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Differences in Vital Signs of Chronic Kidney Failure Patients Before and After Hemodialysis at The Mount Djati Cirebon Regional Hospital

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Abstract: Disease No contagious, especially Fail Kidney Chronic (GGK), is problem significant health impacts in Indonesia, with prevalence increase from 2.0 to 3.8% in 2018. Hemodialysis is therapy main used for handling GGK, which is done on average two to three times per week. Research This aiming for identify difference Vital signs of GGK patients before and after hemodialysis at *Gunung Jati* Regional Hospital, Cirebon. Research This use cross-sectional design with one group pre-test and post-test approach. Research results show change significant on pressure blood, frequency pulse, breathing, temperature body, and saturation oxygen after hemodialysis. There were 59% of patients experience pressure blood tall before hemodialysis, and 61% of patients experience temperature body low after hemodialysis. Research This emphasize importance monitoring hemodynamics in CKD patients for prevent more complications critical during and after procedure hemodialysis.

Keywords: Disease no contagious; Failed kidney chronic; Hemodialysis; Vital signs

Introduction

Non-communicable diseases are chronic diseases that are not transmitted from individual to individual, but are a health problem that needs to be considered in society (Akseer et al., 2020; Luna & Luyckx, 2020). WHO reports that there are 56 million deaths caused by non-communicable diseases that occur worldwide. Non-communicable diseases in Indonesia include diabetes mellitus, cancer, coronary heart disease, stroke, Chronic Kidney Failure, kidney stones, and joint/rheumatic diseases (Soelton et al., 2022).

Chronic renal failure or often referred to as CKD (Chronic Kidney Disease) is a progressive kidney damage that is fatal where the body's ability to maintain metabolism and fluid and electrolyte balance fails, causing azotemia (retention of urea and other nitrogenous waste in the blood) (Pasaribu et al., 2021; Wahyuni et al., 2024). This disease is also known as end-stage renal disease (End Stage Renal Disease). The prevalence of CKD are the number of sufferers in Indonesia itself increased from 2% to 3.8% in 2018 of the total population of Indonesia (Suciana et al., 2020), and only 19.3% of chronic kidney failure patients underwent dialysis therapy.

Hemodialysis is a medical procedure to cleanse the blood of toxins, salts and excess fluids using a dialysis machine (Fadem, 2023; Ye et al., 2020). Hemodialysis is one of the most widely used medical treatments for CKD patients in Indonesia (Paath et al., 2020). The hemodialysis process in Indonesia is mostly carried out twice a week and generally takes 4-5 hours. The frequency of hemodialysis varies depending on the number of functions of the 12 kidneys remaining, on average, patients undergo 3 times a week while the

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duration of hemodialysis is at least 3-4 hours for each therapy procedure (Dai et al., 2020; Yulianto et al., 2020).

The most common complications in patients undergoing hemodialysis according to Triyono et al. (2023) are hypotension (20-30%), muscle cramps (5-20%), nausea-vomiting (5-15%), headache (5%), fever to death. During the hemodialysis process, observation or evaluation is needed to find out early on various possible complications that occur. One complication that can occur due to the process of blood coming out and entering the body is hemodynamic disorders (Loskutov et al., 2020). Hemodynamics is the flow of blood in our body's circulatory system, either through the magna circulation (large circulation) or the parva circulation (circulation in the lungs) (Sari, 2020; Saydam & Serefli, 2021). Hemodynamic monitoring is monitoring the status of hemodynamics, respiration, and other vital signs to ensure that early detection can be carried out properly so that it can prevent patients from falling into more severe conditions (Kemala, 2023).

The number of outpatients with Kidney Failure from January to September 2022 at RSD Gunung Djati Cirebon who were still receiving outpatient treatment was 224 people and 143 patients were hospitalized. Of that number, nine of them died. Almost all patients were adults with chronic kidney failure cases, and around 70% of kidney disorder patients had a history of diabetes and hypertension (Romagnani et al., 2017).

Based on the background description, the researcher is interested in knowing the differences in vital signs of Chronic Kidney Failure patients before and after hemodialysis at RSD Gunung Djati Cirebon. Chronic Kidney Failure (CKF) is a progressive and irreversible kidney function disorder, where the body is unable to maintain metabolism and fails to maintain fluid and electrolyte balance which results in increased urea (Narsa et al., 2022).

Chronic renal failure is a progressive and irreversible disorder of kidney function in which the body fails to maintain metabolism and fluid electrolyte balance, causing retention of urine and other nitrogenous waste in the blood (Muttaqin & Sari, 2014). In CKD patients, every body system is affected by urea conditions, so that patients will show various signs and symptoms. The severity of signs and symptoms depends on the part and level of kidney damage, and other underlying conditions (Webster et al., 2017).

Hemodialysis is a method to remove excess fluid and toxins when the patient's blood circulates through an artificial kidney (dialysis device/dialyzer). The diffusion process moves solutes (such as excess potassium) from the blood across a semipermeable membrane (dialysis device filter) into the dialysate for excretion from the body (Azar & Canaud, 2013; Canaud et al., 2023).

This usually occurs when kidney function is only 10-15%. The client may experience some symptoms, such as nausea, vomiting, swelling and fatigue. However, if the client does not experience these symptoms, the level of waste in the blood is still high and may be toxic to the body, the doctor will tell you when dialysis should be started.

There are a number of indications that require dialysis in patients with acute renal failure or end-stage renal disease. These include pericarditis or pleuritis (urgent indications), uremic encephalopathy or progressive neuropathy (with signs such as confusion, asterixis, tremor, multifocal myoclonus, limp wrists or legs or in severe cases seizures (urgent indications), a person with a bleeding diathesis unresponsive to antihypertensive drugs and persistent metabolic disorders refractory to medical therapy (such as hyperkalemia, metabolic acidosis, hypercalcemia, hypocalcemia, hyperphosphatemia, persistent nausea and vomiting, BUN >40 mmol/liter, creatinine >900). Dialysis is usually initiated in adult patients with chronic kidney disease when the filtration rate decreases to about 10 mL/min/1.73 m2.

According to Imamah et al. (2022), the most common complications during hemodialysis treatment are hypotension (20-30%), muscle cramps (5-20%), nausea and vomiting (5-15%), headache (5%), fever and even death.

Method

This research is a type of observational descriptive research with a cross-sectional study design, namely data concerning independent variables and dependent variables will be collected at the same time. The research design uses one group pre-test and post-test design (Notoatmodjo, 2020).

Population is the whole of a variable related to the problem being studied. The population in this study were GGK patients who underwent hemodilization at RSD Gunung Djati Cirebon. Samples are from a population selected with a certain sampling technique to be able to meet/ represent the population. Sampling is a process of selecting a portion of a population to be able to represent the population. Researchers use non-probability sampling methods (non-random sampling) developed to answer the difficulties that arise in applying random methods, especially in relation to reducing costs and problems that may arise in making a sample frame with the Purposive sampling technique, which is a sampling determination technique by selecting samples among the population according to what the researcher wants, so that the sample can represent the characteristics of the population.

Data collection was conducted through observation using a prepared observation sheet, described by four main steps used, namely the first step is to measure vital signs before hemodialysis. The second step is to intervene with hemodialysis medical intervention. The third step is to observe the vital signs of respondents after hemodialysis. The collected data were then analyzed statistically to determine whether the intervention resulted in a difference in the results of the respondents.

Results and Discussion

Differences in Vital Signs of Patients Before and After Hemodialysis

Blood pressure

From the data of respondents studied based on before performing hemodialysis in the hemodialysis room of Gunung Jati Hospital Cirebon. The results of the study showed that from a total of 44 respondents (100%) showed that CKD patients before undergoing hemodialysis with high blood pressure were 26 people (59%), CKD patients with normal blood pressure were 18 people (41%).

According to research conducted by Huang et al. (2020), the patient's blood pressure may be the same at the beginning of hemodialysis, and increase after hemodialysis, or blood pressure may increase at the beginning of hemodialysis and increase until the end of hemodialysis. In line with research conducted by Matsushita et al. (2022), reported that cardiovascular disease is a risk factor for kidney failure. The disease is estimated to be higher in hemodialysis patients than in the general population. If blood pressure decreases, a reflex occurs that can cause an increase in heart rate to maintain blood pressure (Rosei et al., 2020).

According to Furst et al. (2023), factors that keep blood pressure constant are how hard the heart will pump and how much blood will circulate. Giving fluids such as plasma or saline can increase blood pressure. There is a significant relationship between hemodialysis compliance and blood pressure (Valsaraj et al., 2021). When systolic blood pressure exceeds 120 mmHg and diastolic blood pressure is above 80 mmHg with a pulse of 60-100 times per minute, damage to the blood vessel walls will continue to increase and this can cause kidney filter leakage.

Blood pressure in chronic kidney failure patients undergoing hemodialysis affects the patient's quality of life (Anggraini & Fadila, 2023). This is in line with research conducted by Noradina (2018) which states that there is an effect of hemodialysis on changes in blood pressure. The patient's blood pressure can be normal when starting hemodialysis, then increase after hemodialysis. Or there may have been an increase in blood pressure when starting hemodialysis and increasing until the end of hemodialysis (Damayantie et al., 2022).

Pulse Frequency before and after Hemodialysis

In CKD patients with abnormal pulse rates, there were 2 people (5%), and 42 patients (95%) with normal pulse rates. While after hemodialysis, the pulse rate was normal in 40 respondents (91%), and abnormal in 4 respondents (9%). In the hemodialysis process, the previous patient's condition showed different pulse rate variations. This indicates a difference in pulse rate between before and after hemodialysis in each respondent. This variation can be a slower or faster pulse rate, which is caused by different heart contractions and different levels of physical endurance in patients. This difference causes the pulse rate to fluctuate and the blood flow rate to vary. After the hemodialysis process, these changes can be felt or palpated in the patient's blood flow.

Factors that affect heart rate include activity, stress and emotion, body temperature, and blood pressure. Activity, namely depression increases with work and physical activity and decreases with rest, stress and emotion, namely sympathetic nervous stimulation and emotions such as anxiety, fear, joy, increase heart rate and pulse, body temperature, namely for every 1^{o}F point increases 10x/ minute, an increase of 1°C increases 15x/ minute. Conversely, if the body temperature drops, the heart rate will decrease, meaning that due to a lot of blood loss, the heart rate will increase.

Breath Frequency

In CKD patients before undergoing hemodialysis, the frequency of breathing was abnormal in 26 (59%) and normal in 18 (41%), while the value of the frequency of breathing in patients after undergoing hemodialysis whose value was normal was 24 people (55%), and abnormal in 20 people (45%).

Many respondents experienced tachypnea/ abnormal breathing where the breathing rate becomes rapid because chronic kidney failure often shows respiratory frequency disorders due to accumulation of lung fluid that the kidneys fail to remove, resulting in metabolic acidosis. According to Muttaqin & Sari (2014) such problems are due to complications from *Chronic Kidney Diasase* (CKD) which causes renal tubular acidosis so that the kidneys fail in their efforts to remove acid in the body through urine which is then mixed back into the blood so that the client takes rapid and deep breaths to release CO_2 as compensation to reduce acidity in the blood.

The average respiratory rate before hemodialysis (HD) was 22 times per minute, while after HD it became 21 times per minute. From these results, the average

respiratory measurement of respondents was within the normal range. Respiratory rate is also influenced by various factors, such as exercise (which increases metabolism in the body), stress, increased environmental temperature, and decreased oxygen concentration. This shows that someone with quite high physical activity, such as an athlete who exercises regularly, will have a higher respiratory rate compared to someone who does more light daily activities, such as sitting. This is due to the greater energy needs of people who exercise regularly compared to those who rarely exercise. In addition, someone who lives in the highlands will experience different environmental stress compared to those who live in the lowlands, especially because of the lower air temperature. This condition causes significant differences in physical activity and the types of activities carried out in the highlands and lowlands.

Body Temperature Frequency

The frequency of body temperature of patients with CKD before undergoing hemodialysis was mostly normal, namely 23 people (52%), and experienced low temperatures before undergoing hemodialysis as many as 21 people (48%), after undergoing hemodialysis, the body temperature values of 27 respondents (61%) had low body temperatures, 1 person (2%) had high, and 16 people (37%) were normal.

Body temperature examination is one method to assess the metabolic condition in the body, where body heat is produced through the chemical process of blood metabolism. The balance of body temperature must be maintained by ensuring that the amount of heat lost is proportional to the amount of heat produced. Body temperature regulation is controlled by the hypothalamus. The front of the hypothalamus plays a role in regulating heat dissipation, while the back of the hypothalamus regulates heat storage. The heat dissipation process can occur through radiation, convection, evaporation, and conduction.

The frequency of fever (increased temperature) is less than 1% of all existing hemodialysis procedures. However, the results of this study are higher compared to the results of a study in Pakistan which showed that 42% of patients had fever, while 45% of patients shivered while undergoing hemodialysis.

Oxygen Saturation Measurement

Patients with CKD before undergoing hemodialysis had almost all normal oxygen saturation values (98%). After undergoing hemodialysis, the saturation values of all 44 respondents were normal.

Oxygen saturation is a value that indicates the level of oxygen in the arteries, with a normal range between 95-100%. Oxygen saturation is often referred to as "SATS". When the partial pressure of oxygen decreases, most hemoglobin will experience deoxygenation, or the process of blood distribution that occurs in the body's arterial network. There are several factors that affect oxygen saturation, such as hemoglobin, circulation, and physical activity. If a person does not have an adequate oxygen supply, it is possible that he or she is anemic, although this is not always the case. A person may experience insufficient oxygen supply, but their SpO_2 value can sometimes still be within the normal range.

Conclusion

There are differences in hemodynamic status (blood pressure, pulse, respiration, temperature, and oxygen saturation) before and after hemodialysis in patients at RSUD Gunung Jati Cirebon. The use of other variables related to hemodynamic status can be an addition or idea for experimental research related to hemodynamic problems in patients.

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Conflicts of Interest

The authors declare no conflict of interest.

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