penelitian yang dilakukan adalah penelitian survei deskriptif dengan desain studi *total sampling* dengan menggunakan data primer dari hasil pengambilan tekanan darah dan wawancara pasien hemodialisis di Instalasi Hemodialisa RSMH Palembang. Dalam penelitian ini terdapat total 305 sampel, dengan 198 pasien yang memenuhi kriteria inklusi.

Hasil : Hasil penelitian ini menunjukkan dari 198 subjek penelitian, terdapat 116 pasien (58,6%) yang menderita hipertensi intradialitik yang menjalani hemodialisis kronik. Pasien hipertensi intradialitik terbanyak berada di kelompok usia 46 – 65 tahun (51%), pasien pria (61,2%) lebih banyak dibandingkan pasien wanita (38,8%), riwayat pendidikan pasien terbanyak ialah pendidikan tinggi (41,4%), etiologi penyakit ginjal kronik pasien terbanyak adalah hipertensi (67,2%), dan didapatkan semakin tinggi aktivitas pasien selama melakukan hemodialisis semakin tinggi pula kemungkinan pasien menderita komplikasi hipertensi intradialitik.

Kesimpulan : Penderita hipertensi intradialitik di Instalasi Hemodialisis RSMH Palembang lebih banyak dibandingkan dengan pasien tidak hipertensi intradialitik (normotensi atau hipotensi intradialitik), pasien dengan kelompok usia tua, jenis kelamin laki-laki, dan semakin tinggi aktivitas pasien selama melakukan hemodialisis meningkatkan kemungkinan pasien menderita komplikasi hipertensi intradialitik.

Kata Kunci : Hipertensi intradialitik, hemodialisis kronik, penyakit ginjal kronik

1. Introduction

Chronic Kidney Disease (CKD) or chronic kidney disease is a progressive and irreversible damage to kidney function which causes a failure of the body's ability to maintain electrolyte balance metabolism and the fluid that causes uremia (Smeltzer, Bare, Hinkle & Cheever, 2008). End stage renal disease (ESRD) or end-stage kidney disease where the kidneys are unable to maintain body homeostasis (Ignatavicius & Workman, 2006).

According to Sherwood (2011), the kidneys have a function to help balance the body's acid base, excrete the rest of the body's metabolism and foreign compounds such as drugs, and maintain plasma volume so that arterial blood pressure remains stable. In chronic kidney failure, a kidney replacement is needed to maintain all its functions. The recommended therapy for patients with chronic kidney failure is long-term dialysis or kidney transplantation.

Dialysis is a process of solutes and water passively diffused through a porous membrane from one other liquid compartment. Hemodialysis is an artificial kidney machine consisting of a semipermeable membrane that separates blood on one side and dialysis fluid on the other (Price, 2005). Hemodialysis is considered to be the primary management in chronic renal failure because kidney transplantation is considered more risky and requires relatively more expensive costs.

Hemodialysis is a feasible, safe and efficient method for maintaining chronic renal failure patients who have reached the end stage or End Stage Renal Disease (ESRD) with a frequency of dialysis two to three times a week with a dialysis duration of about 4 hours (Fincham and Moosa, 2008). Although hemodialysis is considered the most recommended therapy, there are still various complications that may occur during the dialysis or intradialytic process. Cardiovascular complications that occur during hemodialysis cause an increase in morbidity and mortality in patients with chronic renal failure undergoing routine hemodialysis. Cardiovascular complications such as cardiac arrhythmias, intradialytic hypotension, intradialytic hypertension, sudden death are the causes of death in 43% of hemodialysis patients and patients with peritoneal dialysis (USDRS, 2006).

Intradialytic hypertension is a condition of increasing postnatal systolic blood pressure with a difference in blood pressure predialysis Systolic Blood Pressure (SBP) ≥ 10 mmHg. The etiology of intradialytic hypertension itself cannot be clearly ascertained, some potential occurrence of intradialytic hypertension is the overactivity of the sympathetic nervous system, increased cardiac output, volume overload, electrolyte changes during the dialysis process, endothelial dysfunction, stimulation of the Renin-Angiotensin system (RAS),

Erythropoiesis therapy Intravenous Stimulating Agents (ESAs), and loss of antihypertensive drugs during the dialysis process.

Efforts to prevent the occurrence of intradialytic hypertension must be done by knowing in advance the risk factors and etiology. Risk factors based on several studies were found to have advanced age characteristics, lower Interdialytic Weight Gain, longer duration of hemodialysis, and greater number of antihypertensive drugs compared with patients without intradialytic hypertension (Inrig et al.).

Intradialytic hypertension has an incidence of 5-15% in patients with chronic renal failure undergoing routine hemodialysis. However, this complication has not received much attention. Until now, medical and paramedical teams have focused more on hemodialytic hypotension as the most common cardiovascular complication (incidence 25 - 55%) (Chen et al., 2006).

Therefore this study focused on the incidence of intradialytic hypertension in the Hemodialysis clinic of the RSMH Palembang with a total sampling method, because there had been no previous studies. Intradialytic hypertension is also one of the contributors to increased morbidity and mortality in hemodialysis patients, indicating the importance of understanding patients regarding intradialytic hypertension.

2. Methods

The type of research conducted was a descriptive survey to determine the number of occurrences and characteristics of patients with intradialytic hypertension who underwent chronic hemodialysis due to chronic renal failure in Palembang RSMH in the November 2018 period.

Subjects in this study were patients with intradialytic hypertension who underwent chronic hemodialysis due to chronic renal failure in Palembang RSMH in the period November 2018. In this study, the sampling process was done by total sampling technique. Data was taken from all patients who underwent hemodialysis in the Hemodialysis room at the Palembang RSMH in the November 2018 period that met the inclusion criteria.

Respondents were randomly selected, with the possibility that the respondent who had just arrived would be immediately taken by the researcher. Retrieving data in the form of blood pressure, taken directly by the researcher using aneroid tensimeter 5 minutes before the start of the hemodialysis process. Followed by a question and answer session, the researcher first introduces himself and asks the subject to be interviewed. After the patient's condition is stable when intradialytic, the patient will begin to ask questions and answers with the researcher. If the patient has difficulty answering the questions given,

then the question may be answered by the person closest to the patient or the patient's guardian. After all the questions answered and blood pressure data were obtained, the results of the study were collected and will be reprocessed by the researcher using SPSS software on the researcher's computer with univariate analysis, and data processing in determining the most influential variable on the patient's risk of intradialytic hypertension, calculation done using the formula:

$$\frac{n \text{ HID}}{n \text{ HID} + n \text{ Non-HID}} \times 100\%$$

And a comparison between variables starts with the largest percentage to the smallest percentage. The variable with the largest percentage is considered to be the most influential variable on the risk of patients getting intradialytic hypertension.

3. Results

This study was conducted to show the prevalence of intradialytic hypertension in patients with chronic renal failure undergoing chronic hemodialysis at the Palembang RSMH. And shows a characteristic picture of patients with intradialytic hypertension with chronic renal failure undergoing chronic hemodialysis in Palembang RSMH based on patient sociodemography, in the form of age, sex, and patient education level, etiology of patients with chronic kidney disease, and based on activities carried out during the hemodialysis process. There were 305 patients, and 198 patients who met the inclusion and exclusion criteria.

Table 1. Incidence of Intradialytic Hypertension in Patients Undergoing Hemodialysis Chronic Due to Chronic Kidney Failure in Palembang RSMH 2018 Period

Prevalensi	n	%
Intradialytic Hypertension	116	58.6
Non-Intradialytic Hypertension	82	41.4
Total	198	100

In table 1, it was shown from 198 subjects who met the inclusion and exclusion criteria. Namely patients undergoing chronic hemodialysis. Of the 198 subjects, 116 patients (58.6%) had intradialytic hypertension.

Based on the results of the study, of 116 patients with intradialytic hypertension 24 patients (20.7%) were in the middle age group, 75 patients (51%) were in the old age group, 17 patients (11.6%) were elderly, and not patients with intradialytic hypertension were found in the young age group.

Table 2. Age Distribution of Patients Undergoing Hemodialysis with Complications of Intradialytic Hypertension

Usia	n	%
Teenager (12 – 25 tahun)	0	0
Adult (26 – 45 tahun)	24	20.7
Old Age (46 – 65 tahun)	75	51
Seniors (>65 tahun)	17	11.6
Total	116	100

Older patients are patients who suffer the most from complications of intradialytic hypertension.

Table 3. Gender Distribution of Patients Undergoing Chronic Hemodialysis with Complications of Intradialytic Hypertension

Jenis Kelamin	n	%
Male	71	61.2
Female	45	38.8
Total	116	100

Table 3 shows the sex distribution of patients with intradialytic hypertension, men having a greater percentage (61.2%).

Based on the results of the study, out of 116 patients the history of education distribution of patients undergoing hemodialysis was 19 patients (16.4%) had a history of primary education, 46 patients (39.7%) had a history of secondary education, 48 patients (41.4%) have a history of higher education, and 3 patients (2.6%) have a history of non-formal or informal education. The distribution of patient education history is shown in table 4.

Table 4. Distribution of Educational History of Patients Undergoing Hemodialysis with Complications of Intradialytic Hypertension

Riwayat Pendidikan	n	%
Pendidikan Dasar (SD/MI, SDLB/ sederajat) atau (SMP/MI, SMPLB atau sederajat)	19	16.4
Pendidikan Menengah (SMA/MA, SMALB dan SMK/MAK atau sederajat)	46	39.7
Pendidikan Tinggi (program pendidikan diploma, sarjana, magister, dan doktor di perguruan tinggi)	48	41.4
Pendidikan Nonformal atau Informal	3	2.6
Total	116	100

From the table of results of the above research, it is shown that the education history of patients undergoing hemodialysis with the most complications of intradialytic hypertension is higher education, followed by secondary education, primary

education, and finally people with a history of informal education.

Of the 116 patients with intradialytic hypertension who were the subjects of the study, the most common causes of chronic kidney disease were hypertension and diabetes mellitus. And there were 6 patients (5.1%) who suffered from chronic kidney disease due to other reasons. Some patients claimed that they did not know the reason they suffered from chronic kidney disease, therefore they were included in the category of other groups. The etiological distribution of chronic kidney disease in patients with intradialytic hypertension who undergo chronic hemodialysis is shown in table 5.

Table 5. Etiology Distribution of CKD patients undergoing Chronic Hemodialysis with Complications of Intradialytic Hypertension

Etiologi PGK Pasien	n	%
Riwayat keluarga dengan penyakit ginjal kronik	5	4.3
Riwayat Hipertensi	80	69
Riwayat Diabetes Mellitus	14	12.1
Riwayat penyakit autoimun (SLE, DM tipe I)	1	0.9
Nefropati obstruktif	10	8.6
Lain - lain	6	5.1
Total	116	100

The etiology of chronic kidney disease in patients with intradialytic hypertension due to chronic kidney disease who has the most chronic hemodialysis is hypertension (69%)

Table 6. Distribution of Activities Performed by Patients with Complications of Intradialytic Hypertension During the Hemodialysis Process

Aktivitas Pasien selama Hemodialisis	n	%
Beristirahat atau tidur	20	17.2
Aktivitas ringan (berbincang dengan orang sekitar)	32	27.6
Aktivitas sedang (makan atau minum)	58	50
Aktivitas berat (berdiri, berjalan, berpindah tempat)	6	5.2
Total	116	100

The activity carried out during the process of hemodialysis is the activity carried out by the patient during the process of hemodialysis. The patient is expected to answer the heaviest activity he does in the final answer.

Table 6 shows the activities carried out by intradialytic hypertension patients while undergoing hemodialysis therapy. Of the 116 patients 20 patients (17.2%) resting or sleeping during the hemodialysis process, 32 patients (27.6%) did light activities such as talking to people around them, 68 patients (50%) were doing moderate activities which were eating and drinking during the hemodialysis process, and 6 patients (5.2%) did heavy activities during the hemodialysis process. The heavy activity in question is the patient standing or walking during the hemodialysis process, such as when the patient goes to the toilet to urinate.

Table 7. Research Results Based on Research Variables

Variabel	HID		Non-HID	
	n	%	n	%
Usia:				
12 – 25 tahun	0	0 %	2	100 %
26 – 45 tahun	24	54.5 %	20	45.5 %
46 – 65 tahun	75	58.1 %	54	41.9 %
65 tahun	17	74 %	6	26 %
Jenis Kelamin:				
Laki-laki	71	61.7 %	44	38.3 %
Perempuan	45	54.2 %	38	45.8 %
Riwayat Pendidikan:				
Dasar	19	58.2 %	13	41.8 %
Menengah	46	59.4 %	36	40.6 %
Tinggi	48	62.3 %	29	37.7 %
Non Formal	3	43 %	4	57 %
Etiologi PGK:				
Riwayat Penyakit PGK pada keluarga	5	55.6 %	4	44.4 %
Hipertensi	80	62.5 %	48	37.5 %
DM	14	66.7 %	7	33.3 %
Riwayat Autoimun	1	16.7 %	5	83.3 %
Nefropati Obstruktif	10	43.5 %	13	56.5 %
Lain-lain	6	60 %	4	40 %
Aktivitas Selama HD:				
Beristirahat/tidur	20	66.7 %	10	33.3 %
Aktivitas Ringan	32	51.6 %	30	48.4 %
Aktivitas Sedang	58	59 %	40	41 %
Aktivitas Berat	6	75 %	2	25 %
Total	116		82	

In the data above, the characteristics of patients suffering from intradialytic hypertension are, patients of male sex, patients with age > 65 years, patients with a history of higher education, patients with etiology of chronic kidney disease, and patients who carry out strenuous activities while undergoing hemodialysis.

4. Discussion

Previous research

In the previous study, the prevalence of intradialytic hypertension in chronic hemodialysis patients due to chronic renal failure in the RSMH Palembang, there were no data.

In a study conducted by Arief Akbar (2011) in Palembang RSMH, the most age group of CKD patients undergoing hemodialysis was age 51 - 60 years (28.72%). In accordance with the results of this study, the largest age group of patients with intradialytic hypertension who underwent chronic hemodialysis due to chronic renal failure were ages 46-65 years.

In the same study, it was found that CKD patients undergoing hemodialysis were male (64.9%). Likewise with the results of this study, male patients were more than female patients.

The distribution of CKD patients undergoing hemodialysis based on the highest level of education is patients who have high school education / equivalent, followed by patients with the most recent education in college / equivalent. Similar to the results of this study, the distribution of CKD patients based on the level of education undergoing hemodialysis is secondary or high school / equivalent, followed by patients with a history of higher education. However, the educational history of patients with complications from intradialytic hypertension who undergo chronic hemodialysis is higher education (41.4%).

The etiology of the cause of chronic kidney disease in patients undergoing hemodialysis is hypertension. The distribution of patients with etiology of chronic kidney disease was hypertension as much as 52.12% followed by diabetes mellitus (19.15%). (Arief Akbar, 2011)

This shows that the results of previous studies are still not much different from the results of current research.

Age

The results of Rikesdas (2013) show that prevalence increases with age. According to Smeltzer & Bare (2002), a person over 40 years of age will progressively decrease the glomerular filtration rate until the age of 70 years, a decrease of up to 50% of its

normal function. The highest percentage of patients with intradialytic hypertension is in the age of > 65 years.

In hemodialysis patients aged 12-25 years, no one has suffered complications from intradialytic hypertension. This is because young patients are mostly new to <3 months hemodialysis or acute hemodialysis, so there are no complications of intradialytic hypertension. At a young age, the vascular structure has not been damaged much. In addition, patients with young age groups have not been exposed to risk factors such as smoking, alcohol, hypertension, and diabetes.

Gender

The greater number of male and female patients is related to the lifestyle of men who are more at risk of exposure to CKD risk factors such as cigarettes, alcohol, energy drinks, lack of hygiene, heavier work, as well as unhealthy lifestyles which are at risk of increasing risk of disease hypertension and diabetes.

In addition, according to Ganong (2003) in Sufiyana (2015), compared to women, men are more at risk of chronic kidney disease, the hormone estrogen which is more commonly owned by women serves to inhibit the formation of certain cytokines that also inhibit osteoclasts from over-absorbing bone, so that calcium levels are balanced. Calcium has a protective effect to prevent the absorption of oxalate which can form kidney stones which can be a cause of kidney failure.

Educational background

The patient's education history is associated with the patient's knowledge of the disease, or their risk of getting certain diseases. From the results of the study, many hemodialysis patients have a history of higher education (education programs in college / equivalent).

This shows that the higher the patient's education, the more knowledge the patient will have in managing the disease, which in the case of kidney failure, the treatment is dialysis or kidney transplantation.

In addition to being associated with the level of patient knowledge in managing the disease, it is also related to the stress level of patients with a history of secondary and high education on their work, which ultimately increases the risk of patients getting hypertension.

The above data shows that hemodialysis patients with complications from intradialytic hypertension have many high educational history, this can also be related to high socioeconomic conditions, resulting in food consumption of patients who are high in fat, high cholesterol, smoking habits, and drinking alcoholic beverages into risk factors cause metabolic diseases such as hypertension and diabetes.

Etiology of CKD Patients

The most risky etiology of intradialytic hypertension is patients with diabetes mellitus or diabetes. When you have diabetes, your body cannot optimally convert food into an energy source. If food is not converted into energy, blood sugar levels in the body will increase. Prolonged conditions will cause damage to blood vessels and kidneys. Symptoms of increasing blood sugar in the body are increased thirst, frequent urination, decreased body weight for no apparent reason, and the body becomes weak. (Arief Akbar, 2011)

Patient Activity During Hemodialysis

Increasing the activity of patients during hemodialysis leads to the high likelihood that these patients experience complications of intradialytic hypertension associated with when patients undergo hemodialysis, patients lying down and resting. But if the patient does other activities, such as suddenly standing up or changing places will increase blood pressure.

Blood pressure after greater activity is due to the fact that when the cell is active the body needs more O₂ supply because of the cell metabolism that works faster in producing energy. So that the circulation of blood in the blood vessels will be faster and the blood volume needed will be even greater. As a result of vasodilation in the heart muscle and arteriolar vasoconstriction which causes the arterioles to narrow and the heart's work every time unit increases so that the blood volume in the arterioles will increase. It can be stated that the volume of blood entering from the arteries to the heart increases. In these organs and causes blood flow to the digestive and kidney tract to decrease. The percentage of blood flowed into these organs to support the increase in both metabolic activity and the work of the heart will also be faster in pumping blood. (Handayani et al. 2016)

5. Conclusion

The prevalence of complications of intradialytic hypertension in chronic hemodialysis patients in the Hemodialysis Installation of Palembang RSMH for the period of November 2018 was 58.6% (116 patients). With the characteristics of patients with intradialytic hypertension who underwent chronic hemodialysis with the most age in the age group 46-65 years, 75 patients (51%), the highest sex were male 71 patients (61.2%), and the most recent education history is a higher education or college / diploma / master / doctorate 48 patients (41.4%). The most etiology of chronic kidney disease in patients was hypertension of 80 patients (69%), and the activity of most hypertensive patients was moderate activity of 58 patients (50%).

6. Thanks To

Thank you to Dr. Hj. Suprapti, SpPD, KGH and Dr. Dr. Irfannuddin, Sp. KO., M.Pd.Ked. as a mentor who has taken the time, energy and mind in guiding and providing input, ideas and suggestions in the preparation of the thesis. Dr. Dr. Zulkhair Ali, Sp.PD, KGH and dr. Emma Novita, M.Kes as the examiner who has given many inputs and suggestions that play an important role in the preparation of the thesis, Thank you to the family of the writer, friends, and colleagues for sampling at the installation of hemodialysis. And the patients who were willing to be the subject of this study.

7. References

1. Agarwal R, Alborzi P, Satyan S, Light RP. 2009. Dryweight Reduction in Hypertensive Hemodialysis Patients (DRIP): A Randomized, Controlled Trial. *Hypertension*. Vol. 53 : hal. 500–507.
2. Akbar, Arief. 2011. Karakteristik Pasien Penyakit Ginjal Kronik yang Menjalani Hemodialisis di Rumah Sakit Dr. Mohammad Hoesin Palembang Periode Oktober 2010. Karya Tulis Skripsi. Palembang:FK UNSRI.
3. Armiyati Y, Dosen S. 2010. Hipotensi dan Hipertensi Intradialisis Pada Hemodialisis di Yogyakarta. (<https://www.researchgate.net/publication/279524963> diakses 20 Juli 2018).
4. Bare & Smeltzer. 2002. Buku Ajar Keperawatan Medikal Bedah Brunner & Suddart (Alih bahasa Agung Waluyo) Edisi 8 Vol.3. Jakarta :EGC
5. Chiu, W. et al. 2007. Intradialytic Dopamine Therapy in Maintenance Hemodialysis Patients with Persistent Hypotension. hal. 22–29.
6. Cirit M, Akcicek F, Terzioglu E, Dkk. 1995. 'Paradoxical' Rise in Blood Pressure During Ultra-Filtration in Dialysis Patients. *Nephrol Dial Transplant* Vol. 10 : hal. 1417–1420.
7. Chen J, Gul A, Sarnak MJ. 2006. Management of Intradialytic Hypertension: The Ongoing Challenge. *Semin Dial*. Vol. 19 : hal. 141–145.
8. Chou KJ, Lee PT, Chen CL, Et Al. 2006. Physiologic Changes During Hemodialysis In Patients With Intradialysis Hypertension. *Kidney Int*. Vol. 69: hal. 1833–1838.
9. Dewi, Sufiana Puspita. 2015. Naskah Publikasi. Hubungan Lamanya Hemodialisa dengan Kualitas Hidup Pasien Gagal Ginjal di RS PKU Muhammadiyah Yogyakarta. Naskah Publikasi STIKES 'Aisyiyah Yogyakarta. Februari 2015, hal. 01 – 11.
10. Dinesh K, Kunaparaju S, Cape K, Flythe JE, Feldman HI, Brunelli SM. 2011. A Model of Systolic Blood Pressure During the Course Of

- Dialysis and Clinical Factors Associated with Various Blood Pressure Behaviors. *Am J Kidney*. Vol. 58: hal. 794–803.
11. Ferry, Cerelia, Eko. 2016. *Jurnal Elektronik. Profil Pasien Penyakit Ginjal Kronik yang Dirawat di RSUP Prof. Dr. R. D.* Vol. 4(1), Januari-Juni 2016.
 12. Ganong, W. F. 2003. *Buku Ajar Fisiologi Kedokteran* (20 ed.). Jakarta: EGC
 13. Gunal AI, Karaca I, Celiker H, Ilkay E, Du- Man S. 2002. Paradoxical Rise in Blood Pressure During Ultrafiltration Is Caused By Increased Cardiac Output. Vol. 15 : hal. 42–47.
 14. Himmelfarb, Jonathan. 2005. Hemodialysis Complications. *Jurnal. American Journal of Kidney Diseases*, Vol. 45 (6), Juni 2005 : hal. 1122-1131.
 15. Ignatavicius, D.D., Workman, M.L. 2006. *Medical Surgical: Critical Thinking for Collaborative Care* Vol. 5. St.Louis. Elsevier Saunders.
 16. Indonesia Renal Registry (IRR). 2015. 8th Report of Indonesian Renal Registry 2015. (<https://www.indonesianrenalregistry.org/data/INDONESIAN%20RENAL%20REGISTRY%202015.pdf> . diakses tanggal 14 Agustus 2018)
 17. Inrig JK, Oddone EZ, Hasselblad V, dkk. 2007. Association of intradialytic blood pressure changes with hospitalization and mortality rates in prevalent ESRD patients. *Kidney Int.* Vol. 71: hal. 454–461.
 18. Inrig JK. 2010. Antihypertensive Agents in Hemodialysis Patients: A Current Perspective. *Semin Dial.* Vol. 23: hal. 290–297.
 19. Isroin, Laily. 2016. *Manajemen Cairan Pada Pasien Hemodialisis untuk Meningkatkan Kualitas Hidup*. Unnuh Ponorogo Press, Ponorogo, Indonesia, hal. 29–39.
 20. Kammerer, Jean et al. 2006. *Jurnal. Adherence in Patients On Dialysis Strategies for Success*. *Nephrology Nursing Journal*. Vol. 34 (5), Oktober 2007.
 21. Karyadi D, Muhilal. 1996. *Kecukupan Gizi yang Dianjurkan*. Jakarta: Gramedia Pustaka.
 22. Kementerian Kesehatan RI. 2017. *Infodatin (Pusat Data dan Informasi Kementerian Kesehatan RI) Situasi Penyakit Ginjal Kronik*. (<http://www.depkes.go.id/download.php?file=download/pusdatin/infodatin/infodatin%20ginjal%202017.pdf> . Diakses tanggal 17 September 2018)
 23. Kidney, Am J. 2004. K/DOQI (Kidney Disease Outcomes Quality Initiative) Clinical Practice Guidelines on Hypertension and Antihypertensive Agents in Chronic Kidney Disease. Elsevier Science B.V., Amsterdam. National Kidney Foundation.
 24. Kutner, N.G., Zhang, R., McClellan, W.M., & Cole, S.A. 2002. Psychosocial predictors of non-compliance in haemodialysis and peritoneal dialysis patients. *Nephrology Dialysis and Transplantation*. Vol. 17(1): hal. 93-99.
 25. Levey, dkk. 2005. Definition and classification of chronic kidney disease: A position statement from Kidney Disease: Improving Global Outcomes (KDIGO). *Kidney International*. Vol. 67(6) : hal. 2089–2100
 26. Lukela, Jennifer Reilly, dkk. 2016. *UMHS Chronic Kidney Disease Guideline*. Michigan Medicine University of Michigan. (<http://www.med.umich.edu/1info/FHP/practiceguides/kidney/CKD.pdf>. Diakses tanggal 19 September 2018).
 27. Martono. 2016. *Jurnal. Monitoring Nilai Kritis Tekanan Sistolik dan Diastolik Pada Asuhan Keperawatan Gagal Ginjal Kronik yang Dilakukan Hemodialisis Jenis Arteriovena Shunt Cimino dan Akses Femoral Cephalica*. *Jurnal Terpadu Ilmu Kesehatan*. Mei 2016, hal. 01 – 117.
 28. National Center for Chronic Disease Prevention and Health Promotion (CDC). 2017. *National Chronic Kidney Disease Fact Sheet, 2017*. CDC US. hal. 1–2
 29. Park J, Rhee CM, Sim JJ, dkk. 2013. A comparative effectiveness research study of the change in blood pressure during hemodialysis treatment and survival. *Kidney Int.* Vol. 84 : hal. 795–802.
 30. Price, A. S. Wilson M. L, 2005. *Patofisiologi Konsep Klinis Proses-proses Penyakit*. Alih Bahasa : dr. Brahm U. Penerbit : Jakarta : EGC
 31. UNC Kidney Center. 2017. *Chronic Kidney Disease (CKD): What Causes It?*. https://unckidneycenter.org/files/2017/10/ckd_causes.pdf. Diakses 13 September 2018).
 32. US Renal Data System: USRDS. 2006. *Annual Data Report: Atlas of End-Stage Renal Disease in the United States*. Bethesda, Maryland, National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases.

Intradialitik Selama Proses Hemodialisis

