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A Study to Determine the Intradialytic Hypotension among Patients on Maintenance Heamodialysis

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ABSTRACT

Objective: *The aim was to govern the intradialytic hypotension frequency among patients on maintenance dialysis and its relationship with various risk factors.* ***Study design:*** *A Cross-Sectional analytical study.* ***Place and duration:*** *In the Nephrology department of Services Hospital Lahore for Six months duration from January 2019 to June 2019.* ***Methods:*** *The intradialytic hypotension frequency was determined and specified as a percentage. All statistical variables such as weight, age, blood flow, dialysate temperature, standard deviation and mean were recorded. The relationship between qualitative risk factors and intradialytic hypotension was paralleled using the Student's t-test with a z-test for proportional and quantitative risk factors.* ***Results:*** *In total sessions; Symptomatic intradialytic hypotension was recorded in 5.4%. In the hypotensive group the pre-dialysis diastolic, systolic, pulse, blood pressure was higher than the other groups with substantial p-values. In the hypotensive group, diastolic, systolic and low mean blood pressure was lesser than the other groups. However, in pulse rate the mean change between the 2 groups (normotensive group, p=0.8 to -2.4 ± 11.1 and hypotensive group -2.1 ± 14.1) did not significantly change with the drop in B.P. Cardiac events were also higher significantly in the hypotensive group.*

Keywords: Intradialytic hypotension, Hemodialysis, Cardiovascular disease

INTRODUCTION

Intradialytic hypotension (HDI) is a usual clinical feature in hemodialysis (HDI) due to poor dialysis membrane biocompatibility. In hemodialysis patients (HD); Dialysis-induced hypotension remains a major problem [1]. There are many elements that cause uneven change in myocardial reserve in reaction to HD-persuaded cardiovascular stress and control of blood pressures [2]. Hemodialysis (HD) is related to a substantial decrease in Nitric oxide (NO) N(G)-mono-methyl-L-arginine (L-NMMA) plasma concentrations, Symmetric dimethylarginine (SDMA) and Asymmetric dimethylarginine (ADMA) inhibitors [3]. Intradialytic hypotension is definite as 20 mmHg reduction in B.P in hemodialysis associated symptoms [4]. If patients undergoing hemodialysis have systolic blood pressure <100 mmHg before hemodialysis, hemodialysis symptoms associated with change of systolic blood pressure of 10 mmHg or above throughout hemodialysis is named intradialytic hypotension. If there is 100 mmHg above B.P, systolic blood pressure of 30 mmHg fall during H.D or above with related symptoms is called intradialytic hypotension [5]. Most of the subjects presented with dizziness or nausea when decrease in B.P occurred. It is related closely to other indications such as cramping, lack of alertness, vomiting, and decrease in vision [5]. There were no symptoms in some cases. The above features are currently BMI (especially in females), cardiovascular disease and old age. In older patients above 65 years; intradialytic hypotension is much common than younger patients (under 45 years). The symptomatic hypotensive incidence attacks are high particularly in subjects with low or normal B.P at the beginning of dialysis and in subjects with a major rise in interdialytic weight [6]. The intradialytic hypotension has 2 types. In 1st type there is steady decrease in blood pressure which during hemodialysis decreases steadily. In 2nd type, sudden hypotension deliberated by a sharp and sudden drop in B.P with the arrival of warning sign [7]. The utmost usual

complication related to hemodialysis is intradialytic hypotension and multiple aetiologies. However, the association between intradialytic hypotension and hypertension is unclear [8]. We explored the effect of B.P on pre-dialysis hypertension before dialysis and with antihypertensive drugs [9]. Excessive intradialytic weight gain, Diabetes, low left ventricular volume and low ejection fraction are enlightened risk factors for intradialytic hypotension [9]. Intradialytic hypotension is related to significant morbidity and mortality. The risk of seizures is associated with heart ischemia, cerebral infarction, vascular thrombosis and arrhythmia [10].

It is as well linked with a rapid residual renal function loss and reduces the capability of dialysis because of recurrent disruptions and damages life quality. It is a usual reflection that if we find the exact frequency and factors related to IDH in dialysis patients if we can reduce the incidence of IDH, we can reduce the IDH frequency in subjects by recording dialysis prescription and writing the risk factors. This improved the life quality of these subjects [11].

MATERIALS AND METHODS

This is an Analytical Cross-sectional Study of 100 Patients Collected with Non-probability convenience sampling in the Hemodialysis Unit and Nephrology department of Services Hospital Lahore for six months duration from January 2019 to June 2019. Hemodialysis bleeding Data were analysed using SPSS version 15.0. The intradialytic hypotension frequency was determined and recorded as a percentage in all hemodialysis sessions lasting more than three months. All numerical variables such as age, weight, dialysate temperature, blood flow, standard deviation and mean were recorded. The association between qualitative risk factors and intradialytic hypotension was analysed by Chi-square test and Student's t-test using quantitative risk factors.

RESULTS

Total 1907 hemodialysis sessions were performed to 100 patients in Six months to determine hypotension and related risk factors. The 51 ± 16 years studied population mean age. The males were 1086 (56.9%) and females were 821 (43.1%), respectively. The diabetic nephropathy ancillary to diabetes mellitus and end-stage renal disease was the utmost common 51.1%, obstructive nephropathy 24.2% and chronic glomerulonephritis hypertension was the 2nd most common cause, others with 7.3% and 4.2% (Figure 1).

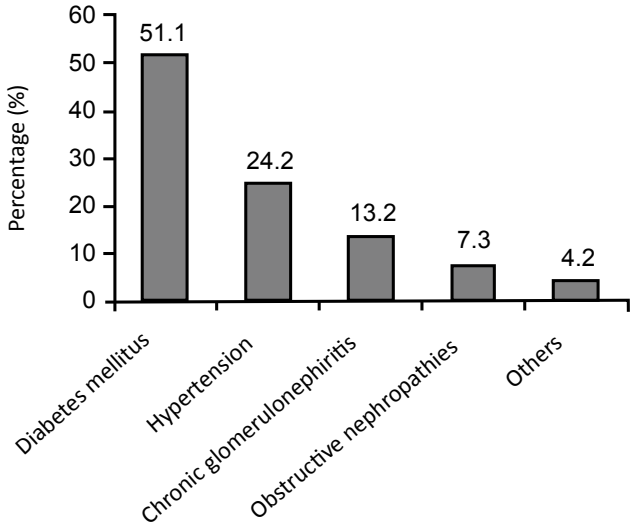

Figure 1 Distribution of hemodialysis sessions by a diagnosis of patients

When a few possible contributions to dialysis sessions, such as the use of dialysis equipment, were examined, only 23.5% of initial use and 76.5% of dialysate reuse were used. In 5.4% of subjects, symptomatic hypotension occurred in three sessions. Into groups I and II, all dialysis sessions were divided in which symptomatic hypotension happened, including dialysis sessions not related to symptomatic hypotension. The pulse data and B.P data were matched as shown in Table 1.

Table 1 Comparison of dialysis sessions with symptomatic hypotension with no symptomatic hypotension

Parameters	Group I (n=103) Mean ± SD	Group II (n=1804) Mean ± SD	p-value
Age (years)	48 ± 6	51 ± 15	0.07
Systolic blood pressure before dialysis (mmHg)	150 ± 27	143 ± 31	0.02
Diastolic blood pressure before dialysis (mmHg)	76 ± 6	72 ± 17	0.04
Mean blood pressure before dialysis (mmHg)	100 ± 118	96 ± 9	0.02
pulse rate before dialysis (min)	84 ± 13	81 ± 14	0.05
Lowest systolic blood pressure before dialysis (mmHg)	104 ± 28	130 ± 31	0.001
Lowest diastolic blood pressure before dialysis (mmHg)	56 ± 16	67 ± 16	0.001
Pulse at lowest BP (min)	86 ± 15	84 ± 15	0.1
Lowest mean BP (mmHg)	72 ± 19	88 ± 19	0.001
Change in systolic BP (mmHg)	46 ± 22	13 ± 28	0.001
Change in diastolic BP (mmHg)	20 ± 15	6 ± 16	0.001
Change in mean BP (mmHg)	29 ± 15	8 ± 18	0.001
Change in pulse (min)	-2.1 ± 14.1	-2.4 ± 11.1	0.8
Weight gain (kg)	2.2 ± 0.7	2.1 ± 0.9	0.03
net ultra-filtration (ml)	1519 ± 750	1905 ± 890	0.001
Ultra filtration rate (ml/hour)	978 ± 636	636 ± 367	0.001
Conductivity (m S/cm)	13.9 ± 0.3	13.9 ± 0.3	0.2
Dialysate temperature (°C)	37.1 ± 0.2	37.1 ± 0.2	0.8

The pre-dialysis mean pressures, pulse rates, Systolic and diastolic were advanced in group I than in group II. Significant, systolic, low and moderate blood pressure was lesser in group I than in group II. However, among the 2 groups; the mean pulse rate change (-2.1 ± 14.1 in group I and -2.4 ± 11.1 in group II, p 0.8) did not vary expressively with B.P fall given in Table 1. The ultrafiltration rate and dialysis weight were higher significantly in 1st group than in the 2nd group, in group II; net ultrafiltration was greater than group I, which meant that more ultrafiltration was attained. The net ultrafiltration rate in group II was lower without significant intradialytic hypotension. The dialysate temperature and conductivity endured uncertain among the 2 groups as given in Table 1. No statistically significant difference was observed in the factors such as reuse of dialysis fluid, emergence of pyrexia, antihypertensive drug intake during dialysis and food intake among the 2 groups as indicated in Table 2.

Table 2 Comparison between hypotensive and non-hypotensive dialysis sessions

	Group I (n=103)	Group II (n=1804)	p-value
Reused dialyzers	77	1381	0.6
Anti-hypertensive medicine intake	24	573	0.07
Pyrexia during dialysis	1	72	0.18
Food intake during dialysis	100	1717	0.7
Cardiac events	4	20	0.04

DISCUSSION

In this analysis, the general intradialytic hypotension frequency was 5.4% paralleled to the internationally stated rate of 5.4%. The major analysis comprised of 44,000 dialysis in France and noted that hypotension was the utmost usual symptom in 6.9% of patients. A detailed analysis with a greater hypotension rate was observed in 8.5% of patients [12]. There is a significant reduction in the intradialytic hypotension frequency, possibly due to the use of recent dialysis machines furnished with sodium, UF profile module, trained dialysis personnel, and bicarbonate dialysate. We noted that women established intradialytic hypotension period in the symptomatic hypotensive group (p=0.001). Intradialytic weight gain is the known risk factors of intradialytic hypotension. In our analysis of group I; 2.2 ± 0.7 kg was the mean weight gain during hemodialysis sessions, in group II 2.1 ± 0.9 kg, and with 0.03 a significant p-value [13]. In one study, the hypotensive patients mean weight gain during hemodialysis sessions was 3.8 kg. According to Tang et al., The gradual increase in sodium has been linked with various side effects. The weight gain between dialysis was higher, but none of the patients noted with overloading sequences, such as pulmonary edema or congestive

heart failure. The 978 ± 636 ml/h was mean ultrafiltration rate in group I and 636 ± 367 ml/h in group II with 0.001 significant p-values [14]. In Schroeder et al study, 1471 ± 601 ml/h was the mean ultrafiltration rate in hypotensive patients. The increase in UF rate caused the fluid to withdraw rapidly from the intravascular compartment, as a result of which fluid from the interstitial spaces began to move from the intravascular compartment to compensate. Changes in fluid withdrawal, decreased cardiac output, vasoconstriction and finally intradialytic hypotension causing hypovolemia, although in our study there was a relatively low weight increase between dialysis and low ultrafiltration, the cumulative ultrafiltration (net) was higher in group II [15]. It was probably due to minor changes in blood pressure during dialysis sessions. Cardiovascular events are the main cause of morbidity and mortality during hemodialysis, which is closely related to intradialytic hypotension. In our study, 3.8% of the sessions had cardiac events in group I during dialysis. The mechanism of cardiac events was due to high UF, leading to rapid absorption of intravascular fluid and hypovolemia, peripheral vasoconstriction and myocardial ischemia.

CONCLUSION

It was concluded that during hemodialysis, hypotension was not associated with the patient's autonomic function at rest. It proposed that the structural neuronal variations are not accountable for the severe reduction of systemic vascular resistance in intradialytic hypotension.

DECLARATIONS

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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