

Original Research

Ambulatory blood pressure monitoring in chronic renal failure patients- A Case Control Study

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ABSTRACT

Introduction: Hypertension is one of the leading risk factor for Chronic Kidney Disease and affects the renal outcome in these patients. Among people with hypertension, the loss of the normal fall in night time BP, called non dipping, can only be diagnosed by ambulatory BP monitoring (ABPM), and is a recognized risk factor for cardiovascular events. Non-dipping can be seen in as many as 80% of people with CKD. **Methods:** Total 100 non diabetic hypertensive chronic kidney disease patients were enrolled as cases and 100 age matched non diabetic hypertensive non kidney disease patients were enrolled as controls at Guru Nanak Dev Hospital, Amritsar over a period of 1 year. Ambulatory blood pressure monitoring, clinic BP, eGFR, and other clinical data were collected. Statistical analysis was done by using unpaired t-test for independent variables. **Results:** out of cases and controls, 120(60%) patients were found nondippers, while remaining 80(40%) had dipper BP pattern. Out of cases, 75% showed non dipping, while in controls 45% had a non-dipping pattern. Patients with non-dipping BP pattern had the worst renal function. **Conclusion:** Ambulatory blood pressure measurement allows a better risk stratification compared to clinic blood pressure measurement. Non-dipping status is closely related to severe renal damage in CKD patients. Hence 24-hr ABPM can be used as prognostic markers in non-diabetic CKD patients, and Lowering of nocturnal BP will reduce the risk of renal damage in these patient.

Key words: Hypertension, chronic renal failure.

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This article may be cited as: Singh G, Kumar S, Singh S, Kaur M, Ambulatory blood pressure monitoring in chronic renal failure patients. A Case-Control Study. HECS Int J Comm Health Med Res 2019;5(3):36-39

INTRODUCTION

Hypertension and loss of diurnal BP variation i.e. non-dipping pattern is responsible for rapid progression of renal disease. Normally, nocturnal dip (% fall in night time systolic blood pressure compared to daytime systolic blood pressure) of more than 10% occurs in night-time and this nocturnal dip is due to fall in sympathetic nervous system activity during night.¹ Patients having less than normal nocturnal decline in night-time systolic blood pressure have been termed non-dippers, while those with normal diurnal BP variation are termed dippers. Dipping ratio (mean night time SBP to mean day time SBP ratio) is more than 0.9 for non-dippers while it is 0.8 to 0.9 for dippers.² The incidence of increased nocturnal dipping of BP in CKD patients is contributed to a number of factors such as to increased sympathetic nervous system activity, volume expansion, sleep apnoea, low level of physical activity during daytime, poor sleep quality and use of antihypertensive drugs.³⁻⁹ Non dipping is associated with compensatory up shooting of BP in the early morning hours leading to a high risk of various vascular events. Hence twenty four hour mean systolic BP remains high in subjects

with non-dipper BP pattern. Hence, some of the increased target organ damage risk i.e. renal and cardiovascular disease progression associated with elevated nocturnal blood pressures (non-dipping blood pressure may simply be due to the greater 24-h BP load in non-dippers as compared to dippers.¹⁰⁻¹³ And 24-hr ambulatory blood pressure monitoring (ABPM) is superior to clinic BP monitoring in predicting the risk in hypertensive CKD patients.¹⁴⁻¹⁶

MATERIAL AND METHOD

The present case control study was conducted in Guru Nanak Dev Hospital, Amritsar to determine the incidence of non dippers in patients of non diabetic hypertensive chronic kidney disease. The subjects included in the current study were divided into cases and controls. Cases included patients having non diabetic hypertensive CKD between the age group of 18 to 60 years of either sex attending nephrology OPD in Guru Nanak Dev Hospital, Amritsar and consented for the study. While controls were age matched non diabetic hypertensive patients without CKD Cases were defined by clinic blood pressure >140/90 mmHg, while ambulatory 24-hr blood pressure >130/80 mmHg) CKD patients of stage 2 to 5 as per KDIGO

guidelines 2012 and controls had clinic blood pressure >140/90 mmHg, while ambulatory 24-hr blood pressure >130/80 mmHg). Twenty four hour ABPM, and eGFR (estimated glomerular filtration rate) were monitored. Statistical analysis was done by using unpaired t test for independent variables to find out the association between non dipping blood pressure pattern and raised risk of target organ damage in non-diabetic hypertensive CKD patients. Any patient having changes in antihypertensive therapy 2 weeks before ABPM, true normotensive persons (BP<130/80 mmHg without antihypertensive therapy), patients on dialysis treatment or renal transplantation, diabetic CKD patients, patients with renal transplant, inadequate ABPM (Number of recordings <14 and during day and <7 during night respectively) and patients having established cardio vascular disease (valvular heart disease, cardiomyopathy, acute coronary syndrome) except hypertension were excluded from the study.

On the first visit to the OPD, clinic BP of all the participants was measured 3 times at 5 minute intervals. The clinic BP taken in this study was a mean of the 6 values recorded in the 2 consecutive days in which the ABPM device for 24-hr ambulatory BP monitoring was installed and removed. The installed ABPM device recorded systolic blood pressure and diastolic blood pressure (SBP and DBP) every 30 min between 7 am to 11 pm (active period) and every 60 min between 11pm to 7 am (passive period). The BP was considered at target when daytime and night-time values were less than 135/85mmHg and less than 120/70mmHg

respectively. After this; dipping status (ratio of mean night time to mean day time SBP) was calculated. Then patients were classified into dipper and non-dipper category depending upon the dipping ratio. Dippers have dipping ratio between 0.8-0.9 while for nondippers this ratio is 0.9-1.0. Investigations collected were serum creatinine, serum urea, eGFR (Cockcroft-Gault formula), USG abdomen (renal size and echo-texture), fasting blood sugar, HbA1C, serum intact PTH, and haemoglobin. To assess the effect of hypertension on renal functions & their eGFR were recorded. The Graph Pad software version 6.0 was used for statistical analysis. The numerical data was compared by using unpaired t test for independent variables and the level of significance was considered at P value of 0.05.

RESULTS

Baseline characteristics of patients:- The demographic and clinical data of the patients at the time of starting the study are listed in Table 1 and 2. Effect of non-dipping blood pressure pattern on renal (eGFR) functions of study population:- Table 3 shows the effect of non-dipping blood pressure pattern on eGFR. Among patients, non-dippers had the mean eGFR (ml/min/1.73m²) of 80.46 ± 4.45 and dippers had 82.28 ± 3.19. The Non-dipping pattern of blood pressure in hypertensive CKD patients has more significant relationship with decline in eGFR or progression of CKD as compared to dipping pattern of BP.

Table 1: Various characteristics in dippers and non dippers

Parameters	Dippers (n=80)	Non Dippers (n=120)
Male	53	64
Female	27	56
Patients with CKD(Cases)	25	75
Patients without CKD (Controls)	55	45
Mean Age	48.58 ±7.94	47.35 ±9.78
Mean Clinic BP	146 ±17/82 ±10	142 ±15/83 ±12
Mean Ambulatory BP		
1. Mean 24 hr	1. 136 ±12/78±8	1. 133 ±9/75 ±6
2. Daytime	2. 144 ± 19/81 ±9	2. 136 ±16/79 ± 7
3. Night time	3. 130±22/76±11	3. 126±17/71±13
Mean eGFR Cases	82.28±3.19	80.46±4.45
Mean eGFR controls	104.73±5.7	102.3±4.63

Table 2: eGFR in various groups

Groups	BP	eGFR (ml/min/1.73m ²)	
		Cases	Control
Daytime BP	mean daytime SBP of 125 – 135 mm Hg	81.23 ± 3.12	103.14 ± 2.50
	mean daytime SBP of 135 – 145 mm Hg	79.29 ± 3.66	99.74 ± 2.32
	mean daytime SBP of >145 mm Hg	77.58 ± 3.62	99.88± 2.20
Night time BP	mean night-time SBP of 110 - 120 mm Hg	85.46 ± 3.63	102.43 ± 1.40
	mean night-time SBP of 120 - 135mm Hg	75.48 ± 2.13	101.02 ± 2.76
	mean night-time SBP of >135mm Hg	75.45 ± 3.76	98.50 ± 4.95

DISCUSSION

Previous studies have demonstrated that 24-hr ambulatory blood pressure monitoring is an important prognostic marker in hypertensive patients.¹⁴⁻¹⁶ Present study is done to assess the incidence of non dipping in non diabetic hypertensive CKD patients. The results of our study confirm the significance of 24-hr ambulatory BP monitoring in identifying or refuting the non-dipping pattern of BP or significant hypertension when compared with outpatient clinic BP measurement, as mentioned in a number of previous studies. The results of our study shows that non-dipping raises the target organ damage risk in non diabetic hypertensive CKD patients and the increment in risk is more in CKD patients as compared to non CKD patients. Minutolo R et al. evaluated the Prognostic Role of Ambulatory Blood Pressure Measurement in Patients with Nondialysis Chronic Kidney Disease and concluded that Office measurement of BP did not predict the risk of the renal or cardiovascular end point. Patients who were non-dippers and those who were reverse dippers had a greater risk of both end points. The result of their study demonstrates that the predictive role of ABPM is independent of other risk factors, such as diabetes mellitus, cardiovascular disease, proteinuria, haemoglobin level, and GFR. They conducted a prospective cohort study in 436 CKD patients (non-dialysis) to show the prognostic efficacy of ABPM (day & night SBP & DBP) in comparison with office measurements and they found that high nocturnal BP leads to increased renal and cardiovascular risk in CKD patients.¹⁵ Similarly in the present case control study, ABPM correlated more significantly with worsening of renal function than clinic BP in non diabetic hypertensive CKD patients. Davidson MB et al. predicted the association of impaired diurnal blood pressure variation with a subsequent decline in glomerular filtration rate and concluded that blunted diurnal blood pressure variation is associated with a subsequent deterioration in renal function that is independent of SBP load and other risk factors for renal impairment.¹⁷ Tripepi et al found that, 24-h systolic BP was also greater in subjects with higher night/day systolic ratios. Hence, some of the increased target organ damage risk associated with elevated nocturnal pressures (non-dipping) may simply be due to the greater 24-h BP load associated with this elevation.¹⁴ This is consistent with our findings that Non-dippers have overall increased risk for target organ damage because of the greater 24-hr blood pressure load as a result of elevated nocturnal blood pressure. Agarwal R et al. also concluded that Systolic ambulatory BP and non-dipping are independent predictors for ESRD after adjusting for clinic BP.¹⁶ In the present study we found that a non-dipper BP pattern was independently correlated with kidney damage in CKD patients. A high BP at night (non-dippers) impacts the heart, vasculature, and kidney, boosting damage and increasing risk of developing clinical events in CKD patients. In the present study the incidence of non dipping was significantly higher in CKD patients than controls and higher nocturnal dipping had a lower eGFR. Therefore, lowering nocturnal BP might help to reduce renal death risk in non diabetic CKD patients who have non-dipping pattern of BP. In this study non-dippers were found to have lower eGFR comparison to dippers. As 24-hr ABPM can be used as a helping parameter for adequate control of hypertension, and consequently control of nocturnal BP will lead to reduction in the risk of renal death or slow down the disease progression in CKD patients.

CONCLUSION

From our study it is very clear that 24-hr ABPM should be used in assessing patients who are at risk of further decrement in renal functions in non diabetic hypertensive CKD patients. In these, ambulatory blood pressure measurement allows a better risk stratification compared to clinic blood pressure measurement by identifying the dipping or non-dipping pattern of BP. Non-dipping blood pressure pattern is more prevalent in CKD patients. Rise in night-time SBP leads to more increment in target organ damage risk when compared to similar level of rise in daytime SBP. Non-dipping BP pattern is strongly related with increased target organ damage risk in non diabetic hypertensive CKD patients, and reduction in nocturnal BP will reduce this renal damage risk and improves the outcome.

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