Scientific Research Publishing

World Journal of Cardiovascular Diseases, 2017, 7, 442-450
http://www.scirp.org/journal/wjcd
ISSN Online: 2164-5337
ISSN Print: 2164-5329

Contribution of Ambulatory Blood Pressure Monitoring to the Management of Arterial Hypertension at Blaise Compaoré University Hospital

Yibar Kambiré[1,2*], Georges Kinda[2], Georges R.C. Milllogo[2,3], Lassina Konaté[1], Issa Diallo[1], K. Jonas Kologo[2,3], Jean-Baptiste Tougouma[4], Germain D. Mandi[1], R. Aristide Yaméogo[1], Salifou Yaogo[1], Caleb Tindano[3], André K. Samadoulougou[2,3], Patrice Zabsonré[2,3]

[1]Department of Medicine and Medical Specialties, Blaise COMPAORE University Hospital, Ouagadougou, Burkina Faso
[2]Department of Health Sciences, University of Ouagadougou, Ouagadougou, Burkina Faso
[3]Cardiology Department, Yalgado Ouédraogo University Hospital, Ouagadougou, Burkina Faso
[4]Cardiology Department, Sourô Sanou University Hospital, Bobo-Dioulasso, Burkina Faso
Email: *kambirey@yahoo.fr

How to cite this paper: Kambiré, Y., Kinda, G., Milllogo, G.R.C., Konaté, L., Diallo, I., Kologo, K.J., Tougouma, J.-B., Mandi, G.D., Yaméogo, R.A., Yaogo, S., Tindano, C., Samadoulougou, A.K. and Zabsonré, P. (2017) Contribution of Ambulatory Blood Pressure Monitoring to the Management of Arterial Hypertension at Blaise Compaoré University Hospital. *World Journal of Cardiovascular Diseases*, **7**, 442-450.
https://doi.org/10.4236/wjcd.2017.712043

Received: November 10, 2017
Accepted: December 11, 2017
Published: December 14, 2017

Abstract

Background: Hypertension is a major public health concern in Burkina Faso. Its management relies on in-office medical setting blood pressure monitoring which is known to be an imperfect diagnosis tool. **Objective:** This study aims to assess the contribution of ambulatory blood pressure monitoring in the management of hypertension at Blaise Compaoré University Hospital. **Methods:** A monocentric descriptive retrospective study was conducted in the cardiology outpatient unit of Blaise Compaoré University Hospital. Patients aged at least 18 years who underwent ambulatory blood pressure monitoring between March 2013 and June 2015 were enrolled. Hypertension was defined as follows: average blood pressure over 24 hours > 130/80 mmHg, or diurnal blood pressure > 135/85 mmHg, or nocturnal blood pressure >120/70 mmHg. Data were analyzed using the SPSS 20.0 software. The threshold for significance was set at 5% for a validity interval at 95%. Chi square test was used for the statistical analysis. **Results:** A total of 122 patients were enrolled. The main reasons for ambulatory monitoring were the evaluation of hypertensive therapy (51.6%) and the diagnosis confirmation (39.3%). The results of the ambulatory monitoring found 61.4% of the patients with hypertension and 37.7% with normal blood pressure. A treatment adjustment was made for 36.1% of the patients; an initiation of antihypertensive therapy was undertaken for 24.6%, an abstention from drug therapy was recommended for

23.8%, and the pursuit of previous treatment for 13.1% of the patients. **Conclusion:** Ambulatory blood pressure monitoring should be used more often in order to optimize the management of hypertension in our current practice.

Keywords

Hypertension, Diagnosis, Treatment, Ambulatory Monitoring, Africa

1. Introduction

Hypertension is the most common cardiovascular risk factor. It is a major public health concern with an overall prevalence of 17.6% and an urban prevalence of 24.6% among people whose age is between 25 and 64 years [1]. It is the most common reason for cardiology consultations nationwide. Its diagnosis and management are based on an in-office medical setting blood pressure monitoring in most cases. Although in-office medical setting blood pressure check is the most common practice for most patients, it does not detect a number of clinical forms. Thus, the 24-hour ambulatory blood pressure monitoring (ABPM) allows a better assessment of those clinical particularities. Some scientific societies recommend a systematic use of the ABPM to confirm high blood pressure prior to initiating any medication in the mild to moderate hypertension cases [2]. This study aims to assess the contribution of the ABPM in the management of hypertension at Blaise Compaoré University Hospital at Ouagadougou (Burkina Faso). There has been no prior study about this subject in our environment.

2. Methods

We conducted a retrospective and descriptive study in the department of medicine and medical specialties at Blaise Compaoré University Hospital. Patients underwent an ABPM as part of outpatient hypertension regular follow-up; they were at least 18-year-old and enrolled consecutively from March 2013 to June 2015.

Blood pressure was recorded every 15 minutes during daytime and every 30 minutes during the night. The daytime went from 6 AM to 10 PM and the night from 10 PM to 6 AM. The patients' final enrollments which have been taken into account in the study were those who had been recorded for at least 24-hours with at least 48 valid measures recorded during the daytime and at night. Hypertension was defined following one of the followings conditions: a 24-hour BP > 130/80 mmHg, a daytime BP > 135/85 mmHg, and a night time BP > 120/70 mmHg. Recordings that lasted more than 2 hours were not taken into account in the study. Also, patients with incomplete data on socio-demographic parameters or cardiovascular risk factors and those who came from other hospitals only for ABPM were excluded from the study.

2.1. Data Collection

Data were collected retrospectively through a collection sheet and from patients' medical records. In addition to ABPM data, we collected sociodemographic features, cardiovascular risk factors, and therapeutic attitude following an ABPM. We also collected para-clinical exams results in the light of World Health Organization recommendations on minimal lab work for hypertension [3] whenever those tests were available. In the same way, transthoracic echocardiography, arterial Doppler imaging, and eye-exam based on lab availability were collected.

2.2. Data Analysis

Data were recorded and analyzed using the SPSS 20.0 software. Values were expressed in terms of averages ± standard deviation, median and the extreme values for the quantitative variables, and in terms of relative frequency for the qualitative variables. Chi square test was used for the statistical analysis. The threshold for significance was a p-value < 5% for a 95% validity interval.

3. Results

One hundred and thirty-two (132) patients benefitted from an ABPM throughout our study period. Ten (10) patients were excluded according to the exclusion criteria. So 122 patients were enrolled in this study. There were 86 women (70.5%) and 36 men (29.5%) with a sex ratio of 0.42. The average age of the patients was 51.5 ± 14.1 years (25 - 88) with a median of 50 years. The majority of the patients were living in urban areas (81.1%) and they were from low- to middle-income class in 93.4% cases.

The average time lag between the prescription and the recording of ABPM was 8.5 ± 21.1 days (range 0 to 120). The average body mass index of our patients was 28.9 ± 5.5 kg/m^2 (range 17.30 to 49.5). Without taking any consideration of sex into, 86.9% of the patients showed at least one cardiovascular risk. The **Table 1** summarizes all the cardiovascular risk factors found on our patients. Hypertension was reported on 76 patients (62.3%) among whom 61 (80.3%) with medical follow-up. The number of anti-hypertensive drugs per patient recorded was 1.8 ± 1.3 (range 0 to 5). Five patients (4.1%) had a history of cardiovascular troubles.

3.1. Indications for ABPM

The main indications for ABPM were the therapeutic assessment (51.6%) and the diagnosis confirmation (39.3%). All the indications for ABPM are reported in **Figure 1**.

3.2. Blood Pressure Features in Our Patients

The in-office medical setting systolic blood pressure average of our patients was 157.44 ± 24.11 mmHg (107 - 249) and the diastolic blood pressure one was 94.40 ± 14.28 mmHg (60 - 154) prior to the ABPM. The average value for the systolic

Table 1. Cardiovascular risk factors in 122 patients who underwent Ambulatory Blood Pressure Monitoring at Blaise Compaoré University Hospital.

Risk Factors	Number (N = 122)	Percentage (%)
Recorded hypertension	76	62.3
Age	46	37.7
Diabetes*	12	9.8
Smoking	2	1.6
Dyslipidemia	6	4.9
Obesity	35	28.5
Overweight	44	35.8
Alcohol consumption	10	8.2
Heredity	13	10.7
Metabolic syndrome	13	10.7
Pregnancy†	7	5.7

*3/4 of diabetic patients had type 2 diabetes. †Hypertension was revealed during pregnancy.

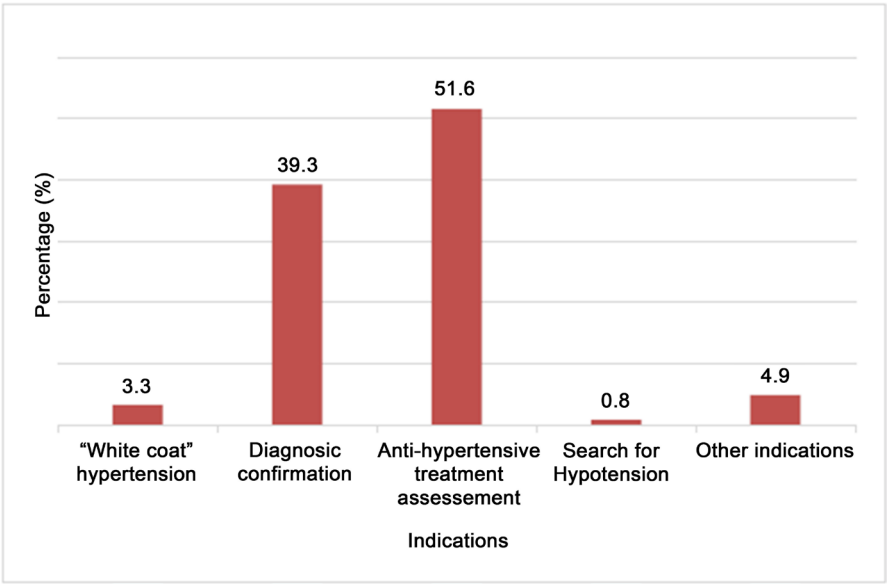

Figure 1. Indications of Ambulatory Blood Pressure Monitoring in 122 patients at Blaise Compaoré University Hospital.

blood pressure for a 24-hour ABPM was 131.79 ± 14.56 mmHg (97 - 173) and that of the diastolic blood pressure was 80.89 ± 10.23 mmHg (62 - 108). The blood pressure differential was 50.83 ± 9.59 mmHg (30 - 78). Forty-two patients (34.4%) were dippers. Patients' blood pressure features are summarized in **Table 2**. ABPM detected 75 patients (61.4%) with hypertension that was systolic and diastolic in 58 cases (77.3%), exclusively systolic in 16 cases (21.3%), and exclusively diastolic in two (2) cases (2.6%). **Table 3** summarizes the different diagnoses made after using an ABPM. Hypertension was confirmed on 36 patients out of 48 (75%) who underwent the monitoring for diagnostic purposes. Uncon-

trolled hypertension was confirmed on 39 patients (61.9%) out of 63 who underwent the monitoring for therapeutic purposes against 38.1% for well-controlled hypertension.

3.3. Para-Clinical Exams and Target Organ Damages

Electrocardiograms (ECG) were available with 57 patients (46.7%) revealing

Table 2. Blood pressure features on 122 patients who underwent Ambulatory Blood Pressure Monitoring at Blaise Compaoré University Hospital.

Parameters	Minimum (mmHg)	Maximum (mmHg)	Average (standard-deviation) (mmHg)
24 hour systolic blood pressure	97.00	173.00	131.79 (14.52)
24 hour diastolic blood pressure	62.00	108.00	80.89 (10.23)
24 hour heart rate	47.00	111.00	77. 54 (10.50)
Diurnal systolic blood pressure	96.00	179.00	133.35 (14.77)
Nocturnal systolic blood pressure	92.00	184.00	128.47 (16.30)
Diurnal diastolic blood pressure	62.00	113.00	83.03 (11.04)
Nocturnal diastolic blood pressure	56	120	76.38 (10.61)
Smoothness index	0.64	0.89	0.780 (0.048)
Average arterial pressure	78.00	130.00	99.75 (11.10)
Differential pressure	30.00	78.00	50.83 (9.59)
Morning rise	0.00	68.33	21.34 (14.45)

Table 3. Recorded diagnoses at the end of the Ambulatory Blood Pressure Monitoring at Blaise Compaoré University Hospital.

Diagnosis	Number (N = 122)	Percentage (%)
NORMAL BLOOD PRESSURE	**46**	**37.7**
No past history of confirmed hypertension	19	15.6
"*white coat*" *hypertension*	8	6.6
Controlled hypertension	19	15.6
HYPERTENSION*	**75**	**61.4**
New onset hypertension	**35**	**28.7**
Uncontrolled hypertension**	**39**	**32.0**
Hypertension with "white coat effect"†	6	4.9
Resistant hypertension	8	6.6
Other type of uncontrolled hypertension	25	20.5
Masked hypertension	**1**	**0.8**
HYPOTENSION	**1**	**0.8**
Total	**122**	**100**

*Hypertension includes new onset hypertension, uncontrolled hypertension and masked hypertension. **Uncontrolled hypertension = Hypertension which is not controlled under drug therapy including 8 cases (6.6%) of resistant hypertension and 6 cases (4.9%) of hypertension with "white coat effect". †Hypertension with "white coat effect" = Uncontrolled hypertension under drug therapy with an in-office increase of blood pressure.

abnormalities in 15 cases (26.3%). The main pathological findings reported on ECG were left ventricular hypertrophy (14%), abnormal repolarization (12.3%) and left atrial hypertrophy (5.3%).

Transthoracic echocardiography was available with 30 patients (24.6%) among which 9 cases were found normal (30%). Left ventricular hypertrophy was reported in five patients (16.7%). The diagnosis of hypertensive cardiopathy was carried out on six patients out of 30 (20%). Lab works were performed including blood creatinine levels on 67 patients (54.9%). The other tests were the blood sugar test, the metabolic panel, the lipid blood test, and the 24-hour proteinuria one respectively reported on 53.3%; 41%; 36.1% and 21.3% of the patients.

Target organ damages were reported in 24 cases (19.7%) based on past medical history and available WHO minimal labs. Those damages consisted in 10 cases (8.1%) of electrocardiographic and/or echocardiographic abnormalities, nine cases (7.3%) of hypertensive nephropathy, two cases (1.6%) of hypertensive cardio-nephropathy, and three cases (2.5%) of stroke.

3.4. Therapeutic Implication of the ABPM

The therapeutic adjustment was made on 44 patients (36.1%) based on an ABPM analysis; an anti-hypertensive drug therapy was started on 30 patients (24.6%), an abstention from drug therapy for 29 patients (23.8%) and no therapeutic change for 16 patients (13.1%). The main reason for therapeutic changes on 44 patients was the uncontrolled blood pressure in 38 cases (86.4%). The therapeutic changes consisted in an addition of molecules for 23 patients (52.3%) or a change of molecules for 16 patients (36.4%). The other therapeutic changes were the multi-drug therapy for four patients (9%), the increase of dosage for two patients (4.5%), or a reduction of dosage for one patient (2.3%).

4. Discussion

4.1. Contribution of ABPM to the Diagnosis of Hypertension

The management of hypertension is first and foremost based on making a correct diagnosis. The most common diagnosis tool remains an in-office medical setting blood pressure monitoring in low income countries. This diagnosis method is strongly influenced by different factors among which the conditions of measurements, the white coat effect, or the technique of monitoring. The method is thus inaccurate and leads to wrong diagnosis in a number of cases. The ABPM allows the detection of "white coat hypertension" which could reach 26% of the patients in the African context [4] [5]. Our diagnosis confirmation rate of 75% and false hypertension rate of 25% are in line with the African data [4] [5]. They corroborate the recommendations of the scientific societies that advocate the ABPM for the diagnosis of the mild to moderate hypertension prior to any drug therapy [2] [6] [7]. Moreover, the ABPM allows the diagnosis of clinical forms that could be missed by an in-office medical setting blood pressure moni-

toring. Beyond the diagnosis confirmation, it allows the diagnosis of "white coat hypertension", paroxysmal hypertension, nocturnal hypertension, and masked hypertension. The ambulatory monitoring reflects a complete 24 hours pattern of blood pressure out of a medical setting and in the patient's daily life conditions. It is therefore more appropriate for the diagnosis of all clinical forms of hypertension. We reported several clinical forms in our study, including the "white coat hypertension", the masked hypertension, the resistant hypertension, and hypotension to a lesser proportion. This report is related to the fact that we targeted patients who were diagnosed with hypertension or suspected of hypertension after an in-office medical setting blood pressure monitoring. Although the ABPM is ideally the best diagnosis tool for hypertension, its systematic use in low-income setting could hinder a better management of hypertension or cause a delay in diagnosis. This is well-illustrated by the long delays between the recommended deadlines for the submission of our patients to the ABPM (sometimes four months). The long delay could be explained by the cost of the exam and the fact that the medical costs are directly supported by the patients or their families. In a Kenyan study, 27% of the patients who were scheduled for a free ABPM on a population-based study in a rural area did not show up [8]. It was then concluded that the ABPM was not well-accepted in this context. It appears reasonable to adapt to uncertain diagnoses, difficult to control or particular clinical forms in such settings [9] [10]. Such pragmatic attitude was used in our study and allowed us to detect 61.4% of patients with hypertension no matter the indication, and 75% among those who undertook the monitoring for diagnosis purposes.

4.2. Contribution of ABPM to the Management of Patients under Antihypertensive Drug Therapy

One of the most common indications for the ABPM is the management of hypertension under treatment [2] [6] [7]. The ambulatory monitoring assesses the efficacy of antihypertensive treatment and diagnoses resistant hypertension with accuracy [11] [12] [13]. In our study, the ABPM allowed us to avoid initiating drug therapy for 23.8% of our patients and to maintain current treatment for 13% of the patients. An antihypertensive treatment was started for 24.6% of the patients while a therapeutic adjustment (modification) was made for 36.1% of all the enrolled patients. In either situation, important decisions had to be made given that starting an unnecessary antihypertensive drug therapy or reinforcing ongoing treatment could lead to more deleterious side-effects and high morbidity for the patients. Conversely, a lack of initiation or reinforcement of antihypertensive treatment for patients with uncontrolled hypertension increases the risk for target organ damages and worsens the patients' prognosis [14]. Many studies showed that the ABPM was useful for the management and control of hypertension. It allows better assessment of overall cardiovascular risk, better classification of patients' level of BP control, and subsequent therapeutic adjustment [15] [16] [17] [18] [19]. An ambulatory monitoring is partic-

ularly necessary in all management stages of resistant hypertension (6.6% in our series): diagnosis confirmation, prognosis assessment, treatment assessment. After diagnosis confirmation, the ABPM allows to initiate another key-step which is the etiologic diagnosis of secondary hypertension that could be treated.

4.3. Study Limitations

A great number of parameters, especially complementary lab exams could not be found given that our study was conducted retrospectively. As a result, the real rate of target organ damages was probably underestimated.

5. Conclusion

The ABPM has contributed to the diagnosis of hypertension on 39.3% of our patients and the assessment of high blood pressure control on 51% of the patients with ongoing drug treatment. It allowed an adequate management of hypertension and the subsequent therapeutic adjustments. The ABPM should be used more often in order to optimize the hypertension management, particularly the mild to moderate hypertension or when particular clinical forms are suspected.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

References

[1] Ministère de la santé Burkina Faso (2014) Rapport de l'enquête nationale sur la prévention des principaux facteurs de risque communs aux maladies non transmissibles au Burkina Faso: Enquête STEP 2013.
http://www.who.int/chp/steps/BurkinaFaso_2013_STEPS_Report.pdf

[2] NICE National Institute for Health and Clinical Excellence (2011) Hypertension in Adults: Diagnosis and Management. Clinical Guideline.
http://www.nice.org.uk/guidance/cg127

[3] Chalmers, J., *et al.*, WHO-ISH Hypertension Guidelines Committee (1999) 1999 World Health Organization—International Society of Hypertension Guidelines for the Management of Hypertension. *Journal of Hypertension*, **17**, 151-183.

[4] Ikama, S.M., Nsitou, B.M., Makani, J., *et al.* (2015) Pratique de la mesure ambulatoire de la pression artérielle à Brazzaville (Congo): Données préliminaires. *The Pan African Medical Journal*, **20**, 353.

[5] Takah, N., Dzudie, A., Ndjebet, J., Wawo, G., Kamdem, F., Monkam, Y., *et al.* (2014) Ambulatory Blood Pressure Monitoring in the Main Cities of Cameroun: Prévalence of Masked and White Coat Hypertension, and Influence of Body Mass Index. *The Pan African Medical Journal*, **19**, 240.
https://doi.org/10.11604/pamj.2014.19.240.4887

[6] Blacher, J., Halimi, J.M., Hanon, O., Mourad, J.J., Pathak, A., Schnebert, B. and Girerd, X. (2013) Prise en charge de l'hypertension artérielle de l'adulte. *Sang Thrombose Vaisseaux*, **25**, 297-305.
https://doi.org/10.1016/S1261-694X(13)70563-7

[7] Mancia, G., Fagard, R., Narkiewicz, K., Redon, J., Zanchetti, A., Bohm, M., *et al.* (2013) 2013 Practice Guidelines for the Management of Arterial Hypertension of the European Society of Hypertension (ESH) and the European Society of Cardiology (ESC). ESH/ESC Task Force for the Management of Arterial Hypertension. *Journal of Hypertension*, **31**, 1925-1938. https://doi.org/10.1097/HJH.0b013e328364ca4c

[8] Etyang, A.O., Warne, B., Kapesa, S., Munge, K., Bauni, E., Cruickshank, J.K. and Scott, J.A.G. (2016) Clinical and Epidemiological Implications of 24-Hour Ambulatory Blood Pressure Monitoring for the Diagnosis of Hypertension in Kenyan Adults: A Population-Based Study. *Journal of the American Heart Association*, **5**, e004797. https://doi.org/10.1161/JAHA.116.004797

[9] Weber, M.A., Schiffrin, E.L., White, W.B., Mann, S., Lindholm, L.H., Kenerson, J.G. and Cohen, D.L. (2014) Clinical Practice Guidelines for the Management of Hypertension in the Community. *The Journal of Clinical Hypertension*, **16**, 14-26. https://doi.org/10.1111/jch.12237

[10] Seedat, Y.K., Rayner, B.L. and Veriava, Y. (2014) South African Hypertension Practice Guideline 2014. *Cardiovascular Journal of Africa*, **25**, 288-294. https://doi.org/10.5830/CVJA-2014-062

[11] O'Brien, E., Parati, G. and Stergiou, G. (2013) Ambulatory Blood Pressure Monitoring What Is the International Consensus? *Hypertension*, **62**, 988-994. https://doi.org/10.1161/HYPERTENSIONAHA.113.02148

[12] O'Brien, E., Parati, G., Stergiou, G., Asmar, R., Beilin, L., Bilo, G., *et al.* (2013) European Society of Hypertension Position Paper on Ambulatory Blood Pressure Monitoring. *Journal of Hypertension*, **31**, 1731-1768. https://doi.org/10.1097/HJH.0b013e328363e964

[13] Gobin, N., Wuerzner, G., Waeber, B. and Burnier, M. (2012) Mesure ambulatoire de la pression artérielle sur 24 heures. *Forum Médical Suisse*, **12**, 600-607.

[14] Dawes, M.G., Bartlett, G., Coats, A.J. and Juszczak, E. (2008) Comparing the Effects of White Coat Hypertension and Sustained Hypertension on Mortality in a UK Primary Care Setting. *The Annals of Family Medicine*, **6**, 390-396. https://doi.org/10.1370/afm.865

[15] Solak, Y., Kario, K., Covic, A., Bertelsen, N., Afsar, B., Ozkok, A., *et al.* (2016) Clinical Value of Ambulatory Blood Pressure: Is It Time to Recommend for All Patients with Hypertension? *Clinical and Experimental Nephrology*, **20**, 14-22. https://doi.org/10.1007/s10157-015-1184-1

[16] Gorostidi, M., Banegas, J.R., de la Sierra, A., Vinyoles, E., Segura, J. and Ruilope, L.M. (2016) Ambulatory Blood Pressure Monitoring in Daily Clinical Practice—The Spanish ABPM Registry Experience. *European Journal of Clinical Investigation*, **46**, 92-98. https://doi.org/10.1111/eci.12565

[17] O'Flynn, A.M., Curtin, R.J., Perry, I.J. and Kearney, P.M. (2016) Hypertension Prevalence, Awareness, Treatment, and Control: Should 24-Hour Ambulatory Blood Pressure Monitoring Be the Tool of Choice? *The Journal of Clinical Hypertension* (*Greenwich*), **18**, 697-702. https://doi.org/10.1111/jch.12737

[18] Walker, R.W., Dewhurst, M. and Gray, W.K. (2015) Ambulatory Blood Pressure Monitoring to Assess Cardiovascular Risk in Sub-Saharan Africa. *The Journal of Clinical Hypertension* (*Greenwich*), **17**, 811. https://doi.org/10.1111/jch.12582

[19] Ghuman, N., Campbell, P. and White, W.B. (2009) Role of Ambulatory and Home Blood Pressure Recording in Clinical Practice. *Current Cardiology Reports*, **11**, 414-421. https://doi.org/10.1007/s11886-009-0060-6