

Background

Increased systolic blood pressure during hemodialysis treatment or intradialytic hypertension is common and it increases the incidence of cardiovascular morbidity and mortality, however this is often ignored in developing countries such as Indonesia. The pathophysiological mechanisms involve many factors and is still unclear. There are limited data about the demographic, clinical and laboratory characteristics of Indonesian hemodialysis patients.

Objectives

The aim of this study is to identify the prevalence of IDH, compare the clinical characteristics of patients with and without IDH in Indonesian ESRD patients.

Methods

- A cross sectional study was carried out in 3 hemodialysis clinics in Jakarta, Indonesia.
- We compared characteristics such as age, gender, BMI, duration of hemodialysis, hemoglobin, hematocrit, ureum, creatinine, sodium, potassium, calcium, uric acid, ferritin, erythrocyte, iron, total cholesterol, MAP, dry body weight, frequency of dialysis per week, nutritional status and difference in pre-post dialysis weight in patients with IDH and control group without IDH.
- Nutritional status was assessed using Subjective Global Assessment (SGA).
- IDH was defined as >10 mmHg increase in systolic BP in at least four of six prior consecutive hemodialysis sessions.
- Students' T-test or Mann-Whitney test was used to compare the quantitative variables.
- Chi-Square or Fischer exact test was used to compare categorical variables.

Results

- There was a total of 114 patients included in this study.
- IDH was present in 47 (34.1%) patients.
- The baseline characteristics of the patients are shown in Table 1.
- The analysis to compare between the 2 groups are shown in Table 2.
- Interestingly, moderate to severe malnutrition status had significant association with IDH (OR = 2.31, $p = 0.031$).
- Patients who undergo dialysis thrice a week was associated with IDH rather than patients who undergo dialysis twice a week (OR = 2.27, $p = 0.035$).

Table 1. Baseline Characteristics (n=114)

Age (years) [Mean (SD)]	52.8 (± 12.5)
Duration of Hemodialysis (months) [Mean (SD)]	38.6 (± 36.2)
BMI (kg/m ²) [Mean (SD)]	22.9 (± 4.4)
Gender	
Male	86 (75.4%)
Etiology of CKD	
Diabetes	35 (30.7%)
Hypertension	68 (59.6%)
Others	11 (9.6%)
Diabetes	43 (37.7%)
Hypertension	88 (77.2%)
Subjective Global Assessment	
Normal	55 (48.2%)
Moderately Malnourished	50 (43.9%)
Severely Malnourished	9 (7.9%)

Table 2. Comparison of demographic, clinical characteristics and laboratory data

Variable	IDH Group (n = 47)	Control Group (n = 67)	P
Age (Mean[SD])	53.4 (± 13.2)	52.8 (± 12.4)	0.800
BMI (Mean[SD])	21.8 (± 3.7)	24 (± 4.4)	0.031
Gender			0.787
Male	29 (61.7%)	43 (64.2%)	
Female	18 (38.3%)	24 (35.8%)	
Duration of HD (Median[Min-Max])	24 (2-192)	30 (6-96)	0.136
Frequency of HD			0.035
3 times/week	25 (53.2%)	22 (33.3%)	
2 times/week	22 (46.8%)	44 (66.7%)	
Hemoglobin (Mean[SD])	8.6 (± 1.7)	8.3 (± 1.5)	0.299
Hematocrit (Mean[SD])	26.5 (± 5.6)	27.4 (± 5.2)	0.380
Ureum (Mean[SD])	122.5 (± 52.2)	146.1 (± 135.4)	0.219
Creatinine (Median[Min-Max])	8.1 (3.0–22.2)	10.8 (2.9–22.6)	0.008
Sodium (Mean[SD])	129.6 (± 28.2)	136.3 (± 16.5)	0.233
Potassium (Mean[SD])	7.3 (± 11.9)	5.4 (± 4.9)	0.355
Calcium (Median[Min-Max])	8.9 (1-13)	8.5 (0.9-11.1)	0.559
Uric Acid (Mean[SD])	5.6 (± 2.2)	11.1 (± 21.4)	0.184
Ferritin (Mean[SD])	314.2 (± 462.3)	611.7 (± 478.6)	0.111
Erythrocyte (Mean[SD])	1.29 (± 1.65)	1.23 (± 1.58)	0.834
Iron (Median[Min-Max])	43.5 (3.84-103)	66.0 (12-258)	0.160
Total Cholesterol (Mean[SD])	194.0 (± 86.6)	175.1 (± 71.6)	0.578
Mean Arterial Pressure (Mean[SD])	108.3 (± 13.1)	98.6 (± 23.2)	0.011
Dry Body Weight (Mean[SD])	59.5 (± 13.4)	61.7 (± 14.5)	0.435
Subjective Global Assessment			0.031
Moderate to Severe	30 (63.8%)	29 (43.3%)	

Discussion

- The prevalence of IDH in our study is 34.1%. This is higher than those reported in other countries previously. Otovic, et al in reported that the prevalence of IDH is 15.45% in Macedonia.
- The results in our study confirmed that intradialytic hypertensive patients have lower BMI compared to the patients without intradialytic hypertension. Other studies have reported that intradialytic hypertensive patients were older and had lower values of serum creatinine and lower dry weight that similar to our result. That may be explained by our studies that these patients are more likely to be malnourished and generally consume more liquids.
- In addition to this assumption is the fact that intradialytic hypertensive patients have statistically significant lower values of serum sodium, and accordingly, larger and statistically significant gradient of sodium compared to the control group, leading to an increase in serum sodium during dialysis (positive sodium balance) which probably stores in the interstitium as osmotic inactive sodium, leading to salt –sensitive hypertension, which is confirmed by other studies. The positive sodium gradient increases thirst, leading to increased fluid intake and extracellular volume expansion and subsequent development of hypertension.
- The increase in the mean arterial pressure and systolic pressure during and after hemodialysis is probably associated with the impaired endothelial function and increased secretion of endothelin-1 and increased peripheral resistance, and can occur without significant changes in cardiac stroke volume
- This study has several limitations: small number of participants, no assessment of intradialytic sodium balance, and the blood pressure is not measured during the interdialytic period by 24-hour ABPM

Conclusion

The prevalence of IDH is higher than previously reported in other countries. Patients with IDH have lower BMI, higher MAP and lower creatinine levels than in controls. Moderate to severe malnutrition and frequency of dialysis per week had significant association with IDH.

References

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