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Intra-Dialytique Hypotension: Prevalence and Associated Factors in 2 Haemodialysis Centres in Senegal

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Abstract

Introduction: This study aimed to assess the prevalence of Intra-dialytic hypotension (IDH) according to the European Best Practice Guidelines (EBPG) definition in relation to the number of haemodialysis sessions and the number of chronic haemodialysis patients and to identify its associated factors. **Patients and Methods:** We conducted an observational, multicentre and looking-forward study of descriptive and analytical purposes over a 4-week period. The study included all patients with regular chronic haemodialysis with at least two sessions per week and a duration of 180 minutes, who consented to participate in the study and were over 15 years of age. Data collection was done with pre-established forms. The following data were collected: blood pressure before each session, at 30, 60, 120, 180 and 240 minutes of each session; socio-demographic data; dialysis data; clinical, paraclinical, therapeutic data and nursing interventions. **Results:** The mean age of the patients was 43.84 ± 12.10 years. Among 568 haemodialysis sessions recorded in 50 patients, IDH was noted in 12 haemodialysis sessions, representing a prevalence of 2.11%. Fatigue was found in 5 sessions with IDH episodes (41.66%) followed by yawning (25%), nausea ± vomiting (16.66%) and cramps (16.66%). As nursing interventions, Trendelenburg position and normal saline administration were performed in all IDH episodes. High blood pressure, inter-dialytic weight gain greater than 3 kg, Uf/H > 10 ml/kg/H, anaemia and hypoalbuminaemia were associated with the occurrence of IDH. **Conclusion:** The prevalence of IDH according to the EBPG definition is low. However, it is an important cause of morbidity and mortality, especially cardiovascular involvement, and the factors associated with its presence have been clearly identified.

Keywords

Intra-Dialytic Hypotension, Chronic Hemodialysis Patients, Dakar, Ziguinchor

1. Introduction

Intra-dialytic hypotension (IDH) has a variable definition depending on the learned academies. There are liberal definitions that require only a minimal fall in systolic blood pressure (SBP) [1] [2] and strict definitions that require a combination of clinical event and nursing intervention [3] [4] [5]. For example, the European Best Practice Guidelines (EBPG) and the Kidney Disease Improving Global Outcomes (KDOQI) have defined it as a fall in SBP ≥ 20 mmHg or a fall in mean arterial pressure (MAP) of at least 10 mmHg associated with a clinical event and the need for nursing intervention [3] [4] [5].

Clinical events are defined as the presence of nausea, dizziness, fatigue, cramps, loss of consciousness or any other complaint related to the dialysis procedure, as judged by the patient and/or the nurse and/or physician [3] [4] [5]. Nursing interventions have been defined as temporary or permanent interruption of ultrafiltration, Trendelenburg position, administration of intravenous fluids and/or discontinuation of the haemodialysis session [3] [4] [5]. IDH is a common complication in haemodialysis with a prevalence ranging from 20% to 50% depending on the study [5] [6]. It is an important cause of morbidity and mortality, especially cardiovascular [3] [7]. It occurs mainly during dialysis when the elimination of plasma fluid by ultrafiltration exceeds the vascular filling rate [8]. It is associated with several risk factors such as: large ultrafiltration volume, age over 65 years, female gender, diabetes, Hispanic ethnicity, longer dialysis time, increased body mass index (BMI), low pre-dialysis SBP [8] [9]… In Senegal, a study conducted by Fotso (2015) defining IDH by a drop in SBP > 20 mmHg, reported a prevalence of 31.4% [10]. This study aimed to assess the prevalence of IDH according to the EBPG definition and to identify its associated factors.

2. Patients and Methods

We carried out an observational, multicentre and looking-forward study of descriptive and analytical purposes over a 4-week period (16 November to 12 December 2020) at hemodialysis center of Ziguinchor in the southern of Senegal. All chronic haemodialysis patients with at least 2 sessions per week and a duration of 180 minutes, who consented to participate in the study and aged over 15 years were included. Data collection was done with pre-established forms. The first form provided information on epidemiological, medical history and comorbidities, initial kidney disease, paraclinical and therapeutic data. These data were considered as potential factors associated with IDH. The second form provided information on blood pressures (before each session, at 30, 60, 120, 180

and 240 minutes of each session), dialysis data, clinical manifestations of IDH, and nursing interventions. HID was defined according to the EBPG [3]. A patient was considered to be hypotensive when they experienced hypotensive episodes during more than 25% of their haemodialysis sessions. Inter-dialytic weight gain (IDWG) was defined as low if <4% and high if >4% of baseline weight. The Kidney Disease Improving Glogal Outcomes (KDIGO) guidelines were used for anaemia, calcemia, phosphoremia [11].

The variables were entered and analysed with Epi-info version 7.2.2.2 and SPSS software version 23.0.0. Descriptive results are presented as means and standard deviations for quantitative variables and as proportions for qualitative variables. The Chi-2 independent test allowed to compare quantitative variables by univariate analysis. The significance threshold was retained for a p-value < 0.05.

The protocol was approved by the Research Ethics Committee of the Faculty of Medicine, Pharmacy and Dentistry of Sheikh Anta Diop University. The ethical approval was registered under the number CER/UCAD/AD/MsN/10/2020.

3. Results

Fifty patients were included in the study with 1955 measurements recorded during 568 haemodialysis sessions performed (**Figure 1**). The mean age of the patients was 43.84 ± 12.10 years with a sex ratio of 0.85. The mean duration of dialysis was 68.78 ± 46.66 months. The other quantitative and qualitative data of the patients are given in **Table 1** and **Table 2** respectively.

IDH was noted during 12 out of 568 haemodialysis sessions, accounting for a prevalence of 2.11%. Four (4) patients underwent episodes of IDH standing for 8%. One patient was hypotensive (IDH episode during 6 haemodialysis sessions). Fatigue was noted in 41.66% (5/12) and yawning in 25% (3/12) of the sessions with IDH (**Figure 2**). Trendelenburg position and normal saline infusion were

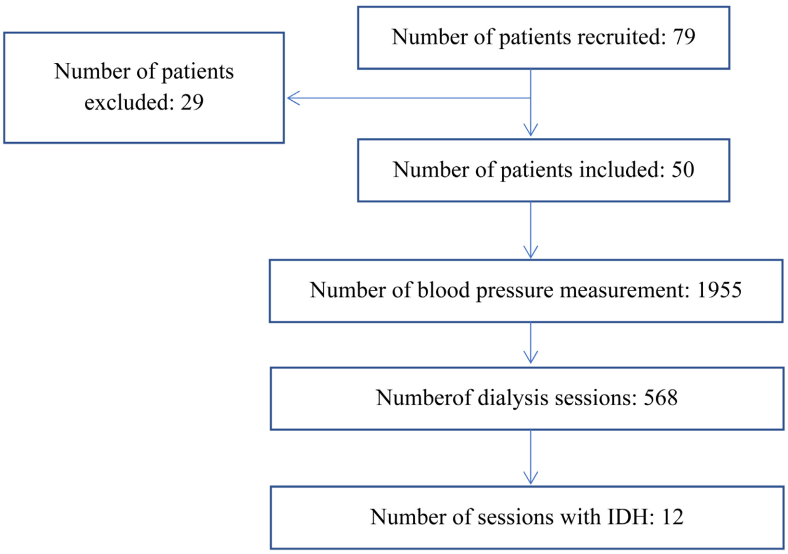

Figure 1. Flow chart of patients.

Table 1. Distribution of the 50 patients of the study population according to sociodemographic data and dialysis parameters.

Data	Means (%)
Medical history and comorbidities	
High blood pressure	(68)
Diabetes	(8)
Cardiopathies	(8)
Initial nephropathies	
Nephroangioclerosis	(40)
Indeterminate nephropathy	(28)
diabetic nephropathy	(8)
CGN of indeterminate etiology	(8)
CTIN of indeterminate etiology	(8)
post partum AKI	(8)
Parameters of dialysis	
Duration under dialysis	68.78 ± 46.66 months
Duration of dialysis sessions	239.51 ± 17.03 min
Weight baseline	64.38 ± 19.89 kg
Uf/H	0.44 ± 0.22 L/H
IDWG	2.53%
Blood outpout	305.52 ± 20.90 ml/min
Kt/V	1.46 ± 0.19
Vascular approaches	
Arterio-veinous fistula	(62)
Tunnelled jugular catheter	(30)

CGN: Chronic Glomerulonephritis; CTNI: Chronic Tubulo-Interstitial Nephropathy; IDWG: Interdialytic Weigh Gain.

Table 2. Distribution of the 50 patients of the study population according to paraclinical data.

Data	Means (%)
Biology	
Haemoglobin level	9.17 ± 2.23 g/dl
Calcemia	87.54 ± 15.83 mg/L
Albuminemia	36.68 ± 9.33 g/L
Phosphatemia	38.22 ± 13.11 mg/L

Continued

Transthoracic heart ultrasound	
Left ventricular hypertrophy	(25)
Pulmonary arterial hypertension	(15.21)
Elevated Left ventricular filling pressure	(13.02)
Impaired left ventricular injection fraction	(5.34)
Moderate	(3.26)
Severe	(2.17)
Valvulopathies	(14.14)
Valvular calcifications	(3.26)
Valvular failure	(10.86)
Cavity dilation	(10.86)
Pericardial detachment	(2.17)

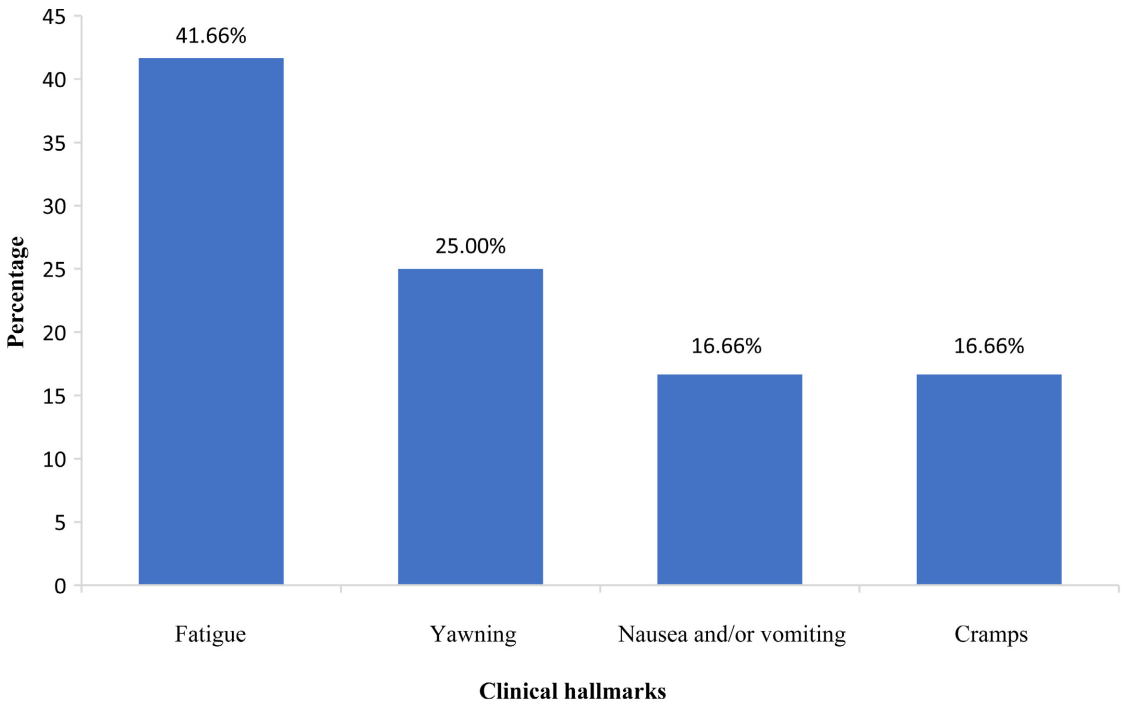

Figure 2. Distribution of the 12 haemodialysis sessions with hypotensive episodes according to clinical hallmarks.

performed during all IDH episodes. Discontinuation of haemodialysis was required in one patient. Permanent or temporary discontinuation was required in 2 patients each.

Hypertension, Interdialytic weigh gain (IDWG) > 3 kg, anemia and hypoalbuminemia were significantly associated with the occurrence of HID with respective p values of 0.047, 0.044, 0.042.

4. Discussion

Using the EBPG definition, IDH was noted in 2.11% of 568 haemodialysis sessions. In the literature, the prevalence of IDH varies depending on the definition used. In 2014, V. Bergur *et al.*, using the same definition, reported a prevalence of 31.1% [8] which is much higher than in our study. Unlike, the studies conducted by Bossola and Akhmouch and their co-workers reported a prevalence of 5% and 11.5% respectively [4] [11]. In Mali, Boubacar *et al.* reported a prevalence of 3.78% [12] which is almost similar to ours. The low prevalence of IDH in our study can be explained by the small sample size and our short follow-up time compared to the studies of Bergur and Bossola [4] [8]. Our study population was younger (43.84 ± 12.10 years Vs 64.1 ± 15.7 years), with fewer comorbidities and lower IDWG (1.8 ± 0.86 kg Vs 4.25 ± 2.24 kg). In our study, HBP, IDWG > 3 kg, anaemia and hypoalbuminemia were significantly associated with the occurrence of IDH. Johanna *et al.* reported that female gender, obesity, hypoalbuminemia and high ultrafiltration rate were associated with the occurrence of IDH [13]. Bergur *et al.* noted that age > 65 years, female gender and high IDwg were associated with the occurrence of IDH [8]. High IDWG sometimes explains why the recommended ultrafiltration rate in patients (10 ml/kg/H) is exceeded, thus partly favouring the occurrence of IDH, also hypoalbimunaemia leads to a decrease in plasma refeeling, thus resulting on IDH.

Fatigue was noted in 41.66% followed by yawning in 25%, nausea ± vomiting and cramps in 16.16% each. Johanna *et al.* reported the same symptoms but in different proportions with cramps (41.24%), followed by dizziness and yawning (29.53%), fatigue (16.03%) and nausea ± vomiting (14.56%) [14]. All these clinical hallmarks reflect contraction of the extracellular fluid, most often secondary to excessive ultrafiltration. Trendelenburg position and normal saline infusion were performed in all episodes of IDH. Our results differ from those of Johanna *et al.* [13] with Trendelenburg position and fluid administration being performed in 81.9% and 54.49% of their IDH sessions respectively.

Prevention is an important part of the management of IDH and has been a problem for a long time with the lack of consensus. With the improvement of haemodialysis techniques, prevention strategies for IDH are better known. Preventive measures include increasing blood pressure during dialysis can be achieved by lowering the temperature of the dialysate, using BVM biofeedback, whereby the dialysis monitor-generator automatically adjusts the ultrafiltration rate according to the relative blood volume, limitation of the IDWG by respecting the measures recommended by the nephrologists, the respect of the therapeutic compliance especially the hydrosodic restriction to limit the IDWG, the respect of the hourly ultrafiltration rate which should not exceed 10 ml/kg/H…

Our study has limitations, notably the small size of our population and the short follow-up time of our patients (4 weeks).

5. Conclusion

The prevalence of IDH according to the EBPG definition was low. However, it is

an important cause of morbidity and mortality, especially cardiovascular involvement, and the factors associated with its presence have been clearly identified. Prevention is an important part of management.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Zimmerman, C.Y., Ladefoged, A. and Søren, S.N. (2002) Can Haemodialysis Induced Hypotension Be Predicted. *Nephron*, **92**, 582-588. https://doi.org/10.1159/000064081

[2] Shimizu, K., Kurosawa, T. and Sanjo, T. (2008) Effect of Hyperosmolality on Vasopressin Secretion in Intradialytic Hypotension: A Mechanistic Study. *American Journal of Kidney Diseases*, **52**, 294-304. https://doi.org/10.1053/j.ajkd.2008.03.024

[3] Kooman, J., Basci, A., Pizzarelli, F., Canaud, B., *et al.* (2007) EBPG Guideline on Haemodynamic Instability. *Nephrology Dialysis Transplantation*, **22**, 22-44. https://doi.org/10.1093/ndt/gfm019

[4] Bossola, M., Laudisio, A., Antocicco, M. and Panocchia, N. (2013) Intradialytic Hypotension Is Associated with Dialytic Age in Patients on Chronic Hemodialysis. *Renal Failure*, **35**, 1260-1263. https://doi.org/10.3109/0886022X.2013.820645

[5] National Kidney Foundation (2005) K/DOQI Clinical Practice Guidelines for Cardiovascular Disease in Dialysis Patients. *American Journal of Kidney Diseases*, **45**, 16-153. https://doi.org/10.1053/j.ajkd.2005.01.019

[6] Davenport, A. (2009) Can Advances in Hemodialysis Machine Technology Prevent Intradialytic Hypotension. *Seminars in Dialysis*, **22**, 231-236. https://doi.org/10.1111/j.1525-139X.2009.00614.x

[7] Burton, J.O., Korsheed, S., Grundy, B.J. and McIntyre, C.W. (2008) Hemodialysis-Induced Left Ventricular Dysfunction Is Associated With an Increase in Ventricular Arrhythmias. *Renal Failure*, **30**, 701-709. https://doi.org/10.1093/ndt/gfm019

[8] Stefánsson, B.V. (2014) Intradialytic Hypotension and Risk of Cardiovascular Disease. *Clinical Journal of the American Society of Nephrology*, **9**, 2124-2132. https://doi.org/10.2215/CJN.02680314

[9] Nesrallah, G.E., Suri, R.S. and Thiessen-Philbrook, H. (2008) Can Extracellular Fluid Volume Expansion in Hemodialysis Patients Be Safely Reduced Using the Hemocontrol Biofeedback Algorithm: A Randomized Trial. *ASAIO Journal*, **54**, 270-274. https://doi.org/10.1097/MAT.0b013e318169271e

[10] Fotso, M.L.P. (2015) Hypotension intra-dialytique: Prévalence et facteurs associés au service de néphrologie de Dantec. Mémoire de fin d'études de néphrologie au Sénégal, N 1192.

[11] Kidney Disease Improving Global Outcomes (KDIGO) Work Group (2012) (KDIGO) Clinical Pratice Guigeline for Anemie in Chronic Kidney Disease. *Kidney International*, **2**, 279-335.

[12] Akhmouch, I., Bahadi, A., Zajjari, Y., *et al.* (2010) Characteristics of Intradialytic Hypotension: Experience of Agadir Centre-Morocco. *Saudi Journal of Kidney Diseases and Transplantation*, **21**, 756-761.

[13] Boubacar, Y. (2012) Bilan d'activités de l'unité d'hémodialyse de l'hôpital mali de

Sébenikoro de Bamako. Thèse de médecine au Mali, N 252.

[14] Kuipers, J., *et al.* (2016) Prevalence of Intradialytic Hypotension, Clinical Symptoms and Nursing Interventions: A Three-Months Prospective Study of 3818 Haemodialysis Sessions. *BMC Nephrology*, **17**, Article No. 21. https://doi.org/10.1186/s12882-016-0231-9