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Original Research Article

Comparison of the manual blood pressure record with ambulatory blood pressure monitoring in young patients found to be hypertensive during routine medical examination before induction to high altitude areas

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ABSTRACT

Background: Ambulatory blood pressure monitoring (ABPM) measurements has been found to be superior to Outpatient Department (OPD) blood pressure measurements (OBPM) for predicting clinical outcomes. There have been various indications of ABPM like to exclude white coat hypertension, evaluation of symptomatic hypotension and hypertension, pregnancy induced hypertension etc. We studied use of ABPM in evaluation of young subjects who were found to be hypertensive in OBPM.
Methods: This prospective study was performed at Command Hospital, Kolkata, India from December 2017 to November 2019.This study had a total of 100 subjects. All patients were young healthy individuals and found to have high blood pressure (BP) readings during routine examination done before induction to high altitude areas (>9000 feet). All subjects who were found to be hypertensive in OBPM were evaluated with 24 hours ABPM at least one week after cessation of all medications. Data expressed as the mean±SD. Comparisons of (a) the peripheral hospital mean systolic and diastolic BP over 01 week and (b) 24 hours mean ABPM.
Results: In the study, the Mean Systolic BP was 143.33±11.82 with corresponding ABPM 123.92±13.17 which is statistically significant. The mean diastolic BP was 87.30±7.20 mm with corresponding ABPM as 71.55±4.11 MAP in manual blood pressure is 125.55 mm and 103.6 mm in ABPM. The results are highly significant.
Conclusions: The study concludes that automated BP recordings may provide a more accurate estimate of a patient's BP status and may prevent unnecessary labelling of young patients as hypertensive.

Keywords: Hypertension in young, Ambulatory blood pressure monitoring, Manual blood pressure

INTRODUCTION

First ambulatory blood pressure was started when first device for ambulatory blood pressure monitoring (ABPM) was developed in 1962.[1] In the first such device, a microphone was placed over one of brachial artery, patients himself used to inflate an occlusive cuff and cuff pressures were recorded by magnetic tape recorder. In the classic study by Sokolow et al published in 1966, modified device was used. In this study it was found that there is definite relationship of ABPM and end organ damage.

ABPM measurements has been found to be superior to OPD blood pressure measurements (OBPM) for predicting clinical outcomes.[1] Hypertension has been

shown to be more closely related to ABPM compared to OPD blood pressure measurements. However, in most of the studies, benefits of treatment of hypertension are based on OPD BP monitoring. Various studies have come to conclusion that measured OPD BP is mostly higher than ABPM. It has been found that even BP measured by a physician tends to be higher than when measured by non-physician.[1]

There have been various indications of ABPM. It has been used to exclude "white coat" hypertension. It also has a role in evaluation of symptomatic hypotension and hypertension, pregnancy induced hypertension, hypertension in young and hypertension in old, drug-resistant hypertension and for treatment adequacy assessment.[2] ABPM has less within subject variability than casual OPD readings. Diagnostic Sensitivity of OBPM ranged from 51 to 91 percent, although specificity and predictive value were in closer agreement.[3] Multiple studies indicate that that ABPM is a better reference standard than OBPM.[4]

As for as Indian scenario is concerned, Kaul et al in study done on 27,472 patients, 8597 patients (31.3%) would have been wrongly diagnosed if only OBPM was considered. This misclassification percentage was higher than in those who were treated (35.2% vs. 26.7%; $p<0.0001$).[5]

In this study, we evaluated use of ABPM in evaluation of young subjects who were found to be hypertensive with manual blood pressure recordings during routine medical examination before induction to high altitude areas.

METHODS

Study population

This prospective study was performed at Command Hospital (Eastern Command) Kolkata, India, from December 2017 to November 2019.

This study had a total of 100 subjects and they had presented for evaluation of hypertension in young.[6] All patients were young healthy individuals and found to have high blood pressure readings during routine examination done before induction to high altitude areas (>9000 feet) and subsequent high blood pressure readings during next week of in hospital blood pressure records.

Inclusion criteria

In the study inclusion criteria for the selection of subjects was hypertensive with manual blood pressure recordings and age should be <40 years.

Exclusion criteria

In the study exclusion criteria for the selection of subjects was Age >40 years, Previously diagnosed hypertensive on medication, abnormal ECG or blood sugar profile and evidence of deranged kidney function. Ethical approval was not required because of nature of study.

Study protocol

Subjects were advised to stop all anti-hypertensive drugs which were initially started by primary health care centre by medical officer. All these patients were evaluated with 24 hours ABPM at least one week after cessation of all medications. Oscillometric (SpaceLabs 90202; Spacelabs, Inc., Redmond, WA) ambulatory blood pressure monitor was used for 24 hour ABPM measurements. This device took BP reading every 30 minutes from 6:00 am to 10:00 pm and at 60-minute intervals in the night (from 10:00 pm to 6:00 am).

Statistical analysis

Data expressed as the mean. Comparisons of (a) the peripheral hospital mean systolic and diastolic BP over 01 week and (b) 24 hours mean ABPM were made.

RESULTS

The present study included 100 patients between 20 and 40 years of age, who were found to have high blood pressure recordings in peripheral hospital.

This study has 100% male population in view of nature of subjects evaluated. No subject has any comorbidities. The mean age of subjects was 33 years (range 22 years to 39 years).[8] (8%) subjects had history of paternal CAD and 17 (17%) had history of maternal CAD. 17 (17%) subjects had history of hypertension in either of parents (Table 1).

Table 1: Demographic profile of the subjects.

S. no.	Variables	Readings
1	Male	100 (100%)
2	Female	00
3	Mean age	33 years
4	Family history of hypertension	17 (17%)
5	Family history of paternal coronary artery disease	8 (8%)
6	Family history of maternal coronary artery disease	17 (17%)

In our study, the Mean manual systolic BP was 143.33 mm of Hg with corresponding ABPM of 123.92 mm of Hg. The mean manual diastolic BP was 87.30 mm of Hg with corresponding ABPM as 71.55 mm of Hg. Mean arterial pressure (MAP) in manual blood pressure recordings was 125.55 mm of Hg and 103.6 mm of Hg in ABPM recordings (Table 2).

Table 2: Mean blood pressure recordings manually in OPD and with ABPM.

S. no.	OPD measurements	ABMP measurements
1	Mean OPD systolic BP	Mean ABPM systolic BP
	143.33 mm of Hg	123.92 mm of Hg
2	Mean OPD diastolic BP	Mean ABPM diastolic BP
	87.30 mm of Hg	71.55 mm of Hg
3	Mean arterial BP OPD	Mean arterial BP ABPM
	125.55 mm of Hg	103.6 mm of Hg

DISCUSSION

When we followed up all patients and we compared manual in hospital systolic BP during 1 week after initial high blood pressure reading and compared it with 24 hours ABPM done during further evaluation at tertiary care center in 3rd week of initial diagnosis of hypertension, the difference is statistically significant. Similar results were found for diastolic and MAP.

As we have stopped all medication for at least one week prior to 24 hours ABPM recordings, it is unlikely that the ABPM recordings were influenced by medications.

In study done by Sokolow et al the average difference between the mean clinic BP and the 24-hour mean of BP was 20.0 and 6.0 mm Hg for systolic and diastolic BP, respectively ($p<0.001$). The differences between clinic BP values and the diurnal means of the two cardiovascular variables were 15.6 and 1.8 mm Hg ($p<0.001$).[1] In study by Myres et al found blood pressure readings (mm Hg, mean±SEM) taken by the ABPM (155±5/88±2) to be lower than for the family physician (166±4/89±3) and the hypertension specialist (174±5/92±2; $p<0.001$). These findings corroborate with findings of our study.[7]

In study done by Kaul et al in 27,472 subjects from Indian population, 8597 patients (31.3%) would have been wrongly diagnosed if only (conventional) OBPM was considered. For patients who were not on any medication, this misclassification percentage was higher than in those who were treated (35.2% vs. 26.7%; $p<0.0001$) as we have found in our study.[5]

CONCLUSION

To conclude, manual in hospital BP was significantly higher than 24 hour ABPM. In fact, no subject of less than 40 years was found to be hypertensive during ABPM. Similar results were found for systolic, diastolic and MAP. The study concludes that automated BP recordings may provide a more accurate estimate of a patient's BP status and may eliminate the white coat effect and unnecessary labelling of young patients as hypertensive.

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Ethical approval: Not required

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