

# Risk Factor for Hypertension in Hemodialysis Patients

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**Abstract:** Hypertension is a major risk factor for cardiovascular and renal disease. This is a cross-sectional study involving 145 patients with chronic hemodialysis treated at the regional hospital in Fier during 2015. The prevalence of hypertension was determined by monitoring blood pressure at the beginning, mid and end of the dialysis based on systolic pressure  $\geq 140$  mmHg and/or PB diastolic (DBP)  $\geq 90$  mmHg in at least two measurements. The mean age of patients was 60.2 (13.3) years old, ranging 16 to 84 years. 65 (44.8%) of the patients were male and 80 (55.2%) of the female, ( $p=0.2$ ). The median time of patients undergoing hemodialysis is 9.8 (6.4) years, range of 1-28 years. 114 or 78.6% of total patients were diagnosed with hypertension (95% CI 71.0% - 84.97%). significant and independent predictive factors of hypertension resulted: gender-males (OR = 1.41  $p = 0.01$ ), diabetes (OR = 2.52  $p = 0.02$ ), uricemia (OR = 1.95  $p < 0.01$ ). Hypertension control, particularly systolic pressure, is crucial in patients with chronic hemodialysis.

**Keywords:** hypertension, chronic kidney disease, dialysis

## 1. Introduction

Hemodialysis patients are at high risk for CV complications. This persists as their most common cause of death. Hypertension remains the most prevalent treatable risk factor in these patients (1). Control of hypertension is important for reducing morbidity and mortality.

Hypertension is common in HD patients with a prevalence rate of approximately 90%. Appropriate BP targets for these patients remain uncertain. Studies have shown major gaps between recommended practice and real-world clinical performance in hemodialysis populations, including management and control of BP.

The measurement of BP is a simple and reproducible method. The National Kidney Foundation Kidney Disease Outcomes Quality Initiative (NKF-KDOQI) BP targets are pre-HD  $< 140/90$  mm Hg, post-HD  $< 130/80$  mm Hg (2).

Volume overload is a primary factor contributing to hypertension, and attaining true dry weight remains a priority for nephrologists. More, a wide variety of pathophysiological mechanisms are involved.

Understanding the mechanisms, evaluating, and defining the best management of blood pressure (BP) in patients receiving renal replacement therapies through hemodialysis (HD) or peritoneal dialysis (PD), is a significant challenge for healthcare professionals. Although BP is measured frequently in the dialysis treatment environment, aspects related to the measurement technique employed may be unsatisfactory. Several other tools are now available and being used in clinical trials and clinical practice to evaluate and treat elevated BP in chronic kidney disease (CKD) patients.<sup>1,2</sup> Different levels of BP may be observed in the same patient under distinct situations, which include evaluations before, during, or after the dialysis session, and at home using ambulatory BP measurements (ABPM), being

frequently and substantially lower than during dialysis measurements.<sup>3</sup>

In patients with end-stage renal disease (ESRD) receiving dialysis, elevated blood pressure is common and poorly controlled in general.<sup>4</sup> Although volume overload and sodium retention appear to be the main pathogenic mechanism of hypertension in this population, other factors such as increased arterial stiffness, activation of renin-angiotensin-aldosterone system, sleep apnea, activation of sympathetic nervous system, and use of recombinant erythropoietin may be also involved.<sup>5</sup>

The association between hypertension and cardiovascular disease risk has been well documented in the general population but in dialysis patients the associated risk is poorly understood, and still present paradoxical and unexpected reports.<sup>6</sup> The presence of stage 5-D CKD is associated with a several-fold increased risk of cardiovascular mortality, compared to age- and sex-matched controls without CKD.<sup>7</sup> Epidemiological studies have shown that systolic blood pressure (SBP), diastolic blood pressure (DBP) along with traditional risk factors for cardiovascular disease are associated with end-organ damage, including vascular stiffness and poor outcomes in dialysis patients. Indeed, increased and decreased SBP are both associated to cardiovascular disease (CVD) events and decreased SBP following previous hypertension (HTN) is also associated with adverse outcomes.<sup>8</sup> While we wait for the ongoing review of the CKD Blood Pressure KIDGO guidelines, so far there is no guideline for the dialysis population addressing this important issue. The aim of this study was to determine the risk factors of hypertension among hemodialysis patients.

## 2. Material and Methods

This is a cross-sectional study involving 145 patients with chronic hemodialysis treated at the regional hospital in Fier during 2015. The prevalence of hypertension was

determined by monitoring blood pressure at the beginning, mid and end of the dialysis based on systolic pressure  $\geq 140$  mmHg and/or PB diastolic (DBP)  $\geq 90$  mmHg in at least two measurements. The sociodemographic and clinical characteristics of the patients and pdata regarding laboratory examinations of hematological and biochemical parameters were collected from the individual charts of the patients.

### Statistical analysis

Data analysis was performed using SPSS 20.0 statistical package. Descriptive statistics of continuous variables are summarized as mean (M) and standard deviation (SD). Differences between measurements were assessed with Student t-test and Wilcoxon test. Categorical variables are presented as absolute frequency and percentage. The chi-square test and Fisher's exact test were used to compare the proportions between the categorical variables. Statistical significance was set at  $p \leq 0.05$ . Statistical tests are two-sided.

### 3. Results

The study involved 145 patients with a mean age of 60.2 (13.3) years, ranging from 16 to 84 years. 65 (44.8%) of the patients were male and 80 (55.2%) were female, ( $p=0.2$ ). In the study predominate patients  $>50$  years old with 118 (81.4%) of the total cases ( $p < 0.01$ ). 73 (50.3%) of the patients were from rural areas while 72 (49.7%) were from urban areas ( $p=0.9$ ). The average time that patients undergo hemodialysis is 9.8 (6.4) years with a range of 1-28 years. 114 or 78.6% of the total patients were diagnosed with hypertension (95% CI 71.0% - 84.97%). Regarding gender with hypertension were 49 (75.4%) of females and 64 (80%) of males ( $p=0.6$ ). The mean systolic pressure value for total pre-dialysis patients. There was no significant difference in mean values of diastolic pressure before dialysis 80.0 (19.9) mmHg, during dialysis 78.3 (10.5) mmHg and after dialysis 78.5 (11.3) mmHg ( $p=0.8$ ). In multivariate analysis of logistic regression, significant and independent predictive factors of hypertension resulted: gender-males (OR = 1.41  $p = 0.01$ ), diabetes (OR = 2.52  $p = 0.02$ ), uricemia (OR = 1.95  $p < 0.01$ ) (fig. 1). Hypertensive patients were treated with antihypertensive and fluid volume discharge medications. Salt and water retention with excess extracellular fluid volume is frequent in hemodialysis patients. Overhydration is responsible for volume and pressure overload. Extracellular volume excess is an important factor in the pathogenesis of arterial hypertension, and control of volume status by ultrafiltration and achievement of dry weight is considered an essential therapeutical approach (15) (16). Volume reduction is associated with arterial pressure reduction and with decreased LVH (17) . Reducing dietary salt intake is considered to be a fundamental intervention in this population (18) (19).

The percentage of interdialytic weight gain predicts increased pre-HD systolic BP and greater reduction in systolic BP from pre to post-HD. This is seen particularly in non-diabetics, younger patients, and those with greater estimated dry weight. We should be less aggressive with BP in older patients or those with diabetes (17).

Measurements by 24-hours ambulatory BP monitoring have shown that intensification of ultrafiltration may improve the

control of hypertension in these patients (15). But it increases the risks for arteriovenous fistula complications and CV events (20).

More frequent or longer dialysis is the ideal option for bettering BP control in HD patients. Frequent HD had significantly greater reductions in pre-HD systolic BP and number of antihypertensive medications used. A significant reduction in left ventricular (LV) mass is found with frequent HD (21) (22).

Nocturnal HD is another option suggested to improve outcomes in HD patients by offering increased dialysis time and reducing the large fluctuations in fluid shifts that occur with conventional HD. Nocturnal HD showed improvements in BP (systolic, diastolic, and mean arterial pressure) and LV mass index (23) .

For our patients, we cannot ensure in the hospital 3 dialysis sessions for all. When weight gain is important, we extend the session at 5 hours. We insist on achievement of dry weight.

The RAAS has long been implicated in the etiology of hypertension in HD patients. It has been shown that ESRD patients have higher sympathetic nervous system activity. Abnormal autonomic sympathetic nervous activity can manifest as an absence of a nocturnal dip in BP. Nocturnal or diurnal dipping in BP is frequently absent in both CKD and ESRD populations and is associated with adverse outcomes (24) .

Endothelial cell dysfunction involves disrupted balance of vasoconstrictors and vasodilators mediators, with as consequences, increased vasoconstriction.

Treatment with antihypertensive agents in ESRD patients was associated with improved CV events and mortality (25). The current recommendation is to employ a RAAS-blocking drug as the first-line agent in patients on HD (4) . In addition to their beneficial effect on BP, RAAS inhibitors improve LVH and pulse wave velocity. Additional antihypertensive agents are frequently needed for persistent hypertension, and calcium channel blockers and beta-blockers are some of the next recommended therapies (8) .

Arterial stiffness is a pathogenetic process that occurs naturally with aging, but is accentuated in ESRD. The consequence is increased SBP and pulse pressure, which contribute to LVH.

Secondary hyperparathyroidism that accompanies CKD may contribute to the high prevalence of hypertension. Systolic and diastolic BP were significantly increased in subjects with elevated parathyroid hormone (PTH). Treatment with vitamin D significantly lowered cytosolic calcium, PTH, and mean BP (4).

More, ASE used to correct the anemia associated with ESRD are also suspected of causing increases in BP by increased sensitivity to angiotensin II and adrenergic stimuli.

#### 4. Conclusions

Hypertension is highly prevalent in HD patients. It is associated with CV disease, the leading cause of mortality in HD patients.

Management of hypertension in HD patients should include the establishment and maintenance of the appropriate dry weight and limitation of interdialytic sodium/fluid intake.

Pharmacologic therapy should include RAAS inhibitors as first-line agents.

We found in our study that hypertension risk factors in HD were: males, diabetes and uricemia.

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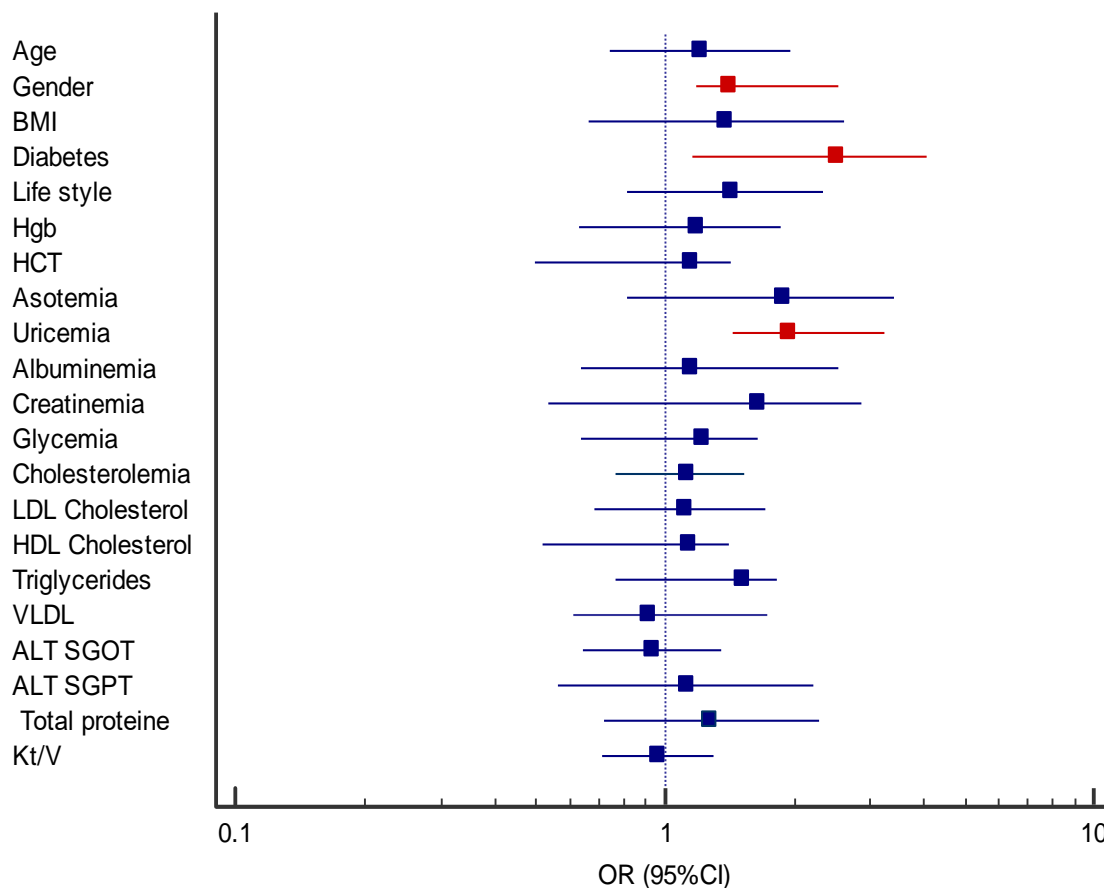


Figure 1: Independent risk factor for hypertension in HD patients