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Original Research Article

Accuracy of community pharmacy blood pressure measurement: a cross-sectional study

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ABSTRACT

Background: Recently, community pharmacy blood pressure measurement has gained popularity as it is easily accessible and cost-effective out-of-office method especially for blood pressure monitoring. However, it's practical applicability and clinical value has not been fully studied. This study aimed to evaluate the accuracy of community pharmacy blood pressure measurement.
Methods: Study participants were adults (390) who measured their blood pressure at different community pharmacies and came to the emergency departments (for confirmation of their blood pressure reading on the same day) of eight major hospitals in Baghdad, Iraq 2024. Participants were directly interviewed and blood pressure measured according to guidelines.
Results: The mean age was (44.8±14.2) years of whom (58.7%) were males. The sensitivity was (85.1%), specificity (9.1%), positive and negative predictive values (22.9%, 65.9%), respectively. Paired t test showed significant difference between both systolic and diastolic blood pressure measurements in pharmacies (156.4±21.7 and 91.9±14.2, respectively) and hospital (122.7±15.4 and 77.4±9.50, respectively) ($p<0.001$). Pearson's correlation test showed that there was mild positive correlation between measurements in hospital with body mass index (BMI) ($r=0.20$, $p=0.005$ and $r=0.22$, $p<0.005$, respectively).
Conclusions: Community pharmacy blood pressure measurement lack accuracy. Further detailed studies are needed.

Keywords: Blood pressure measurement, Community pharmacy blood pressure, Cross-sectional study, Hypertension

INTRODUCTION

Hypertension (HTN) is a common health problem that affects roughly about 30% of people globally (two-thirds of them living in low and middle income countries) and is the most commonly diagnosed condition during outpatient office visits.[1] About half of adults with HTN are unaware that they have the condition and about 80% of those diagnosed with HTN have their blood pressure uncontrolled.[2] HTN is a major risk factor for cardiovascular (CV) diseases (e.g. myocardial ischemia and heart failure), stroke, and chronic kidney disease.[3] In low and middle income countries, about two third of deaths from CV diseases were attributed to HTN. Screening for HTN helps improving BP control and substantially reduce the incidence of CV diseases.[4] U.S. preventive services task force (USPSTF), The American Heart Association (AHA) and the American Academy of Family Physicians (AAFP), recommended using office BP as initial BP screening (in adults18 years or older) with an outside of the clinical setting measurements (home blood pressure monitoring (HBM) and ambulatory blood pressure monitoring (ABM)) to confirm a HTN diagnosis. People then categorized into normal, high normal and HTN (stage 1, 2 and 3) and every category will require follow up interval (taking into account the CV risk) in order to control blood pressure and reduce complications.[4,5]

Community pharmacists are instrumental in managing HTN and their interventions, specifically focused on education, monitoring of medications, BP measurement and chasing CV risk factors, have proved to enhance BP control.[6] The need to add pharmacists to the BP telemonitoring system is being increasingly in demand especially since the onset of the COVID-19 pandemic, however, if pharmacist BP telemonitoring will improve BP control compared to office-based usual care, still in question.[7] Recent guidelines supported the engagement of non-physician health care professionals (such as pharmacists and nurses) in the care team for the management of HTN as it could be useful for understaffed and resource-poor health systems.[8] Any device that is validated, well maintained and properly calibrated can be used for BP measurement.[9] In Iraq, the prevalence of HTN is about 36.6% and the BP in one third were uncontrolled in addition to high prevalence of all risk factors for non-communicable diseases (NCD).[10,11]

Recently in Iraq, community pharmacy BP measurement (CPBP) has gained popularity as it is easily accessed by patients, offers cost and is useful for screening and follow-up purposes. However, it's practical applicability and clinical value has not been fully studied. This study aimed to evaluate if CPBP in Iraq is providing an accurate result when compared to the gold standard measuring technique as outlined by international recommendations. This study importance goes in line with guidelines about pharmacies as a result of their popularity and significant role in relieving burden on the under resourced health facilities in addition to improving overall HTN early diagnosis and reduces complications. Up to our knowledge, no study was done in Iraq to assess CPBP.

METHODS

A cross-sectional study was done for the period from December 2022 to March 2023. Data were collected (using multistage random sampling technique) from emergency departments of eight hospitals evenly distributed throughout Baghdad, Iraq (four hospitals from each; Alkerch and Alrusfa). All participants (390) (using single proportion formula to calculate sample size) were directly interviewed and data filled in a specially constructed questionnaire. Study participants were all adults who visited emergency department for confirmation of CPBP on the same day and without taking any act to change blood pressure after the first BP measurement. Three measurements of BP were taken (2 or 3 minutes apart) on the control arm (the arm on which the CPBP measurement was done) using a clinically validated mercury sphygmomanometers with a cuff adaptable to large (32–42 cm), medium (23–31 cm), and small (17–22 cm) arm circumferences. BP was measured according to the international recommendations and HTN defined as systolic blood pressure (SBP) more than140 mmHg and/or diastolic blood pressure (DBP) more than 90 mmHg.[12,13] Height was measured using a height tape measure with an approximation of ±0.1 cm and the body mass index (BMI) was calculated as body weight/height² (kg/m²).

Data analysis

Data were entered and analyzed using statistical package for the social sciences (SPSS) version 25. Mean and standard deviation used to analyze quantitative data, paired t test and Pearson's correlation were used to compare BP measurements. Sensitivity, specificity, positive predictive and negative predictive values used to assess accuracy. P value ≤0.05 considered statistically significant.

RESULTS

Of those with HTN, 24.7% have their BP uncontrolled, and the prevalence of unaware high BP was 29.1 (Figure 1). The mean age of study participants was (44.8±14.2) years of whom 58.7% were males. The mean BMI was (27.3±4.81). 74.4% were non-smokers, 14.6% illiterate, and 73.6% with known history of HTN (Table 1).

Table 1: Socio-demographic characteristics of study population.

Variable	N	%
Age (mean±SD)	44.8±14.2 years	
BMI (mean±SD)	27.3±4.81	
Sex		
Male	229	58.7
Female	161	41.3
Marital status		
Married	261	66.9
Unmarried	90	23.1
Others	39	10.0
Education		
Illiterate	57	14.6
Primary school	93	23.8
Secondary school	135	34.6
Higher education	105	26.9
Smoking		
Yes	71	18.2
No	290	74.4
Ex-smoker	29	7.4
Hypertension		
Yes	287	73.6
No	103	26.4

*Continuous variables were presented as mean±SD or and categorical variables were expressed with number (proportion, %).

The sensitivity was (85.1%), specificity (9.1%), positive and negative predictive values (22.9%, 65.9%), respectively (Table 2).

Paired t test showed significant difference in mean of systolic and diastolic BP measurements in pharmacies (156.4±21.7 and 91.9±14.2, respectively) and hospital

(122.7±15.4 and 77.4±9.50, respectively) (p<0.001) (Table 3).

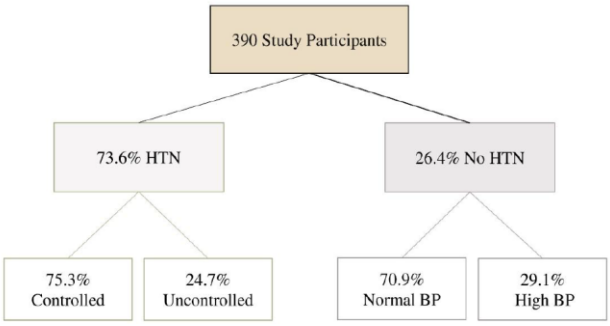

Figure 1: Flow chart of study participants according to the past history of hypertension.
HTN=Hypertension, BP=blood pressure.

Table 2: Accuracy of CPBP.

Pharmacy BP	Hospital BP		Total
	Normal	High	
Normal	27	14	41
High	269	80	349
Total	296	94	490

Sensitivity 85.1%, specificity 9.1%, positive predictive value 22.9%, and negative predictive value 65.9%.

Table 3: Blood pressure measurements in pharmacies and hospitals (mm Hg)*.

Parameters	Pharmacy	Hospital	Significance
SBP**	156.4±21.7	122.7±15.4	P<0.001
DBP***	91.9±14.2	77. 4±9.50	P<0.001

*Paired t test, **range (100-230 mm Hg pharmacy, 86-170 mm Hg hospital), ***range (60-130 mm Hg pharmacy, 50-110 mm Hg hospital).

Pearson's correlation test showed that there is mild positive correlation between both (SBP and DBP) measurements in hospital with BMI (r=0.20, p=0.005 and r=0.22, p<0.005, respectively) in contrast to no correlation in pharmacy measurement (r=0.03, p=0.61 and r=0.027, p=0.65, respectively) (Table 4).

Table 4: Correlation between BMI and BP (systolic and diastolic) measurements in Pharmacies and hospital.

Variables	Pearson r	Significance
Pharmacy SBP	0.030	P=0.613
Pharmacy DBP	0.027	P=0.649
Hospital SBP	0.202	P=0.001
Hospital DBP	0.220	P<0.001

Presence of symptoms was the main reason that made 87.7% of participants check their BP (Figure 2). Of these symptoms, headache was the most frequent (Figure 3).

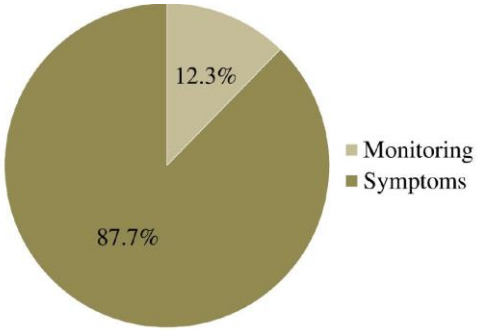

Figure 2: Reason why to measure blood pressure.

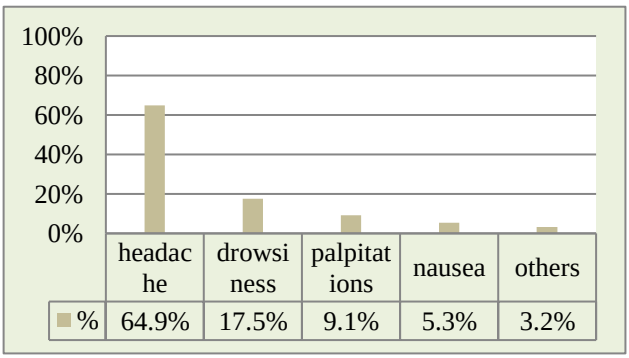

Figure 3: Distribution of the sample according to presenting symptoms.

DISCUSSION

Recently in Iraq, BP measurements in pharmacies became increasingly used for either initial check (or even diagnosis) or monitoring of HTN. The drive for this increasing attitude in making pharmacies more frequently visited places compared to other health care facilities might be attributed to a variety of reasons; the most important one being the crowded and sparse health care centers (whether primary health care centers or hospitals) compared to the abundant number of pharmacies. For example, 2017 WHO statistics showed that in Iraq, there are 0.8 physicians (became one physician in 2020), 1.3 hospital beds and 1.8 nurses per 1000 people.[14] Of other reasons are the high cost of private doctors or hospitals visits and an appointment is generally required to be seen for a BP measurement. However, the usefulness of the CPBP method in the diagnosis or follow up of HTN has never been addressed. In this study, there was a statistically significant difference in the mean systolic and diastolic BP measurements between CPBP and OBP, being higher with the former. This finding contradicts what was concluded from six studies that there was no significant difference when comparing mean systolic CPBP to general practitioner clinic measurements.[15-20] Inaccurate and lack of device standardization with absence of standardized technique for BP measurement are very common reasons for this discrepancy in the findings.

Furthermore, in the present study, the low sensitivity, specificity, negative and positive predictive values of

CPBP also might be due to numerous factors; the quality of personnel working in pharmacies, the methods for measuring BP and even the type and calibration of the BP device. Accurate and reproducible blood BP is essential for the diagnosis and monitoring of HTN.[21] In addition, Health care providers are more accurate than pharmacists (in BP measurement) first because of proper training, frequent daily practice and proper environment. Second, there is no training for BP measurements in the college of pharmacy curriculum in Iraq neither BP measurement training courses.[22] Pearson's correlation test showed that there is mild positive correlation between both (SBP and DBP) measurements in hospital with BMI (r=0.20, p=0.005 and r=0.22, p<0.005, respectively) in contrast to no correlation in pharmacy measurement (r=0.03, p=0.61 and r=0.027, p=0.65, respectively). A well-known positive relationship between BMI and blood pressure do exist.[23] A large cross sectional study done at China (included 1.7 million adults aged 35-80 years from 141 primary health care sites, showed that there was positive association between BP and BMI.[24] furthermore, this finding also supports the low accuracy of CPBP.

About two thirds of study participants measure their BP when they have headache. One study showed that only 15-20% of patients with untreated HTN reported headache, with headache being primarily associated with very high or sudden elevations in blood pressure.[25,26] This misconception may reflect the poor health knowledge about HTN which is common problem in both the developing and developed world.[27] Health knowledge is an important step in for HTN diagnosis and control as the treatment of HTN predominantly depends on the patient's perception of HTN and understanding level.[28] In addition, 87.7% of the study participants (who are hypertensives) only measure their BP when they have symptoms (e.g. headache, drowsiness, and palpation) and this again mandate to strengthen health education strategies. One study showed that about half (56%) of hypertensive participants actually reported symptoms.[29]

The prevalence of uncontrolled HTN was 24.7% and that falls in agreement with other studies done in Iraq.[30,31] Inclusion of pharmacists and other non-physician health care professionals, enhancing health education and improving the accuracy of CPBP monitoring is of the methods to improve BP control among individuals.

We believed that no study was done to assess CPBP in Iraq (despite its important health consequences). This study selected emergency units randomly that cover entire the capital Baghdad in which more than ten million of inhabitants lives with different ethnicity, a condition which enhances generalization of the results. However, of the study limitations, besides being a cross sectional study lacking causality, we relied on OBP only as the reference method for BP measurement as it is done by well-trained doctors or other health staff. Additionally, this study included only those who made headway to hospital in order to ascertain their BP measurements, so we recommend further studies to explore the prevalence of those who are satisfied with CPBP measurement only.

CONCLUSION

CPBP lack accuracy compared to OBP, and because of their important role in HTN management, control strategies to improve quality and policies to monitor BP measurement in pharmacies should be taken.

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