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A 27-year-old Man with Chronic Kidney Disease and Intradialytic Hypertension, A Review of Psychological Aspects as Risk Factors

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Abstract: Intradialytic Hypertension (IDH) is a complication that can occur in patients with chronic kidney disease (CKD) undergoing hemodialysis, with a prevalence of 5% to 15%. Intradialytic hypertension can be caused by various factors, including fluid overload, sympathetic overactivity, activation of the renin-angiotensin-aldosterone system (RAAS), endothelial dysfunction, elevated sodium levels, medications such as erythropoietin, and vascular stiffness. **Case report :** A 27-year-old male patient (KNW) with CKD and intradialytic hypertension was evaluated to determine the underlying cause of his condition. **Discussion :** A detailed analysis was conducted to assess potential contributing factors, including an underlying disease or other risk factors such as a hereditary predisposition from the patient's father, as well as anxiety, stress, and depression, along with lifestyle factors such as heavy smoking, alcohol consumption, and lack of exercise awareness. The patient was subsequently provided with both non-pharmacological and pharmacological therapies. Educational counseling was offered regarding dietary and fluid intake, exercise, adherence to hemodialysis (HD) sessions, and the importance of medication compliance. **Conclusion :** Following this intervention, improvements were noted, including the resolution of headaches and stabilization of blood pressure. The likely contributing factors for this patient's intradialytic hypertension were psychological issues, poor medication adherence, and a lack of social support. The management strategy successfully achieved target blood pressure levels, thereby preventing further complications related to intradialytic hypertension.

Keyword: intradialytic hypertension, chronic kidney disease, anxiety, depression

INTRODUCTION

Intradialytic hypertension (IDH) is a potential complication encountered in patients with chronic kidney disease (CKD) undergoing hemodialysis. The prevalence of IDH is approximately 5% to 15%, and it is associated with an increased risk of cardiovascular mortality, although this condition has not received sufficient attention[1,2]. Intradialytic complications often become discussion materials; according to the 2020 Indonesian Renal Registry (IRR), IDH is the most common comorbid, accounting for 30% of intradialytic

complications, despite only ranging 5-15% in rpevalence[3]. Although IDH has been recognized for several years, there is no universally accepted definition. According to Inrig et al., IDH is defined as an increase in systolic blood pressure (SBP) of >10 mmHg pre- and post-dialysis. Another definition describes IDH as a rise in blood pressure during HD that does not respond to fluid removal[4,5]. Potential causes of IDH include fluid overload, increased cardiac output, sympathetic nervous system hyperactivity, activation of the renin-angiotensin system (RAS), electrolyte changes during dialysis, endothelial dysfunction, intravenous erythropoiesis-stimulating agents (ESAs), and the removal of antihypertensive medications during dialysis[6,7]. Psychological factors, such as anxiety, stress, and depression, are significant contributors to elevated blood pressure in HD patients. Emotional instability may also trigger hypertension[8].

Identifying risk factors is key to preventing IDH. Patient characteristics and pathophysiological mechanisms, such as older age, low dry weight, reduced serum creatinine and albumin levels, and the use of prescribed antihypertensive drugs, have been linked to the development of IDH. However, these associations remain a topic of debate[9].

METHOD

A 27-year-old male patient diagnosed with stage 5 CKD on regular HD (3 sessions per week) presented with intradialytic hypertension and moderate anemia. He attended a routine hemodialysis session at Bali Husada Cipta Canthi Clinic on November 15, 2023. The patient reported pulsating headaches located at the back of the head, persistent and unrelieved by analgesics, without blurred vision or diplopia. Nausea and vomiting were denied. Two hours into the HD session, the headache worsened. Additionally, the patient complained of abdominal cramps, neck pain, cold sweats, nausea, and a single episode of vomiting during HD. The patient stated consuming approximately 1 liter of water per day, with positive defecation and negative urination..

He had a history of CKD on HD for one year, undergoing sessions three times a week, and long-standing uncontrolled hypertension. Diabetes mellitus (DM) and cardiac disease were denied. The patient's father had a history of uncontrolled hypertension and DM. The patient reported being a heavy smoker for 10 years (1 pack/day) and frequently consuming salty foods. He was also a heavy alcohol drinker before his illness, consuming alcohol daily, and rarely exercised. Since starting HD, the patient was abandoned by his wife and family and currently lives alone in a rented room. Formerly a tattoo artist assistant, he now receives fewer job opportunities and has missed several HD sessions in the past six months, often expressing a lack of will to live..

Physical examinations showed blood pressure (BP) outside of HD: 144/92 mmhg, pre-HD BP: 150/85 mmHg; pulse 95 bpm; 1 hour post-HD start: BP 160/90 mmHg; Pulse: 97 bpm; UF: 750 mL; 2 hours post-HD start: BP 171/100 mmHg; Pulse: 98 bpm; UF: 1500 mL; 3 hours post-HD start: BP 185/100 mmHg; Pulse: 101 bpm; UF: 2250 mL; 4 hours post-HD start: BP 198/102 mmHg; Pulse: 101 bpm; UF: 3000 mL; 5 minutes post-HD: BP 210/98 mmHg; Pulse: 105 bpm. Eye examination revealed pale conjunctiva. Lung examination showed no rhonchi, and there was no peripheral edema. Laboratory results showed hemoglobin (Hb) of 7.6 g/dL, white blood cell (WBC) count of 19.1 x 10^3 /µL. The Depression, Anxiety, and Stress Scale (DASS) score was 40, indicating severe depression, anxiety and stress. Currently, the patient is consuming candesartan 32 mg once daily, nifedipine 90 mg once daily, clonidine 0.3 mg threetimes daily, carvedilol 25 mg twice daily, folic acid 2 mg twice daily, calcium carbonate ($CaCO_3$) 500 mg three times daily. Dialysis prescription at the time was Qb 250, duration 4 hours with heparin dose of 6000 units, dry weight 55 kg, interdialytic weight gain (IDWG) 3 kg, ultrafiltration (UF) 3000 mL, HD 3 sessions per week.

RESULT AND DISCUSSION

Intradialytic Hypertension (IDH) according to K/DOQI is defined as an increase in post-dialysis systolic blood pressure: post-dialysis systolic BP – pre-dialysis systolic BP ≥ 10 mmHg, with a post-dialysis BP ≥ 130/80 mmHg, measured 5 minutes after dialysis[2].

On physical examination, the patient's pre-dialysis BP was 150/85 mmHg with a heart rate of 95 beats per minute (bpm). Five minutes post-dialysis, the BP was 210/98 mmHg, with a heart rate of 105 bpm. This indicates a systolic BP increase of 60 mmHg, fulfilling the criteria for diagnosing intradialytic hypertension.

The causes of intradialytic hypertension are thought to be multifactorial, with psychological factors playing a significant yet often overlooked role. According to a study by Adhar et al., higher levels of depression, anxiety, and stress correlate with elevated blood pressure[7]. Anxiety refers to an unclear, often anticipatory fear linked to a feeling of uncertainty and helplessness. Depression increases peripheral vascular resistance and cardiac output, stimulating sympathetic nervous system activity, resulting in muscle tension, increased heart rate, and elevated blood pressure. Additionally, stress triggers the adrenal glands to release adrenaline, which accelerates heart rate and raises blood pressure and emotional disorders[8].

Possible contributing factors for intradialytic hypertension in this patient include psychological disturbances. After starting hemodialysis (HD), the patient experienced social isolation, loss of employment, and a lack of motivation to live, along with trauma associated with HD sessions. The DASS (Depression, Anxiety, and Stress Scale) score of 40 indicated severe depression, anxiety, and stress, strongly influencing the patient's BP elevation during HD. The Farmingham study identified anxiety levels occurring in intradialytic patients are undetected for five years of ongoing HD; however, the patient in our case has been depressed for the last year [10]. According to Salmawati, anxiety also affects the physical condition of the patient, in which the patient feels fatigue due to increased adrenaline and non-adrenaline hormone secretions. Therefore, patients frequently feel pain, muscle seizures especially in the neck, chest and back. Another study by Sari et al. in 2009 showed a significant association between family upport and patient's adherence for hemodialysis[10]. The patient in our case frequently presented with headaches, neck cramps, and emotional distress, including crying during HD sessions, and showed poor compliance with HD over the past six months; therefore, this psychological factor might be the cause of intradialytic hypertension in this case.

Apart from psychological disturbances, fluid overload is also one of the factors contributing to intradialytic hypertension. Additionally, increased interdialytic weight gain (IDWG) is associated with a higher risk of heart disease, mortality, and hospitalizations. According to KDOQI (2015), the normal value for IDWG should be less than 4.0%–4.5% of dry body weight. Factors such as increased cardiac output, sympathetic nervous system overactivity, stimulation of the renin-angiotensin system (RAS), electrolyte imbalances during dialysis, endothelial dysfunction, intravenous Erythropoiesis-Stimulating Agents (ESAs) therapy, loss of antihypertensive medications during dialysis, and the duration of hemodialysis also influence the occurrence of intradialytic hypertension[4,6,8,11].

In this patient, fluid intake was approximately 1 liter per day, with no urine output. The patient's dry weight was 55 kg, with an IDWG of 3 kg, which was successfully removed with a UF of 3000 ml. However, during the first, second, and third hours of dialysis, as UF increased, there was no corresponding drop in BP, indicating that fluid overload was not the primary cause of intradialytic hypertension in this patient. Activation of the renin-angiotensin-aldosterone system (RAAS) may be a contributing factor. A decrease in arterial pressure triggers the release of renin, which converts angiotensinogen to angiotensin I, then to angiotensin II by ACE, causing blood vessel vasoconstriction[12,13]. During HD, arterial

pressure reduction can activate the RAAS, leading to elevated BP in this patient. An increased inflammatory response may also contribute to endothelial dysfunction[14]. Endothelial dysfunction is one of the mechanisms in causing intradialytic hypertension, as evidenced by the elevated white blood cell (WBC) count of 19.1 x 10^3/uL. The loss of antihypertensive medications during dialysis can further contribute to intradialytic hypertension in this patient. According to the study by Inrig et al., patients with intradialytic hypertension often undergo hemodialysis for more than a year, increasing their risk of vascular stiffness. This condition may exacerbate intradialytic hypertension due to sympathetic overactivity triggered by fluid removal during dialysis, resulting in vasoconstriction [6,15]. In this case, the patient had undergone HD for ≥ 1 year, consistent with Inrig et al.'s findings, where patients undergoing HD for ≥ 1 year are at greater risk of worsening intradialytic hypertension.

Procedural strategies such as ultrafiltration (UF) profiling can optimize fluid removal during periods of peak hydration, potentially reducing cardiovascular complications and patient-reported symptoms. Sodium profiling, however, may result in positive sodium balance, leading to increased thirst, weight gain, and interdialytic hypertension. UF profiling can reduce hemodynamic instability and associated cardiovascular consequences without altering sodium balance [11,13]. Hemodialysis machines offer several types of profiles. UF Profile 2 is designed to deliver a lower UF rate near the end of treatment and has shown a significant reduction in the frequency of hypotensive episodes by 19.4% of all procedures. Ultrafiltration profiling is considered a suitable strategy for patients with intradialytic hypertension[16,17].

Ultrafiltration profiling using UF Profile 2 was attempted to reduce the patient's blood pressure. Additionally, the patient was treated with candesartan 32 mg twice daily, nifedipine 90 mg once daily, clonidine 0.3 mg three times daily, carvedilol 25 mg twice daily, folic acid 2 mg twice daily, and calcium carbonate (CaCO3) 500 mg three times daily. Hemodialysis (HD) was conducted three times per week to stabilize the patient’s hemodynamic condition and improve dialysis adequacy. The patient was also educated on appropriate fluid intake and salt consumption. Painkillers were administered to relieve headaches; however, the patient continued to experience persistent symptoms, and intradialytic hypertension remained elevated.

In this case, regular psychiatric counseling was initiated to address depression, anxiety, and stress. The patient was prescribed fluoxetine 20 mg once daily and transferred to a different HD unit to alleviate trauma associated with the previous treatment site. Following counseling and the unit transfer, the patient’s condition gradually improved, with complete resolution of headaches, the absence of intradialytic hypertension, and a return to normal work activities.

CONCLUSION

The patient experienced intradialytic hypertension characterized by an increase in post-dialysis systolic blood pressure ≥ 10 mmHg. The potential contributing factors included activation of the renin-angiotensin-aldosterone system (RAAS), endothelial dysfunction, hemodialysis duration of ≥ 12 months, loss of antihypertensive medications during dialysis, and psychological disturbances. After the implementation of both non-pharmacological and pharmacological therapies, the patient’s condition improved.

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