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March 2015

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## Recommended Citation

Shahab, H., Khan, H. S., Almas, A., Khan, S. A., Khan, A. H. (2015). Are BP readings taken after a patient-physician encounter in a real-world clinic scenario the lowest of all the readings in a clinic visit.. *JCPSP: Journal of the College of Physicians and Surgeons--Pakistan*, 25(3), 206-209.

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# Are BP Readings Taken After a Patient-Physician Encounter in a Real-World Clinic Scenario the Lowest of All the Readings in a Clinic Visit

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## ABSTRACT

**Objective:** To determine the difference in Blood Pressure (BP) readings taken before, during and after the clinic encounter.

**Study Design:** Descriptive study.

**Place and Duration of Study:** Cardiology Clinic, The Aga Khan University Hospital, Karachi, from January to August 2013.

**Methodology:** Hypertensive and normotensive participants aged  $\geq 18$  years were recruited. Pre-clinic BP was measured by a nurse and in-clinic BP by a physician. After 15 minutes, two post-clinic BP readings were taken at 1 minute interval. All readings were taken using Omron HEM7221-E.

**Results:** Out of 180 participants, males were 57% and 130 (71%) were hypertensive. Mean SBP (Systolic BP) taken pre-clinic, in-clinic, post-clinic 1 and post-clinic 2 were:  $126 \pm 20$  mmHg,  $131 \pm 23$  mmHg,  $126 \pm 20$  mmHg and  $121 \pm 21$  mmHg respectively ( $p < 0.001$ ). Mean DBP (Diastolic BP) taken pre-clinic, in-clinic, post-clinic 1 and post-clinic 2 were  $77 \pm 12$  mmHg,  $81 \pm 13$  mmHg,  $79 \pm 12$  mmHg and  $79 \pm 11$  mmHg respectively ( $p < 0.001$ ).

**Conclusion:** BP taken in the post-clinic setting may significantly be the lowest reading in a clinic encounter, making in-clinic BP unreliable to diagnose or manage hypertension.

**Key Words:** Hypertension. White-coat hypertension. Ambulatory blood pressure monitoring. Blood pressure.

## INTRODUCTION

Hypertension is a chronic disease of great public concern.<sup>1</sup> The National Health Survey reports that every third person in Pakistan, over the age of 45 years has hypertension.<sup>2</sup> This accounts for 25% of all deaths in the country.<sup>3</sup>

Blood Pressure (BP) reading taken in a physician's clinic becomes less reliable due to various reasons. White-coat effect is defined as an alert reaction that occurs when BP is measured by the physician, increasing the patient's basal BP and affects normotensive patients and those with sustained hypertension.<sup>4</sup> It leads to persistently higher office BP compared with the readings taken outside clinic.<sup>5</sup> Upto 33% of the patients experience this white-coat effect.<sup>6,7</sup> Anxiety associated with physician's interaction has been implied as the cause of difference in BP between nurse and physician's measurements and this is a recurrent theme in multiple

well-designed studies.<sup>8</sup> Therefore, diagnostic and treatment decisions should not be based on the reading taken by the physician in the first encounter.<sup>8</sup> The recent NICE guidelines 2011 for hypertension recommended the use of Ambulatory Blood Pressure Monitoring (ABPM) as part of the work-up protocol to diagnose hypertension,<sup>9</sup> aimed to minimize white-coat effect. This recommendation is being questioned due to its expense, 24-hour length, inconvenience and lack of widespread availability,<sup>10</sup> especially in developing countries.

The medical environment affects BP readings;<sup>11</sup> as well as the observer taking the readings as shown by the higher BP readings taken by the physician compared with those taken by the nurses.<sup>8,12,13</sup> It was hypothesized that the exact time within each clinic visit at which BP is measured may also affect reading; BP taken post-clinic may be lower as anxiety associated with the clinic visit decreases.<sup>14</sup>

Hence, this study was conducted to determine the mean difference in BP taken before, during, and after a regular clinic encounter in an attempt to find the lowest BP reading over the course of a routine clinic visit.

## METHODOLOGY

It was a descriptive study conducted from January to August 2013 in the Cardiology Clinic at the Aga Khan University Hospital, Karachi. All hypertensive or normotensive patients, aged  $\geq 18$  years, were asked to participate. Pregnant females, patients with volume loss

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Received: November 11, 2013; Accepted: November 11, 2014.

(e.g. diarrhea), taking an extra dose of antihypertensive medication or taking NSAID's were excluded.<sup>15</sup>

A minimum sample of 101 participants was required to estimate a mean difference<sup>8</sup> of 7.5 mm SBP (Systolic BP) and 2.9 mm DBP (Diastolic BP) at an alpha of 5% and a beta of 80% in BP before and after clinic visit. Keeping a dropout rate of 10%, the total minimum sample size was calculated to be 110.

Ethical approval (1994-Med-ERC-11) for the study was taken from AKUH, Ethical Review Committee. BP and pulse readings were taken at three different points in a single clinic visit. The pre-clinic reading was taken by the assessment nurse after the patients waited for 16 ± 1.7 minutes before being seen. The in-clinic reading was taken by the physician inside the clinic room after 15 ± 2.1 minutes wait. This waiting time was unavoidable due to the high patient load in each clinic and applied to each participant. After the clinic encounter was over, participants were asked to be seated, with a prohibition of smoking or exertion, for another 15 minutes in the waiting area. An interval of 15 minutes based was chosen on a study that suggested that SBP reaches a plateau phase within the first 15 minutes<sup>16</sup> and to match the time interval that the patients waited before pre-clinic and in-clinic readings were taken. After 15 ± 1.3 minutes, participants were called back to another clinic room where post-clinic readings were taken. Two post-clinic readings were taken by a research officer at an interval of 1 minute (post-clinic 1 and post-clinic 2). A standard BP measurement was observed for all four BP readings. BP was measured in the right arm at heart level, while participants were seated in a chair with a back-rest. They were asked not to talk during the time the readings were taken. All BP readings were taken using an automated and validated Omron HEM7221-E to avoid inter-observer variability. The observers taking BP for the study were the same as in a routine clinic to emphasize the clinic scenario in this study. Since the same standard procedures were followed for each reading and an automated apparatus was used, we could appreciate the changes in BP being attributed to the point in time of a clinic visit at which the readings were taken.

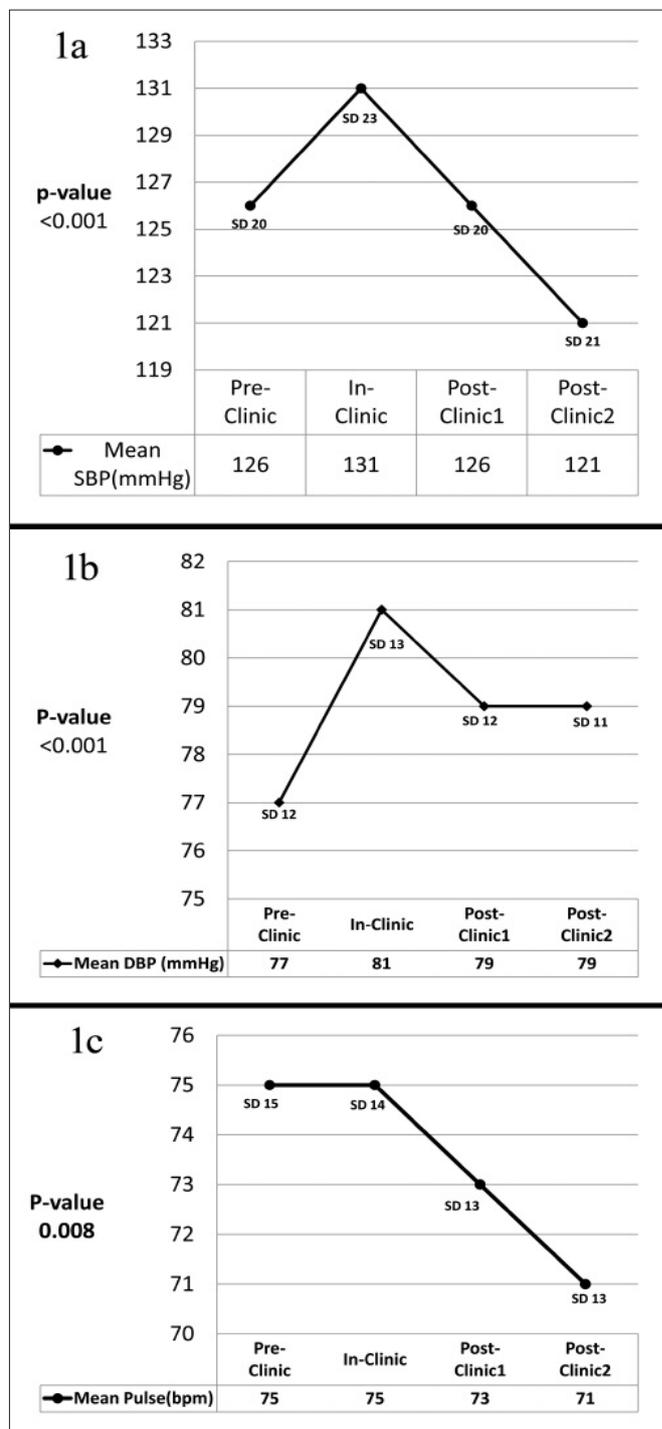
Statistical Package for Social Sciences (SPSS), version 19 was used for analysis. Mean and SD were used for quantitative variables, and frequency and percentage for categorical variables. The repeated-measure analysis of variance (ANOVA) was used to compare the mean BP at four different intervals. The p-values were calculated using greenhouse-geisser method. The differences were considered statistically significant when  $p < 0.05$ .

### RESULTS

A total of 200 patients were approached. Of these, 12 (6%) refused to participate and 8 (4%) left before the 15

minutes wait was over, the main reason being participants' shortage of time. Total sample size was 180. The mean age of participants was 57 ± 15 years; 57% were males and 71% were hypertensives.

The mean SBP, DBP and pulse values taken pre-clinic, in-clinic, post-clinic 1 and post-clinic 2 are shown in



**Figure 1 (a,b,c): (1a).** Trends of mean Systolic Blood Pressure (mmHg) amongst participants, pre-clinic, in-clinic, post-clinic 1 and post-clinic 2. **(1b).** Trends in mean Diastolic Blood Pressure (mmHg) amongst participants, pre-clinic, in-clinic, post-clinic-1 and post-clinic-2. **(1c).** Trends in mean pulse values (beats per minute) amongst participants, pre-clinic, in-clinic, post-clinic-1 and post-clinic-2.

**Table I:** Comparison of initial, in clinic, post-clinic-1 and post-clinic-2 blood pressure and pulse values.

	Initial reading Mean (SD)	Clinic reading Mean (SD)	Post-clinic reading # 1 Mean (SD)	Post-clinic reading # 2 Mean (SD)	p-value
SBP (mmHg)	125.6 (20.23)	130.9 (22.79)	125.52 (20.00)	120.92 (21.45)	< 0.001
DBP (mmHg)	76.63 (11.98)	81.33 (12.65)	79.06 (11.83)	78.78 (11.18)	< 0.001
Pulse (bpm)	75.16 (14.51)	75.25 (13.93)	72.77 (13.22)	71.47 (13.21)	0.008

Figure 1. A comparison amongst these values along with their values of significance is shown in Table I.

The post-clinic 2 SBP and DBP were 10 mmHg and 2 mmHg lower than the in-clinic SBP and DBP, respectively. The in-clinic SBP and DBP were observed to be 7 mmHg higher compared to the pre-clinic SBP and DBP. Pulse values showed a significant decrease of 4 beats per minute (bpm) from pre-clinic to post-clinic 2.

## DISCUSSION

This study showed that BP in the post-clinic setting may be the lowest out of all readings in a real-world clinic scenario. Extensive literature is available on the in-clinic BP rise, clinic BP being higher than ABP or self-measured BP readings.<sup>13,17,18</sup> Similarly, the serial decrease of BP readings over the course of a clinic visit has been studied.<sup>19,20</sup> However, the effect on patient's BP and pulse in an actual clinic, once their physician encounter ends, has not been researched thoroughly. This study showed that there was a clear cut rise in BP between pre-clinic and in-clinic readings, and subsequently, when the alert period associated with the physician's meeting was over, there was a substantial and significant decline in BP in the post-clinic period. The significantly lowered pulse readings post-clinic signified a trend towards a decrease in the alert reaction that the patient experienced initially on entering a health-care setup.

The present study results agreed with those of Ogedegbe *et al.* where the researchers had measured BP and state anxiety scores amongst patients in a hypertension clinic, stating that white-coat effect is a conditioned response.<sup>14</sup> The pattern of BP readings followed the same trend as the white-coat hypertensives in the aforementioned study, showing an almost similar drop in BP between readings taken by the physician and those taken after the physician encounter. They had shown that the state anxiety score measured in the absence of the physician is the lowest and this correlated with the lowest BP taken post-clinic shown in this study. With their findings, Ogedegbe *et al.* suggested the use of ABPM whereas we propose the use of post-clinic BP as it may overcome the BP rise believed to be associated with the anxiety related to the physician's encounter.

These results compared with those of Van der Wel *et al.* study, which showed that thirty-minute Office Blood Pressure Monitoring (30-minute OBPM) is an alternative to the 24-hour ABPM.<sup>16</sup> In this study setting where cost

and logistic constraints are cardinal, this 30-minute OBPM may not be viable. Firstly, it required a validated ABPM device which may not be universally available in most developing healthcare setups. Secondly, in a busy clinic, arranging for a separate, quiet room where BP is measured over 30 minutes may be logistically challenging. Furthermore, 30 minutes wait may not agree well with patients whereas BP readings taken 15 minutes after the patient-physician encounter, shortens the clinic stay making it a better option.

The study was conducted in an actual clinic so our methodology and results can be applied to any routine clinic. Standard and validated instruments were used to improve internal validity and to prevent inter-observer variability. Different observers recorded BP at different points in time replicating the scenario in a real clinic where one observer cannot take pre-clinic and in-clinic BP on all patients.

Hypertensive patients may behave differently with different anti-hypertensive drugs which we did not address. No reading was higher in the post-clinic period compared to in-clinic. It is possible that since all the readings were taken within the clinic, any patient exhibiting masked hypertension may not be evident in the post-clinic reading.

If the patient's post-clinic BP has decreased significantly, he/she can be seen by the physician again to make the required changes in management. Additionally, those patients with a significant post-clinic drop may be reinforced to check their BP frequently. In order to decrease the need of using the expensive and effort-intensive ABPM to diagnose hypertension, we may need to make some changes in the regular clinic logistics especially in developing countries.

In order to determine if post-clinic BP is as reliable and representative as ABPM, further studies assessing correlations with ABPM are required. This may help in validating this study and furthermore, reduce dependence on ABPM.

## CONCLUSION

BP taken in the post-clinic setting may be the lowest of all readings taken within a clinic. Therefore, it may be better than the falsely elevated in-clinic BP in diagnosing hypertension or assessing its control.

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