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PHARMACOTHERAPY FOR HIGH BLOOD PRESSURE AT THE CONSULTATION SERVICE OF ABIDJAN HEART INSTITUTE (CÔTE D'IVOIRE)

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Abstract
High blood pressure is a cardiovascular disease that, if not well treated, can lead to complications. In fact, only 55% of people suffering from high blood pressure treated, have a controlled blood pressure. A rigorous pharmacotherapy approach based on the rational use of antihypertensive drugs could help to improve this figure. This study aimed to investigate the pharmacotherapy for high blood pressure at the consultation department of the Abidjan Heart Institute. This descriptive retrospective study focused on patient records received from 2019 to 2021. It consisted of collecting data on patients receiving consultations, for prescription of antihypertensive drugs and their follow-up. Therefore, compliance of requirements with national and international recommendations were sought. The study population of 251 patients was female dominated (sex ratio: 1.3) with a mean age of 55.94±12.51 years. Risk factors included aging (40.64%), menopause (72.54%), female (56.57%) and BMI (31.47%). All stages of high blood pressure were represented, including controlled hypertension (27.09%) and type 1 hypertension (26.69%). Management protocols were based on ESC/ESH recommendations. Prescriptions for monotherapy, bitherapy, tritherapy, quadritherapy and pentatherapy showed a satisfactory level of compliance. Patient follow-up showed a significant increase (54.9%) in controlled hypertension and a non-significant reduction (20.1%) in type 2 hypertension. The pharmacotherapy for high blood pressure at the consultation service of Abidjan Heart Institute showed a satisfactory level of compliance in the approach.

Keywords : Antihypertensives, Prescription, High blood pressure, Abidjan

Introduction

High blood pressure is a common cardiovascular disease [1]. It affects more than a billion people worldwide and its complications make it one of the leading causes of premature death globally. The vulnerability of hypertension lies in its late diagnosis for it is a silent disease in early stages [2]. The prevalence of hypertension is highest in the African region with a rate of 46% among adults in 2008, compared to 40% in Europe and 35% in Americas where the value is relatively lower [3]. In 2017, the prevalence of high blood pressure in Côte d'Ivoire was estimated to 20.04% in the total population

[4] and represented 75% of consultations at the Abidjan Heart Institute (AHI) with an increase of 33.4% compared to previous years [5-7].
If high blood pressure is detected early, medication can reduce the cardiovascular risks associated with this sickness such as stroke or heart or kidney failure. Indeed, antihypertensive drugs work through a variety of mechanisms on biological targets located in the heart or blood vessels [8; 1].
It is therefore necessary to use appropriate antihypertensive medication during the acute phase of the disease if we want to reduce its morbidity and mortality. Among those treated, only 55% have controlled blood pressure (BP) [9]. A rigorous pharmacotherapy practice could improve this figure. This approach, based on a rational use of antihypertensive drugs, aims to improve the quality of life of hypertensive patients.
For this purpose a study was conducted at the Abidjan Heart Institute, the main hospital for the management of cardiovascular diseases in Côte d'Ivoire. The objective was to study the pharmacotherapy of high blood pressure at the outreach department of the Abidjan Heart Institute.

Material and Methods

A retrospective cross-sectional descriptive study was carried out at the outreach department of Abidjan Heart Institute (AHI). This study aimed to examine records of patients previously admitted at this department. It took place from 7th July to 2nd December 2022. This study concerned the records of patients over 18 years old, consulted at this department from January 2019 to December 2021, containing patient data to treatment, with at least an episode of drug prescription, and records of patients with hypertension. Incomplete or lost records of patients were not included in this study.
The study began by selecting files according to inclusion and non-inclusion criteria, then collecting information from survey sheets and analysis of data.
A data collection sheet was used to gather information from patient records. Information was collected on socio-demographic data (age, sex, place of residence, occupation, gender parity), clinical data (risk factors, type of hypertension), pharmacotherapy data (medical prescription, pharmacotherapy dispensing, administration of treatment, follow-up of treatment). As drug therapy is correlated with the patient's type of hypertension, the value of blood pressure was collected in mmHg, as well as the antihypertensive therapy used (drug therapy class, combination therapies).
The definition and classification of types of high blood pressure were based on hypertension values and risk factors given by the National Therapeutic Protocols for Pathologies (NTPP 2019) and the recommendations of the European Society of Cardiology and the European Society of Hypertension (ESC/ESH 2018) [10; 11]. A retrospective follow-up was carried out in patients with several prescription episodes in order to determine the types of hypertension and therapies used for patients after admission to the Abidjan Heart Institute and the end of the study period.
Data on pharmacotherapy dispensing and treatment administration were particularly obtained after enquiries from AHI Pharmacy staff and the Outreach Department. The formula used to calculate the percentage of compliance with international recommendations is the ratio of the number of prescriptions complying with the recommendations of the total number of prescriptions (× 100). Data were collected anonymously after approval by the CIA Ethics Committee. Data in the form of quantitative variables were expressed as means ± standard deviations and qualitative variables were expressed as numbers and percentages. Statistical analysis was performed using R software version 4.1.1. The Chi-2 test was used to compare the number of patients exposed to risk factors with controlled or uncontrolled hypertension, and to compare therapies according to the type of hypertension. The t-student test was used to compare the mean age of patients. Differences were considered significant for a p-value ≤ 0.05 or when the calculated Chi-2 value was greater than the theoretical value read in the Chi-2 table (ddl = 1): 3.84.

Results

Socio-demographic and clinical data

A total of 251 patient files were included in this study. The socio-demographic data are recorded in Table I. The sex ratio was 1.3, with 57% female, in which 72% had at least one child. The mean age

was 55.9 ± 12.5 years, ranging from 21 to 101 years. There were more patients between 50 and 60 years old. 83.3% of patients lived in Abidjan and 61.8% were still working, compared with 13.6% who retired. The clinical data for patients (Table 1) showed that there were more with uncontrolled hypertension. They were mostly women, with more than one child. They lived in Abidjan and were working. All patients were exposed to risk factors, 65.4% of them had changeable risk factors (Table 2). Patients with uncontrolled hypertension were the most exposed to all risk factors. Senility (40.6%) and obesity (31.5%) were mostly observed.

Therapeutic data

All patients in the study received antihypertensive treatment according to the type of hypertension (Table 3). Patients with controlled hypertension (27.1%), type 1 hypertension (26.7%) and type 3 hypertension (21.9%) were the most numerous. Antihypertensive drugs were used either as monotherapy (11.6%), bitherapy (59.4%), tritherapy (19.9%), quadritherapy (8.4%) or pentatherapy (0.8%) (Table 3). In monotherapies, calcium channel blockers (CCBs) were mostly prescribed (41.4%), and patients with type 1 hypertension were more concerned (41.4%) (Table 4). Angiotensin Converting enzyme inhibitors (ACEIs) were prescribed most frequently in dual therapy (43.6%) (Table 5). For other therapies, the most prescribed combinations were those combining an ACE inhibitor, a diuretic and an ACI for triple therapy (28%), an ACI, a diuretic and an Angiotensin II receptor blocker (ARB2) and a beta-blocker (BB) in quadritherapies (38.1%) and, finally, the combination of an ACE inhibitor, an ACE inhibitor, two diuretics and a BB was the only one found in pentatherapies (100%) (Tables 6 and 7).

The level of compliance of drug classes prescribed alone or in combination was assessed with the ESC/ESH recommendations, the reference used in the service. Overall compliance was 70.9%, with peaks for pentatherapies (100%), quadritherapies (83.3%) and bitherapies (80%) (Table 4 - 7).

Table 8 shows the evolution of types of AHT and types of therapy during patient follow-up. An increase in patient's number was observed in all types of hypertension except for type 2 hypertension (-20.1%). In controlled hypertension, the number of patients increased by 54.9% (chi2 > 3.84). Type 2 and type 1 systolic hypertension increased by 40% and 37.5% respectively (chi2< 3.84). In terms of therapies, a decrease in monotherapy protocols (-52.3% with Khi2 > 3.84) was observed whereas an increase was notice in tritherapies (71.6% and Khi2 > 3.84), quadritherapies (90.9%) and pentatherapies (100%).

Discussion

High blood pressure is a major health issue in Africa, with a prevalence of 27%, and over 60% in old age patients in sub-Saharan Africa. The morbidity and mortality associated with this sickness can be controlled by taking appropriate medication and by eliminating changeable risk factors [8; 12]. The aim of this retrospective study was to describe the pharmacotherapy management of patients diagnosed with high blood pressure at the Abidjan Heart Institute (AHI). 251 hypertensive patients were enrolled at the outreach department.

During the study, the mean age was 56 years. This mean age might be related to the conditions of inclusion of hypertensive patients with a threshold age of 18 years.

Other studies with no age limit at inclusion obtained lower mean ages [4; 13]. The number of patients with hypertension increased with age between 21 and 61 years, resulting in an unequal distribution of hypertension according to age groups. The age group [14] was more important (57.37%) in the population. This result is almost identical to that of a study conducted in Togo in 2006, where the predominant age group was between 46 and 69 years [15]. Indeed, old age promotes the loss of elasticity of arteries and is by default the first non-changeable risk factor [16]. Women had the highest frequency of hypertension (56.6%) because they are naturally exposed to a higher number of risk factors which are less or not changeable such as parity (72%), menopause (72.5 %), pregnancy (3.9%) and intaking of hormonal contraceptives (4.2%) which is a major cause of secondary hypertension [17].

In addition, other complication risk factors such as smoking (8%), alcoholism (12%) and chronic renal failure (0.4%) were found in all patients in this study, with at least two risk factors per patient. These risk factors were more frequent in patients with uncontrolled hypertension. This could suggest a higher risk of mortality and organ damage, corroborated by the results of other studies carried out in black African patients [18-19].

Obesity (31.5%) and major comorbidities such as diabetes (13.2%) and dyslipidaemia (11.6%) represent a significant cardiovascular and cerebrovascular risk for patients in this study according to the ESC/ESH classification. These comorbidities hasten the development of complications associated with hypertension. The complications are explained by the progressive thickening and stiffening of arteries, as well as by the aggravation of atheromatous plaques in some key arteries under a permanent impact of excessively high blood pressure [16].

To sum up, uncontrolled blood pressure in 73.3% of patients is generally common in most sub-Saharan African countries [20] and is the main cause of damage organs targeted by hypertension, such as the kidney, retina and heart [16]. The main goal of treating hypertensive patients is to reduce the total risk of cardiovascular morbidity and mortality.

The six (6) types of high blood pressure defined in the ESC classification were represented. Controlled hypertension (27.1%) and type 1 hypertension (26.7%) were more prevalent than type 3 hypertension (21.9%) and type 2 hypertension (19.1%). Thus, patients in this study had fewer severe forms (type 3 hypertension). Despite the reduction in severe forms, the number of patients exposed to mortality remains high. This is a real challenge for African regions, because black African patients have more severe forms of high blood pressure than patients in other continents [18-19].

Five (5) types of antihypertensive therapy were recorded in the therapeutic protocols of this study, with a predominance of bitherapy (59.4%) followed by tritherapy (19.9%), monotherapy (11.6%), quadritherapy (8.4%) and pentatherapy (0.8%). This could be explained by a significant drop in monotherapy prescriptions (52.3%, Chi2 = 13.9) during the therapeutic follow-up of patients with the triple therapy, quadritherapy and pentatherapy profile, which recorded increases of 71.6% (Chi2 = 6.6), 90.9% and 100% respectively. Monotherapy was mostly prescribed in several other studies including mainly old age patients [21-23] and according to the recommendations of the ESC, bitherapy should be used for young patients and monotherapy for old age patients. In fact, more than 2/3 of hypertensive patients are not satisfactorily controlled by monotherapy according to report of the Joint National Committee VII [12]. They need at least two or more antihypertensive drugs. Our results are similar with those of this report, since more than 88% of our patients needed at least two drugs for their therapy. This could have led to a significant increase of 54.9% (Chi-2 = 6.6) in controlled hypertension observed during the follow-up of patients against a non-significant reduction of 20.1% in type 2 hypertension (Chi2 = 1.7).

In monotherapy, calcium channel blockers and beta-blockers were mostly prescribed (41.4% and 20.7%) whereas diuretics were less prescribed (3.5%). This same result was obtained in other studies carried out in Guadeloupe [24], Cotonou [25] and Avicienne [26]. In bitherapy, calcium channel blockers were mainly associated with ACE inhibitors (43.6%). Calcium channel blockers were found in 71.2% of combinations against 27.5% for diuretics. In tritherapy, there was a predominance of ACE inhibitor, calcium channel blocker and diuretic associations (28%) with calcium channel blockers present in 66% of associations and diuretics in 70%. Calcium channel blockers and diuretics were also preponderant in quadri and pentatherapies.

Diuretics, beta-blockers and calcium channel blockers can adequately lower blood pressure and significantly improve cardiovascular issues [27]. These drugs are suitable for initiating and maintaining treatment, either as monotherapy or in combination with other drugs in combination therapy regimens, as observed in this study. It was thus noted an overall compliance of 70.92% of protocols prescribed by doctors at the Abidjan Heart Institute according to ESC recommendations.

Conclusion

The protocols used had a satisfactory level of compliance, although there were disparities in the choice of some molecules, especially in monotherapy. The follow-up of treatment showed a good trend, with

a higher proportion of patients with controlled hypertension at the end of this study compare to the beginning. As the Abidjan Heart Institute is the main hospital for the management of cardiovascular diseases in Côte d'Ivoire, this study could be extended to first contact structures in order to contribute to a rigorous pharmacotherapy approach to improve patients' quality of life.

Ethics Approval and Consent to Participate

The data were collected after favorable opinion from the medical and scientific management and the ethics committee of the Abidjan cardiology institute.

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Author Contributions

All authors made significant contributions in all areas, including the conception, design, and execution of the study, as well as data collection, data analysis, and interpretation. The authors participated in drafting and revising the manuscript, provided final approval for the publication version, agreed to the chosen journal for submission, and accepted responsibility for all of their work.

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Conflict of interest

The authors declare that they have no competing interests in this work.

Table 1: Socio-demographic and clinical data (SD = standard deviation; BP = Blood Pressure)

Socio-demographic data	% of patients (or mean ± SD)		
	All patients	Patient with controlled BP	Patient with uncontrolled BP
Age	55.9 ± 12.5 years	57.3± 9.4 ans	55.4± 10.1 years
Sex			
Male	43.4	25	84
Female	56.6	42	100
Place of residence			
Abidjan	83.3	58	151
Outside Abidjan	12.7	9	33
Profession			
Professional activity	61.8	40	104
With no professional activity (unemployed, Housewife)	24.7	20	53
Retired	13.6	7	27
Parity for women			
No child	38.0	2	5
More than one child	72.0	17	71
Total		67	184

Table 2: Risk factors for hypertensive patients at the outreach department of AHI

Risk factors	% of patients		
	All patients	Patient with controlled BP	Patient with uncontrolled BP
Modifiable risk factors (n = 162)			
Diabetes	13.2	9	24
Dyslipidemia	11.6	9	20
Obesity (BMI ≥ 30.0 Kg/m2)	31.5	10	34
Smoking	8.0	2	18
Alcoholism	12.0	6	24
Hormonal Contraception	4.2	0	6
Risk factors with little or no potential change (n = 89)			
Senility (Age ≥ 60 years old)	40.6	26	76
Sex (male)	43.4	25	84
Chronic renal failure	0.4	0	1
Menopause	72.5	33	70
Pregnancy	3.9	1	5

Table 3: Distribution of types of high blood pressure according to therapy

Therapeutic	Type of Hypertension (BP = systolic/ diastolic mmHg)						Patient numbe	(%)	p-value
	Controlled AHT (< 140/ < 90)	AHT 1 (140-159/ 90-99)	AHT 2 (160-179/ 100-109)	AHT 3 (> 180/ ≥ 110)	AHT S1 (≥ 140/ < 90)	AHT S2 (>160/< 90)			
Monotherapy	14.7%	22.39%	2.08%	4.44%	11.11%	0%	29	11.6	0.31
Bitherapy	63. 2%	58.21%	70.83%	62.22%	33.33%	66.67%	149	59.4	0.52
Tritherapy	11.8%	13.43%	20.83%	40%	44.44%	33.33%	50	19.9	0.06
Quadritherapy	8.8%	5.97%	6.25%	13.33%	22.22%	0%	21	8.4	0.84
Pentatherapy	1.5%	0%	0%	2.22%	0%	0%	2	0.8	0.45
Total	68 (27,1%)	67 (26.7%)	48 (19.1%)	55(21.9%)	10 (4.0%)	3 (1.2%)	251	100	

AHT S = AHT systolic

Table 4: Drug classes prescribed as monotherapy

Drug classes	Type of AHT (BP = systolic/ diastolic mmHg)						%	Compliance with ESC/ESH
	Controlled AHT (< 140/ < 90)	AHT 1 (140-159/ 90-99)	AHT 2 (160-179/ 100-109)	AHT 3 (> 180/ ≥ 110)	AHT S1 (≥ 140/ < 90)	AHT S2 (>160/< 90)		
Abidjan heart institute	3	6	1	1	1	0	41.4	Yes
Beta-blockers	3	1	0	1	0	0	20.7	No
ACEI	2	1	0	0	0	0	13.8	Yes
ARB	2	1	0	0	0	0	10.3	No
Centrally acting Antihypertensive agent	0	1	0	0	0	0	10.3	No
Diuretic	0	2	0	0	0	0	3.5	No
Total	10	12	1	2	1	0	100	33.3%

AHT S : AHT systolic ; CCB : Calcium Channel Blocker ; ACEI : Angiotensin Converting Enzyme Inhibitor; ARB 2 : Angiotensin II receptor blocker

Table 5: Drug classes prescribed in bitherapy

Drug classes	Type of AHT (BP = systolic/ diastolic mmHg)						%	Compliance with ESC/ESH
	Controlled AHT (< 140/ <90)	AHT1 (140-159/ 90-99)	AHT 2 (160-179/ 100-109)	AHT 3 (> 180/ ≥ 110)	AHT S1 (≥ 140/ < 90)	AHT S2 (>160/< 90)		
CCB+ACEI	7	18	15	18	1	1	43.6	Yes
CCB+ARB	7	6	4	4	1	0	14.8	Yes
ACEI+Diuretic	9	4	6	1	0	0	13.4	Yes
CCB+Diuretic	3	4	1	2	0	1	7.4	Yes
Diuretic+ARB	1	5	4	0	0	0	6.7	Yes
CCB+Beta-blockers	3	2	0	2	1	0	5.4	Yes
Others (4 combinations)	13	0	4	1	0	0	8.7	Yes /No
Total	43	39	34	28	3	2	100	80%

AHT S : AHT systolic ; CCB : Calcium Channel Blocker ; ACEI : Angiotensin Converting Enzyme Inhibitor; ARB : Angiotensin II receptor blocker

Table 6 : Drug classes prescribed in tritherapy

Drug classes	Type of AHT (BP = systolic/ diastolic mmHg)						%	Compliance with ESC/ESH
	Controlled AHT (< 140/ < 90)	AHT 1 (140-159/ 90-99)	AHT 2 (160-179/ 100-109)	AHT 3 (> 180/ ≥ 110)	AHT S1 (≥ 140/ < 90)	AHT S2 (>160/< 90)		
ACEI+Diuretic+CCB	1	3	2	5	2	1	28	Yes
ACEI+CCB+BB	0	2	2	5	0	0	18	Yes
CCB+Diuretic+ARB	2	1	1	2	1	0	14	Yes
ACEI+Diuretic+BB	1	0	4	1	0	0	12	Yes
CCB+Diuretic+BB	1	2	0	0	0	0	6	Yes
BB+ARB +Diuretic	1	0	0	2	0	0	8	Yes
Others (6 combinations)	2	1	1	3	1	0	14	Yes /No
Total	8	9	10	18	4	2	100	58%

AHT S : AHT systolic ; CCB : Calcium Channel Blocker ; ACEI : Angiotensin Converting Enzyme Inhibitor; ARB : Angiotensin II receptor blocker ; BB : Beta-Blocker

Table 7 : Drug classes prescribed in quadritherapy et pentatherapy

Drug class	Type of AHT (BP = systolic/ diastolic mmHg)						%	Compliance with ESC/ESH
	Controlled AHT (< 140/ < 90)	AHT 1 (140-159/ 90-99)	AHT 2 (160-179/ 100-109)	AHT 3 (> 180/ ≥ 110)	AHT S1 (≥ 140/ < 90)	AHT S2 (>160/< 90)		
Quadritherapy								
CCB+DIU+ARB +BB	1	3	3	0	1	0	38.1	Yes
CCB+CEI+BB+DIU	2	0	0	3	2	0	28.6	Yes
CCB+CEI+2 DIU	1	0	0	2	0	0	14.3	Yes
ACEI+2 DIU+BB	0	1	0	1	0	0	9.5	Yes
ACEI+ARB+2 DIU	1	0	0	0	0	0	4.8	No
ACEI+ARB +BB+AAC	1	0	0	0	0	0	4.8	
Total	6	4	3	6	3	0	100	83.3%
Pentatherapy								
ACEI+CCB+2 DIU+BB	1	0	0	1	0	0	100	Yes
Total	1	0	0	1	0	0	100	100%

AHT S : AHT systolic ; CCB : Calcium Channel Blocker ; ACEI : Angiotensin Converting Enzyme Inhibitor; ARB : Angiotensin II receptor blocker ; BB : Beta-Blocker

Table 8: Evolution of diagnosed types of hypertension and therapeutic protocols used when admitted and during patient follow-up

	% Patients initially diagnosed	% Patients during follow up	% Evolution	Chi-2 test
Types of AHT				
Controlled AHT	17.5	27.1	54.9	**6.6***
AHT 1	25.9	26.7	3.1	1.1
AHT 2	23.9	19.1	-20.1	1.7
AHT 3	24.3	21.9	9.9	0.4
AHT S1	6.4	4.0	37.5	1.5
AHT S2	2	1.2	40	0.5
Types of therapies				
Monotherapy	24.3	11.6	-52.3	**13.9***
Bitherapy	59.4	59.4	0	0
Tritherapy	11.6	19.9	71.6	**6.6***
Quadritherapy	4.4	8.4	90.9	3.3
Pentatherapy	0.4	0.8	100	0.3

* Chi-2 test, significant difference if Chi-2 calculated > 3.84

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