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Original Research

Hypertension Management in Primary Health Care Centres: Blood Pressure Control and Classes of Antihypertensive Medication, Khartoum State, 2018

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▎ **ABSTRACT** ▎

Background
In Sudan, the delivery of care based on the primary health care (PHC) level, which is the first contact with the health system. PHC is the level at which the modifiable risk factors for hypertension are addressed together with the treatment of known hypertensive patients.

Objective
To assess the management of hypertension in PHC in Khartoum State, 2018.

Material and Methods
The study was a descriptive cross-section, health centre's based that covered six PHC centres in Khartoum State. The study interviewed all diagnosed Sudanese hypertensive patients more than 18-years of age who attended the selected PHC centres. The research team collected data using a structured questionnaire and measuring the blood pressure (BP) with a mercury sphygmomanometer. The study variables were demographic characteristics and disease features as independent variables and hypertension control as the dependent variable. The statistician analyzed the data using the statistical package for the Social Science version 21.0 and the Chi-square (χ) test to obtain the *p* value to test the association between the addressed variables. The study group adopt ethical considerations throughout the study.

Results
Of the 384 hypertensive patients interviewed in this study, 57% were females and 47.7% were more than 60-years of age. A large percent of the subjects were either primary educated or illiterate (32.6%, 19.8% respectively). More than half of the hypertensive patients (52.1%) were uncontrolled and 52.9% had no comorbidities. Diabetes was predominant (39.3%) among those who had comorbidities. The majority of the patients (92.7%) were adherent to the medication. Of the studied patients, 58.1% used monotherapy. The most controlled patients were the elderly and middle-aged patients and the highly educated patients (*p*=0.005). Patients with a duration less than five-years were more likely to be controlled (*p*=0.036). The majority of the patients who used combined treatment were found to be controlled.

Conclusion
This study concluded that the high prevalence of uncontrolled hypertensive patients attending PHC was mainly attributed to the use of monotherapy, presence of comorbidities and medication non-adherence. The latter is related to patients' ignorance, financial constraints and dislike of using many drugs during the day. In addition, the use of combined therapy, elder age and high education were factors for better control.

Keywords
Hypertension control; Antihypertensive medication; Hypertension management.

BACKGROUND

Globally there are one billion hypertensive patients due to the prevalence of contributing modifiable risk factors. These factors, such as unhealthy diet, physical inactivity, tobacco and alcohol use, and hyperlipidemia–which are not yet well-addressed, will lead to an increasing number of patients. In the Eastern Mediterranean Region, the prevalence of hypertension averages 26% and it affects approximately 125 million individuals.[1]

Hypertension has the highest prevalence among the major non-communicable diseases (NCDs) in Sudan, represented a quarter of NCDs.[2] Hypertension in Sudan is one of the ten leading diseases treated in outpatients of health facilities and also is one of the ten leading causes of death.[3] Proper management of hypertension has been associated with about a 40% reduction in the risk of stroke and about a 15% reduction in the risk of myocardial infarction. Thus, by applying standard management of hypertension, we can reduce the major complications that lead to morbidity, disability and mortality.[4]

The goals for the management of hypertension are well-defined, effective therapies are widely available, and practice guidelines for hypertension have been disseminated extensively. Even with such advances, hypertension control rates are still low.[5]

World Health Organization (WHO) defined medication adherence as "*the extent to which the medication-taking behavior of a patient corresponds with agreed recommendations from a health care provider*".[6] It is important in achieving blood pressure control.[7] Patients who were adherent to the regimen of their hypertension treatment were often significantly less likely to have elevated blood pressures.[8] Unfortunately, poor adherence to medications is widespread especially in the treatment of chronic conditions such as hypertension leading to poor health outcomes and huge medical spending on drug-related morbidity. As reported by the WHO, adherence to medication in patients with chronic diseases averages only around 50% in developed countries. The situation is reported to be worse in developing countries due to poor accessibility to medications and health care services. The asymptomatic nature of the condition intensifies the problem of non-adherence in hypertension.[6,9]

The overall prevalence of hypertension in Sub-Saharan Africa (SSA) is estimated to be 30%, ranging from 16% at the age of 30-years to 44% at the age of 60.[10] About 74.7 million individuals are currently hypertensive in SSA, and this number is expected to increase to 125.5 million individuals by the year 2025. In Sudan, the prevalence of hypertension in urban communities witnessed a dramatic increase from 7.5% in 1990 to 18.2% in 2012.[11,12]

In Sudan, delivery of care has been based on the primary health care (PHC) level which is the first contact of the community with the health system. A high percentage of the population use PHC, as it is more accessible and affordable and hence it has the drive to reach vulnerable populations. The PHC approach, with over 2078 PHC Centres and 380 rural hospitals, distributed all over Sudan supposed to deliver promotive, protective, curative, and re-habilitative services, but have never functioned as such as mentioned in the non-communicable diseases strategy 2010.[13]

PHC Centres are proposed to play an essential role in the provision of continuous, comprehensive care for hypertensive patients.

This study aimed to reveal the control status and treatment compliance among Sudanese hypertensive patients in Khartoum State, for possible public health application of the findings by the Ministry of Health (MOH) targeting at improving the management of hypertension at the PHC level.

MATERIALS AND METHODS

Study Design and Area

The study was a descriptive cross-sectional, health Centre's based study. It was conducted in PHC Centres in Khartoum State in the three major localities; Khartoum, North Khartoum and Omdurman. There are consultants of family medicine in all these Centres. These Centres provided services in form of health education, regular follow-up for patients with chronic diseases, routine blood investigations. These services were provided covered with health insurance (HI), while the medicine included in the HI drug list was provided covered with 75% of the cost. Medicine not included in the HI drug list will be fully paid for by the patients. The study population included hypertensive patients who attended the selected PHC Centres State; it recruited all diagnosed Sudanese hypertensive patients whose age was more than 18-years.

Sample Size and Sampling

The sample size was calculated to be 384 using the formula $n=Z2pq/e2$, where $Z=1.96$ (which corresponds to the level of confidence); $p=0.5$ (estimated proportion of the population with controlled hypertension); $Q=1-p=0.5$; $e=$margin of error at 95th confidence interval (C.I) (0.05).

The total sample size was divided equally by the number of centres, and 64 patients were enrolled from each centre. The selection of the Centres was done purposively based on their geographical location, caseload and presence of a family physician as the care provider. Based on that six PHC centres were identified; [(2 in Khartoum (Omer Ibn-Alkhatab and GeraifGhareb Centre, 2 in Khartoum North (Alkhatmeiah and Alenghaz Centres) and 2 in Omdurman (AldawHagog and Wad Nobawie Centres)] The selection of the patients was done following a systematic selection of all diagnosed hypertensive patients who attended the outpatient clinic for follow-up during the study period, till reaching the sample size in each health centre.

Ethical Considerations

Ethical approval was obtained from the institutional review board (IRB) of the Sudan Medical Specialization Board (SMSB). Written consent was obtained from the administration of the six PHC Centres in the study area. Verbal consent was obtained from all

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participants through taking their agreement to participate after explaining to them the study objectives and benefits. The participants were informed of their rights that their participation in the study is completely voluntary and confidentially has been considered.

Data Collection Tools and Techniques

The study collected data by interviewing hypertensive patients and measuring their blood pressure (BP). The researcher assisted by twelve medical doctors – who have been trained by the researcher– collected the data using a structured pretested questionnaire developed by the researcher. The questionnaire followed the steps and recommendations of the Sudanese guideline in the management of hypertension. It covered the personal data, disease features, medication compliance and types. The medication compliance was assessed by asking the hypertensive patients about their practice concerning pills taking during the last month.

The BP was measured using a mercury sphygmomanometer; patients were relaxed and seated for five-minutes with uncrossed legs, back and arm supported. The researchers checked the right and left radial pulse, if they were the same then they used the left arm to measure the BP. If they were differed they measured the BP in both arms and took the highest reading. BP was used by placing the middle of the cuff on the upper arm at the level of the heart. One reading of BP was being taken for each patient, but if the BP reading as high as 160/100 the researchers gave the patient another five minutes for rest then measuring BP again and they took a second reading. The study variables included the demographic characteristics (age, gender, educational levels, occupation), disease features (hypertension duration, comorbidities, anti-hypertensive medications, medication compliance) as independent variables and hypertension control as the dependent variable.

Data Analysis

Data were analyzed by using a statistical package for the Social Science version 21.0. The researchers agreed on the level of 140/90 as the cutoff for the controlled hypertension. A Chi-square test was used to obtain the p value to test the association between the hypertension control and other variables.

RESULTS

Sample Coverage and Characteristics of the Study Population

In total, 384 hypertensive patients were interviewed, of them, 57% as females. The age of 47.7% of the studied population was more than 60-years, while only 5.7% were in the age group less than 40-years. A large percentage of the subjects were either primary educated or illiterate (32.6%, 19.8% respectively), whereas those having a post-university education were only (9.6%). Concerning their occupations, the majority were housewives (44%) (Table 1).

Disease Features

Regarding the hypertension control status, more than half of the

patients (52.1%) were uncontrolled, whereas the median of systolic blood pressure (SBP) was 135, about one-half (50.3%) of the patients had SBP less than 140. Moreover, the median of diastolic blood pressure (DBP) was 80, where 57% of the patients had DBP less than 90.

Table 1. *Demographic Characteristics of the Hypertensive Patients Who Attended PHC. Khartoum State, Sudan, 2018*

	Hypertension Control		
	Controlled (%)	Uncontrolled (%)	p value
Gender			
Male	71 (42.5%)	96 (57.5%)	0.266
Female	113 (52.1%)	104 (47.9%)	
Age (Years)			
<40	5 (22.7%)	17 (77.3%)	
40–60	83 (46.4%)	96 (53.6%)	0.026
>60	96 (52.5%)	87 (47.5%)	
Educational Levels			
Illiterate	21 (27.6%)	55 (72.4%)	
Primary	45 (36%)	80 (64%)	
Secondary	34 (41.5%)	48 (58.5%)	0.005
University	51 (79.6%)	13 (20.4%)	
Post-university	32 (86.5%)	5 (13.5%)	
Occupation			
Worker	27 (35.5%)	49 (64.5%)	
Employee	64 (47.4%)	71 (52.6%)	0.061
Housewife	93 (55%)	76 (45%)	
Student	0 (0%)	4 (100%)	

Table 2. *Clinical Characteristics and Drug Management of the Hypertensive Patients Attended PHC, Khartoum State, Sudan, 2018*

Clinical Characteristics	Hypertension Control		p Value
	Controlled (%)	Uncontrolled (%)	
Duration (Years)			
<5	68 (51.9%)	63 (48.1%)	
5-10	62 (44%)	79 (56%)	0.036
>10	54 (48.2%)	58 (51.8%)	
Comorbidities			
Diabetes	73 (48.3%)	78 (51.7%)	0.159
Pervious stroke	4 (26.7%)	11 (73.3%)	0.000
CKD	5 (33.3%)	10 (66.7%)	0.046
None	102 (50.2%)	101 (49.8%)	0.215
Medication Adherence			
Adherent	184 (51.7%)	172 (48.3%)	0.000
Non-adherent	0 (0%)	28 (100%)	
Drugs			
Mono-therapy	84 (37.7%)	139 (62.3%)	0.008
Combined therapy	100 (62.1%)	61 (37.9%)	

According to the hypertension duration, the majority (71%) of the patients had the disease for less than 10-years. More than half of the hypertensive patients had no comorbidities (52.9%). Diabetes was predominant (39.3%) among those who had

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comorbidities. The majority of the patients (92.7%) were adherent to the medication (Table 2).

Table 3 displayed the main reasons for non-adherence, where the majority mentioned ignorance of the importance of complying with the drug regimen, thus neglecting taking it regularly. In addition, 34% stated the financial problem as a reason for non-adherence, where they couldn't pay for the cost of the drugs. Few of the study population mentioned that they dislike taking many pills during the day.

Table 3. *Reasons of Non-Adherence among the Non-Adherent Hypertensive Patients (n=28) Attended PHC, Khartoum State, Sudan, 2018*

	N	%
Reasons of non-compliant		
Financial problem	10	35.6
Dislike to take many pills during the day	6	21.4
Ignorance of the importance of drug compliance	12	43

Concerning hypertension drug management, 58.1% of the studied patients used mono-therapy and the remaining used combined therapy. Calcium channel blocker (CCB) was found to be the common monotherapy used followed by Angiotensin covering enzyme inhibitor (ACEI) then Angiotensin receptor blocker (ARB) and beta-blocker are the least (27.6%, 16.7%, 12%, 1.8% respectively). On the other side the combination of ACEI and CCB was found to be the predominant used by 11.2% of the patients, then CCB and ARB in 9.1% and ACEI and beta-blocker in 5.2% of the patients. A triple combination of CCB, ARB and diuretics was used by 3.4% and ACEI, CCB and beta-blocker in 0.5% of the patients (Table 4).

Table 4. *Distribution of Controlled and Uncontrolled Hypertensive Patients with the Types of Mono and Combined Therapy among Patients Attended PHC, Khartoum State, Sudan, 2018*

	Hypertension Control		
	Controlled (%)	**Uncontrolled (%)**	*p* **value**
Mono-therapy			
Beta-Blocker	4 (57.1%)	3 (42.9%)	
ACEI	25 (39.1%)	39 (60.9%)	0.001
ARB	36 (78.3%)	10 (21.7%)	
CCB	55 (51.9%)	51 (48.1%)	
Combined Therapy			
ACEI+Beta-Blocker	5 (45%)	11 (55%)	
ACEI+CCB	18 (41.9%)	25 (58.1%)	
ACEI+Diuretic	0 (0%)	13 (100%)	
ACEI+ARB	0 (0%)	2 (100%)	
Beta-Blocker+Diuretic	0 (0%)	6 (100%)	
Beta-Blocker+CCB	4 (44.4%)	5 (55.6%)	0.000
Beta-Blocker+ARB	5 (41.7%)	7 (58.3%)	
Diuretic+ARB	5 (100%)	0 (0%)	
CCB+ARB	18 (51.4%)	17 (48.6%)	
CCB+Diuretic	0 (0%)	1 (100%)	
ACEI+CCB+Beta-Blocker	0 (0%)	2 (100%)	
CCB+ARB+Diuretics	9 (69.2%)	4 (30.8%)	

DISCUSSION

The study revealed that females were more affected by hypertension than males (57% *vs.* 44% respectively) with a ratio of 1.3:1 and about half of the hypertensive patients (47.7%) had aged more than 60-years, this is consistent with a study conducted by Eltagi et al[14] in Khartoum, which showed a positive increase of hypertension with age, the prevalence reached 100% among those above 60-years and 51.7% among those in age group (46-60-years), also they found that the females were commonly affected by hypertension than males (53.5% *vs.* 46.5%). This is also in line with other studies where the risks of hypertension increase with age.[15-17] This confirms that the prevalence of hypertension is affected by age and gender.

This study showed that diabetes was predominant in (39.3%) patients followed by previous stroke (3.9%) and chronic kidney disease (CKD) (3.9%). Also, Eltagi et al[14] revealed that diabetes and kidneys' problems were the main comorbidities in hypertensive patients. Also, the results showed that diabetic patients had five-four times more likely to have hypertension compared to those who have no history of diabetes OR 5.44 (95% CI 1.89-15.69, *p*=0.017).[14] Also, Balla et al noticed that in Sudan among rural population diabetes and hypertension are closely interrelated.[18] Another study that was carried out in Ethiopia revealed that self-reported diabetes was a significant predictor of hypertension.[15]

Also, the current study demonstrated that 52.1% of the patients were uncontrolled, this was lower than what was reported by Abdulmohsin et al[19] which was 60%, and the Canada Heart Health Survey that found only 13% of Canadians with hypertension were adequately controlled,[20] and higher than what reported by Al-Shammari et al[21] which was 28.8%, and the international study conducted by Birtwhistle et al[22] which revealed 20%. This result also was even higher than the US National Health and Nutrition Examination Survey (NHANES III) that 25% were uncontrolled.[23] Also the percentage of uncontrolled hypertensive patients was more than what reported in Addis Ababa, Ethiopia (40.1%) and Gondar, Ethiopia (46.6%).[24,25] These variations might be attributed to the differences in origins, geographical areas, physical activities, biological and genetic factors.

In medication adherence, the results showed that 92.7% of the studied hypertensive patients were adherent. These findings were consistent with the study conducted by Inkster et al[26] reported a 91% level of adherence among hypertensive patients in primary care. However, the findings were much higher than those reported in the Ethiopian study (60.5%),[27] and the United Arab Emirates (54.4%),[28] this may be attributed to the presence of comorbidities and health education levels of the patients in the other studies, which may significantly affect medication adherence.

Though the Sudanese guidelines in the management of hypertension promote combination therapy, the present study revealed that 58.1% of the patients used monotherapy drugs, indicating that the medical practitioners still prescribing or otherwise adopting their prescription. The combination therapy drugs are

more expensive and few of the patients don't like to use more than one drug, stated by the non-adherent patients. The most frequent monotherapies were CCB and ACEI. These results went in the same line with Abdulaziz et al,[29] who found that the majority of the subjects were on mono (70%) and the most frequent mono anti-hypertensive therapies were beta-blockers (34%) and ACEI (25%). In addition, CCB with ARB (9.1%) and ACEI with beta-Blocker (5.2%) were the frequent dual combined therapy.

The results of the present study showed that most controlled patients were found in older (52.5%) and middle-aged patients (46.4%), and most of younger age (77.3%) were found to be uncontrolled (*p* 0.026). These findings are consistent with the study of Solomon et al.[27]

Regarding the levels of education and the hypertension control, most post-university (86.5%) and university educated (79.6%) patients were found to be controlled, while illiterate (72.4%) and primary educated (64%) patients were found to be uncontrolled (*p* value=0.005). this indicated that A high-level of education was associated with better blood pressure control.[30] In a study conducted on 184 patients with free access to care, Paulsen et al identified that patients with less than 10-years of education were less likely to achieve blood pressure control compared to those with more than 10-years levels of education.[31] In the analysis of the NHANES1999-2004, Ostchega et al[31] found that hypertensive patients with lower-levels of education and in the low socio-economic class were more likely to have uncontrolled blood pressure. Sandoval et al[32] found that low education was associated with poor blood pressure control. Wong et al[33] found that individuals with lower education backgrounds had 3.5 times higher uncontrolled BP than those with higher education.

According to the association between the hypertension control status and the clinical characteristics of the patients, duration of hypertension showed a significant relationship with control status; the patients with duration less than 5-years (51.9%) more tendered to be controlled and those had duration >10-years (51.8%) were uncontrolled patients (*p* value=0.036). additionally, the majority of patients without comorbidities (50.2%) were controlled.

Not surprisingly; all non-compliant patients were found to be uncontrolled. For no doubt, this indicated that; adherence to the medication is a key factor for controlling hypertension (*p* value=0.000), however, some of the adherent patients were still uncontrolled, this was mainly attributed to the presence of comorbidities which significantly affected the controlling of hypertension. (*p*=0.000). In addition, the use of monotherapy was another factor, where the study demonstrated that most of the patients who received monotherapy (62.3%) were uncontrolled, especially ACEI (60.9%), CCB (48.1%) and beta-blockers (42.9%) (*p* value=0.008) while most of the patients who received combined treatment (62%) were found to be controlled, especially those who used diuretic+ARB (100%), CCB+ARB+diuretic (69.2%) and CCB+ARB (51.4%).

Recent clinical trials have shown that effective BP control can be achieved in most hypertensive patients, by two or more anti-hypertensive drugs for most patients.[34-36] As stated by Moser et al,[37] 30% to 60% of patients will be controlled with a single drug regimen, while two drugs in combination are likely to improve control rates by 80 to 85%; three or more drugs will provide control in 90 to 95% of patients.

In the association of controlled and uncontrolled hypertensive patients regarding the types of mono and combined therapy; the majority of the patients who used ACEI drug as monotherapy (60.9%) were uncontrolled and most of those used ARB (78.3%) were controlled (*p*=0.001). on the other side, all the patients who used ACEI+Diuretic, ACEI+ARB, Beta-Blocker+Diuretic, CCB+Diuretic and ACEI+CCB+Beta-Blocker in combination were uncontrolled, while all the patients who used Diuretic+ARB and most of the patients (62.9%) who used CCB+ARB+Diuretics in combination were controlled (*p*=0.000).

RECOMMENDATIONS

Information, education and culture materials are recommended for hypertensive patients to improve their adherence to medication and the control of their BP. The MOH has to avail the recommended types of antihypertensive medication in PHC Centres, maybe by including them in the HI drug list to overcome the financial problem as a reason for non-adherence. The MOH has to foster the protocols and guidelines for hypertension treatment, which is crucial to avoid the practice of doctors of prescribing a monotherapy and contraindicated combination of antihypertensive medication. Future research needs to disclose the noncompliance of doctors with Sudanese guidelines for the management of hypertension and the causes of uncontrolled hypertension among the younger age group of patients.

CONCLUSION

This study concluded that the high prevalence of uncontrolled hypertensive patients attending PHC was mainly attributed to use of monotherapy, presence of comorbidities and medication non-adherence. The latter is related to patients' ignorance, financial constraints and dislike of using many drugs during the day. In addition, the use of combined therapy, the elderly and highly educated patients were factors for better control.

STRENGTH AND LIMITATIONS OF THE STUDY

In the centers, there were no specific day or examination room for hypertensive patients, so that the data collection took a long time. But what facilitates our data collection is the cooperation of the medical doctors and family physician.

CONSENT FOR PUBLICATION

Not applicable.

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