

An Observational Study on Morning Dose V/S Evening Dose of Antihypertensive Drugs in Control of Blood Pressure and Outcomes

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ABSTRACT

Introduction: Hypertension is a chronic condition marked by persistently elevated arterial blood pressure, contributing significantly to global cardiovascular morbidity and mortality. While pharmacologic treatment is standard, the optimal timing of antihypertensive drug administration—morning versus evening—remains debated. This study aimed to compare the effectiveness of morning and evening dosing of antihypertensive medications in controlling blood pressure and influencing cardiovascular outcomes, medication adherence, and quality of life.

Methodology: A hospital based, single centred, observational study was conducted in the department of Cardiology, Pushpagiri Medical College Hospital, Thiruvalla, Kerala for a period of six months. The study was done in patients receiving antihypertensive therapy. A total of 300 study subjects were selected based on the inclusion and exclusion criteria.

Results: Baseline and post-treatment systolic and diastolic blood pressure showed no statistically significant differences between morning and evening groups. Adherence scores and SF-36 quality of life scores showed no significant variation between groups. The occurrence of cardiovascular outcomes, including myocardial infarction, stroke, and renal complications, was low and comparable between both groups ($p>0.05$).

Conclusion: The timing of antihypertensive drug administration, whether morning or evening, does not significantly affect blood pressure control, medication adherence, quality of life, or incidence of cardiovascular events. These findings support flexible dosing schedules based on patient convenience and clinical judgment.

Keywords: Hypertension, Blood pressure control, Morning dose, Evening dose, Medication adherence, Quality of life.

INTRODUCTION

Hypertension is a globally prevalent chronic condition characterized by persistently elevated arterial blood pressure. It significantly contributes to cardiovascular morbidity and mortality. Blood pressure, comprising systolic and diastolic components, plays a crucial role in cardiovascular risk assessment[1].

Sustained elevations—systolic ≥ 140 mmHg and/or diastolic ≥ 90 mmHg—indicate hypertension[2]. Globally, approximately 1.3 billion adults suffer from hypertension, with many unaware of their condition or inadequately treated. The prevalence is particularly high in developing countries, including India, where lifestyle changes, dietary habits, and lack of awareness contribute significantly to disease burden[3]. Though pharmacologic therapy is the cornerstone of hypertension management, recent research has questioned not just which drugs to prescribe, but also when to prescribe them. Circadian biology suggests that blood pressure exhibits daily fluctuations, typically peaking during the day and dipping at night. This has led to increasing scientific interest in chronotherapy—the alignment of medication administration with biological rhythms to improve outcomes.

Previous studies have explored the circadian rhythm of blood pressure and its implications. For example, Siddharth et al. (2024) found that evening administration of telmisartan significantly improved nocturnal blood pressure control and adherence[4]. Meanwhile, Steve V. Morant et al. (2024) reported no substantial difference in cardiovascular outcomes when accounting for patient chronotype[5]. Hypertension can lead to severe complications like myocardial infarction, renal complications, stroke. Quality of life assessments (e.g., using the SF-36) and medication adherence measures (e.g., MARS-10 scale) are gaining prominence in evaluating treatment success and long-term outcomes.

The SF-36 (Short Form 36) questionnaire is a validated and widely used tool that assesses patient-reported quality of life across multiple health domains, including physical functioning, bodily pain, general health, vitality, and emotional well-being[6]. The MARS-10 (Medication Adherence Rating Scale) is an established tool used to assess patients' compliance with prescribed therapies. Cardiovascular outcomes in hypertensive patients are directly affected by blood pressure control, adherence to medication, and quality of life. Improved adherence and enhanced quality of life have been associated with a reduced incidence of myocardial infarction, stroke, and chronic kidney disease. Studies indicate that targeted interventions addressing adherence and psychosocial well-being significantly lower hospitalization rates and cardiovascular mortality[7,8].

The study objectives are to compare the control of blood pressure in patients taking antihypertensive drugs in the morning and evening, investigate the incidence of cardiovascular events, specifically stroke, renal failure, and myocardial infarction. To assess the quality of and evaluate medication adherence using the MARS-10 scale.

MATERIALS AND METHOD

Single centered, Hospital based, Observational Study was conducted in the department of Cardiology, Pushpagiri Medical College Hospital, Thiruvalla, Kerala, India for a duration of 6 months including a total of 300 patients.

Inclusion criteria

- Age group: 18 years and above
- Both male and female patients
- Patients taking antihypertensive medications OD.
- Those who give consent voluntarily to participate in this study.
- Both IP and OP patients.

Exclusion criteria

- Patients diagnosed with Renal diseases, Stroke and Myocardial Infarction.
- Pregnant and lactating women.

A total of 300 patients (150 each) were taken, according to the formula;

$$n = 2 * \frac{(Z\alpha + Z\beta)^2 (SD)^2}{(\mu_1 - \mu_2)^2}$$

STUDY PROCEDURE

A observational study was conducted in the Department of Cardiology at Pushpagiri Medical College Hospital on the topic “An Observational Study On Morning Dose V/S Evening Dose Of Antihypertensive Drugs In Control Of Blood Pressure And Outcomes”. The entire study was carried out after getting approval from Institutional Ethics Committee. The selection was based upon the inclusion and exclusion criteria. Patient’s data collection form was used for recording the demographic details of the patient (age, gender, medical history, social history). It was a 6 months study and follow up was taken after 2 months of treatment with antihypertensives drug. Before and after the study period, the patients were evaluated by observing the changes in blood pressure, to look into incidence of stroke, renal failure, myocardial infarction.

STATISTICAL ANALYSIS

Data was properly coded and entered in Microsoft Excel and analyzed using SPSS software, version 23. Qualitative variables were summarized as frequencies and percentages, and comparisons between groups were made using the Chi-square test or Fisher’s exact test as appropriate. Quantitative variables such as systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), and SF-36 quality-of-life domain scores were expressed as mean (SD) or median (IQR), depending on data distribution. For comparison of continuous variables between two groups, independent sample t-test or Mann-Whitney U test was used based on normality. A p-value of <0.05 was considered statistically significant.

RESULTS AND DISCUSSION

The present study observed the morning dose versus evening dose of antihypertensives in control of blood pressure and outcomes.

1. Prevalence of risk factors for hypertension among the study population

The study included 300 hypertensive patients, equally divided into morning and evening dosing groups. The demographic analysis revealed that the majority of patients (39%) were in the age group of 50–60 years, with mean ages of 59.00 ± 10.21 years and 58.77 ± 10.31 years in the morning and evening groups, respectively. Females constituted a higher proportion of the population (58%) compared to males (42%). A family history of hypertension was present in 30.7% of the morning group and 28.7% of the evening group. The prevalence of alcohol use was low, reported by 10.7% and 10.0% of the morning and evening groups, respectively. Similarly, smoking was reported by 6.7% in the morning group and 8.0% in the evening group. Comorbid conditions were common, with 44.6% of patients diagnosed with diabetes mellitus and 56% with dyslipidemia.

2. Distribution of study population based on drug type.

Three types of antihypertensive drugs were used in the study: Telmisartan (40.7% of patients), Losartan (35.3%), and Cilnidipine (24%). These drugs were equally distributed between the morning and evening dosing groups.

3. Comparison of Blood Pressure Control (Morning vs. Evening Dose)

In terms of blood pressure control, both groups were comparable at baseline, with mean systolic blood pressures of 141.88 ± 15.86 mmHg (morning) and 141.05 ± 16.07 mmHg (evening), and mean diastolic pressures of 83.03 ± 10.24 mmHg and 82.51 ± 10.22 mmHg, respectively. After the follow-up period, both groups achieved similar control, with systolic blood pressure decreasing to 131.96 ± 12.61 mmHg in the morning group and 130.51 ± 12.27 mmHg in the evening group. Diastolic blood pressure decreased to 80.21 ± 7.94 mmHg and 78.99 ± 7.99 mmHg in the morning and evening groups, respectively. The reductions in both systolic and diastolic pressures were not statistically significant between groups, suggesting that the timing of antihypertensive drug administration had no substantial effect on blood pressure control. This trend was consistent across all drug types, with no significant difference observed in blood pressure reduction between morning and evening dosing within each drug subgroup. This result has strong positive correlation to the study conducted by Mackenzie IS et al.,(2022).

4. Incidence of Myocardial Infarction, Renal Failure and Stroke

The incidence of major cardiovascular and renal complications was also examined. Myocardial infarction occurred in 2.0% of the morning group and 0.7% of the evening group. Renal complications were reported in 2.7% and 2.0% of the morning and evening groups, respectively. Stroke occurred in 2.7% of patients receiving morning doses, compared to 0.7% in those receiving evening doses. These differences were not statistically significant and showed no notable variation across different drug types, indicating no advantage of one dosing time over the other in preventing such adverse outcomes. This result is positively correlated to the study conducted by Mackenzie IS et al.,(2022).

5. Quality of Life

Assessment of patients' quality of life using the SF-36 questionnaire demonstrated no significant difference between the two groups across all domains, including physical functioning, emotional well-being, pain, and general health perception. This pattern held true when analyzed by drug type, indicating that the timing of Telmisartan, Losartan, or Cilnidipine administration did not influence patient' perceived quality of life. This result is positively correlated to the study conducted by Mackenzie IS et al.,(2022).

6. Medication Adherence

Medication adherence assessed by the MARS-10 scale revealed mean scores of 7.64 ± 1.53 in the morning group and 7.72 ± 1.42 in the evening group. When broken down by drug type, all three medications showed comparable adherence levels between the dosing times. These findings indicate high and consistent levels of adherence in both groups, further supporting the conclusion that the time of drug administration does not significantly impact patient compliance, regardless of the antihypertensive drug prescribed. This result is positively correlated to the study conducted by Mackenzie IS et al.,(2022).

Table 1: Prevalence of risk factors for hypertension among the study population

Demographics		Frequency(N=300)	Percentage(%)
Age (Years)	30-40	18	6%
	40-50	38	13%
	50-60	118	39%
	60-70	93	31%
	70-80	33	11%

	Total	300	100%
Gender	Male	126	42%
	Female	174	58%
	Total	300	100%
Family History	Present	126	42%
	Absent	174	58%
	Total	300	100%
Social history	Alcoholism	31	10.3%
	Smoking	22	7.3%
	None	247	82.3%
	Total	300	100%
Comorbidities	Diabetes only	67	22.3%
	Dyslipidemia only	101	33.6%
	Both	67	22.3%
	None	65	21.6%
	Total	300	100%

Table 2: Distribution of study population based on drug type.

Study Group	Drug Type			Total
	Telmisartan	Losartan	Cilnidipine	
Morning Group	61	53	36	150
Evening Group	61	53	36	150
Total	122	106	72	300

Table 3: Comparison of Blood Pressure Control (Morning vs. Evening Dose)

Blood pressure	BP – Mean ± SD		Test Statistic[#] & P value
	Morning Dose	Evening Dose	
Systolic BP 1	141.88±15.86	141.05±16.07	Z=0.690, p=0.490
Diastolic BP 1	83.03±10.24	82.51±10.22	Z=0.785, p=0.433
Systolic BP 2	131.96±12.61	130.51±12.27	Z=1.010, p=0.313
Diastolic BP 2	80.21±7.94	78.99±7.99	Z=1.197, p=0.231
SBP difference	9.92±13.29	10.54±13.48	Z=0.284, p=0.777
DBP difference	2.81±10.48	3.52±9.40	Z=0.850, p=0.395

[#]Mann Whitney U Test

Figure 1: Comparison of baseline blood pressure

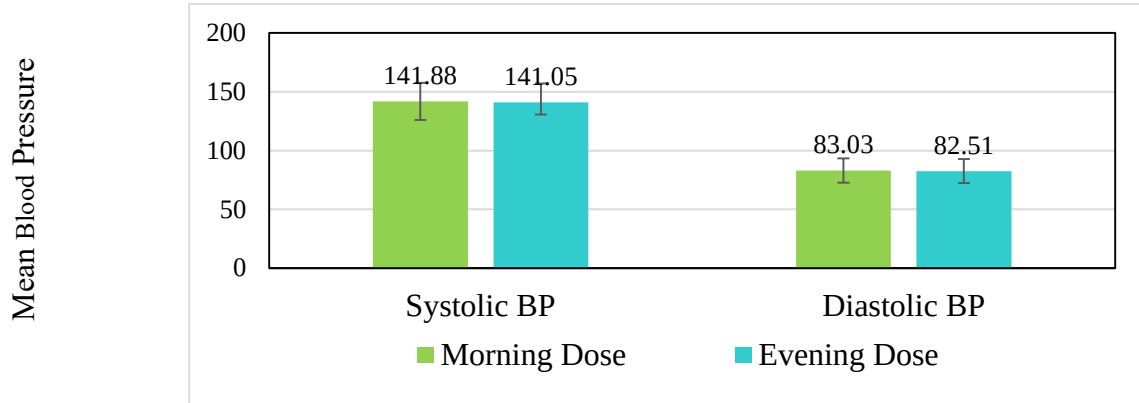


Figure 2: Comparison of blood pressure after follow up

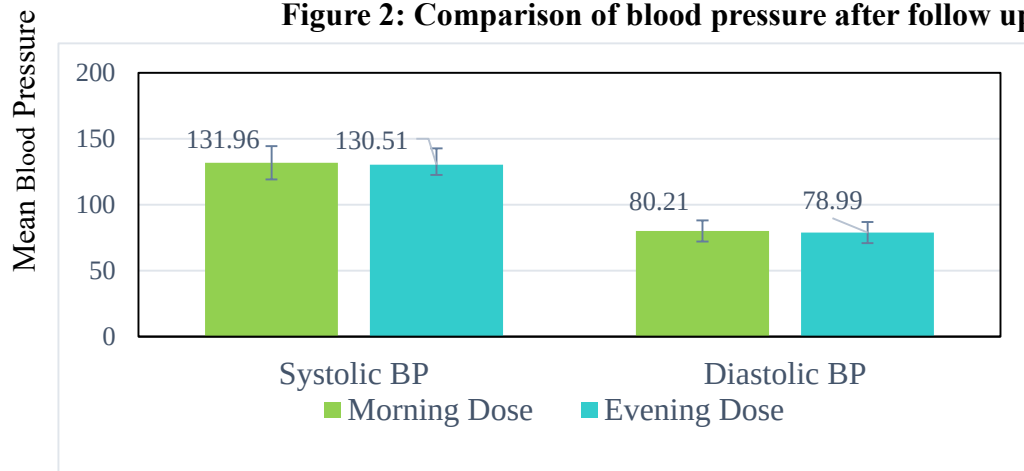


Figure 3: Comparison of change in blood pressure after follow up

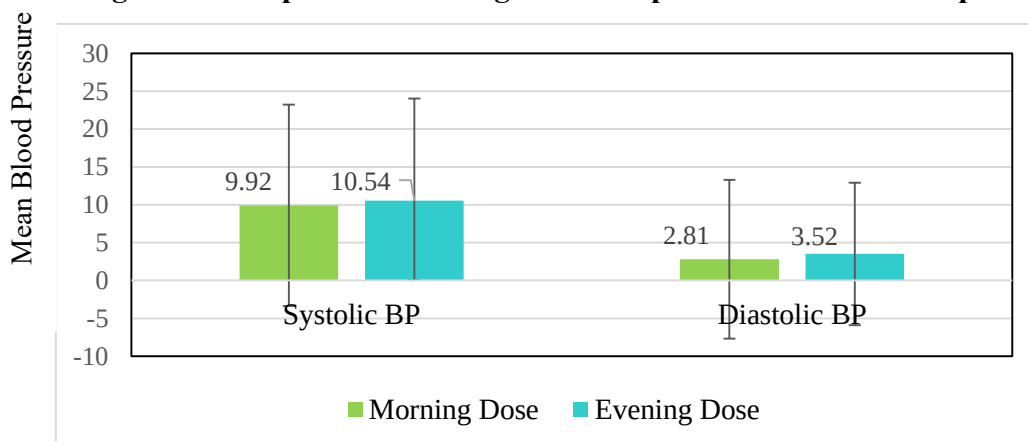


Table 4: Incidence of Myocardial Infarction, Renal Failure and Stroke

Complication	Occurrence	Morning Group	Evening Group	Test Statistic & P-Value
MI	Present	3	1	P=0.622

	Absent	147	149	
	Total	150	150	
Renal Complications	Present	4	3	p=1.000
	Absent	146	147	
	Total	150	150	
Stroke	Present	4	1	p=0.371
	Absent	146	149	
	Total	150	150	

Fisher's exact test

Table 5: Quality of Life

SF 36 Domain	SF 36 score – Mean ± SD		Test Statistic [#] & P value
	Morning Dose	Evening Dose	
Physical function	59.14±19.13	59.33± 20.02	Z=0.443, p=0.658
Role of limitations due to physical health	61.37± 34.08	63.29± 33.72	Z=0.496, p=0.620
Role of limitations due to emotional problems	65.17± 22.68	67.61±33.62	Z=0.577, p=0.564
Energy / fatigue	55.97± 12.74	55.81± 12.98	Z=0.270, p=0.787
Emotional well being	66.90± 12.05	65.27± 13.66	Z=0.742, p=0.458
Social functioning	72.91± 15.98	73.81± 17.53	Z=0.577, p=0.564
Pain	63.81± 18.19	64.49± 17.12	Z=0.288, p=0.774
General health	57.87± 13.32	54.49± 14.86	Z=1.833, p=0.067
Health change	55.13± 20.07	57.57± 18.54	Z=0.845, p=0.398

[#]Mann Whitney U Test

Table 6: Medication Adherence

Drug type	MARS Score – Mean ± SD		Test Statistic [#] & P value
	Morning Dose	Evening Dose	
Telmisartan	7.44± 1.66	7.57± 1.35	Z=0.264, p=0.792
Losartan	7.60± 1.50	7.79± 1.45	Z=0.734, p=0.463
Cilnidipine	8.03± 1.32	7.86± 1.53	Z=0.319, p=0.750
Overall	7.64± 1.53	7.72± 1.42	Z=0.377, p=0.706

[#]Mann Whitney U Test

CONCLUSION

Hypertension is a condition characterized by consistently high arterial blood pressure. The systolic BP will be more than or equal to 140mmHg and diastolic BP will be more than or equal to 90mmHg. This study of observing whether morning dose or evening dose of antihypertensive drug administration, provide flexible dosing schedules based on patient's lifestyle and convenience. As our study concludes that there is no significant impact in taking antihypertensive medications in the morning or evening, adjusting to different time zones becomes easier. It helps physicians to provide a more personalized prescribing and can streamline medication schedules especially for patients with multiple drugs, reducing complexity. Finally it will help to resolve any disputes regarding the same for the better control of blood pressure among physicians and researchers.

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