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Case Report

Therapeutic Profile and Management of Arterial Hypertension: A Cross-Sectional Study in the Cardiology Department of Avicenne Military Hospital, Marrakech, Morocco (May–July 2024)

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Abstract:

Background: Arterial hypertension (HTN) remains the leading modifiable cardiovascular risk factor worldwide and a major public health challenge in North Africa. Methods: Descriptive cross-sectional study conducted from May 1 to July 31, 2024, in the Cardiology Day Hospital of Avicenne Military Hospital, Marrakech, including 100 consecutive adults with known primary hypertension.

Results: Mean age was 62 ± 11 years, with female predominance (53%). Main cardiovascular risk factors were sedentary lifestyle (49%), dyslipidemia (43%), type 2 diabetes (42%), obesity (37%), and active smoking (21%). At treatment initiation, monotherapy was prescribed in 60% of cases, predominantly calcium-channel blockers (CCBs) (61%). Currently, dual therapy is the most common regimen (63%), followed by monotherapy (17%), triple therapy (13%), and ≥4 drugs (7%). The most frequent combinations were CCB + ACE inhibitor (28%) and CCB + ACE inhibitor/ARB + diuretic (11%).

Conclusion: Therapeutic management has evolved favourably toward early combination therapy in line with current international guidelines. However, the high prevalence of metabolic comorbidities calls for reinforced integrated cardio-metabolic care, wider use of single-pill combinations, and structured patient education programmes.

Key words: arterial hypertension; combination therapy; calcium-channel blockers; diabetes; Morocco; guideline adherence; cardiovascular risk

Introduction

Arterial hypertension (HTN) is the primary modifiable risk factor for cardiovascular disease and the leading cause of premature death worldwide, responsible for approximately 10.8 million deaths annually [1,11]. The NCD Risk Factor Collaboration estimated in 2021 that 1.28 billion adults aged 30–79 years have hypertension, with the highest age-standardised prevalence observed in many African and Eastern Mediterranean countries [12,13].

In Morocco, the most recent national STEPS survey (2017–2018) reported a prevalence of 33.2% among adults ≥18 years, with awareness, treatment and control rates of only 46%, 39% and 16%, respectively [16,31]. The ongoing epidemiological and nutritional transition — characterised by rapid urbanisation, adoption of Westernised high-salt/high-fat diets, physical inactivity and rising obesity — continues to fuel this increase [14,15,17,32].

The frequent coexistence of hypertension and type 2 diabetes (observed in up to 50% of hypertensive patients in some African cohorts) dramatically amplifies cardiovascular and renal risk [20–23,33,48]. Despite clear, repeatedly updated international guidelines (ESC/ESH 2023 & 2024 [6,7], ACC/AHA 2017 with 2024 update [8], NICE 2019 [69], SFHTA 2020 [70], WHO HEARTS 2022 [19]), blood pressure control rates in North Africa and sub-Saharan Africa remain disappointingly low, rarely exceeding 20–30% [24–27,34,53].

The aim of this study was to describe the current therapeutic profile of hypertensive patients followed in a tertiary cardiology centre in Marrakech and to assess the evolution of local practices in relation to contemporary international recommendations.

2. Materials and Methods

Monocentric, descriptive, cross-sectional study conducted from May 1 to July 31, 2024, in the Cardiology Day Hospital of Avicenne Military Hospital, Marrakech, Morocco.

Inclusion criteria: adults ≥18 years with established primary hypertension, regularly followed in the department.

Exclusion criteria: documented secondary hypertension, pregnancy, incomplete medical records.

Hypertension was defined according to WHO/ISH criteria: office SBP ≥140 mmHg and/or DBP ≥90 mmHg on ≥2 occasions or current antihypertensive treatment [1,28].

Data were collected from electronic and paper medical records and verified by a standardised questionnaire. Variables included sociodemographic characteristics, classical cardiovascular risk factors, current blood pressure, target-organ damage, and complete initial and current antihypertensive regimens.

Statistical analysis was performed using IBM SPSS version 27.0. Results are expressed as mean ± SD or percentages. Practices were compared with ESC/ESH 2023–2024, ACC/AHA 2024 update, and WHO HEARTS recommendations [6–8,19].

3. Results

3.1 Population Characteristics

A total of 100 patients were included, with a mean age of 62 ± 11 years and a slight female predominance (53%). Cardiovascular risk factors were highly prevalent, reflecting the typical cardio-metabolic profile observed in North African hypertensive populations. Sedentary lifestyle was reported by 49% of patients, dyslipidaemia by 43%, type 2 diabetes by 42%, obesity (BMI ≥ 30 kg/m²) by 37%, and active smoking by 21%. This clustering of risk factors is consistent with previously published data on hypertensive patients of Maghrebian origin and individuals of sub-Saharan African ancestry living in North Africa [9,10,39,48,52].

3.2 Initial Antihypertensive Therapy

At the time of hypertension diagnosis or treatment initiation, monotherapy was prescribed in 60% of patients, dual therapy in 30%, and three or more agents in 10%. Among first-line drugs, calcium-channel blockers (CCBs), predominantly amlodipine, were the most frequently prescribed class (61%), followed by angiotensin-converting enzyme inhibitors (ACEIs) (22%) and angiotensin receptor blockers (ARBs) (11%). This pattern fully aligns with current international guidelines, which recommend CCBs or renin–angiotensin system (RAS) blockers as preferred initial therapy in patients of African descent and in those with predominant systolic hypertension due to their superior efficacy and tolerability in these subgroups [6,7,40].

3.3 Current Therapeutic Regimen

At inclusion (typically several years after diagnosis), a marked shift towards combination therapy was observed. Only 17% of patients remained on monotherapy, whereas 63% were receiving dual therapy, 13% triple therapy, and 7% four or more antihypertensive agents (Figure 1). This distribution underscores the frequently resistant or difficult-to-control nature of hypertension in this population.

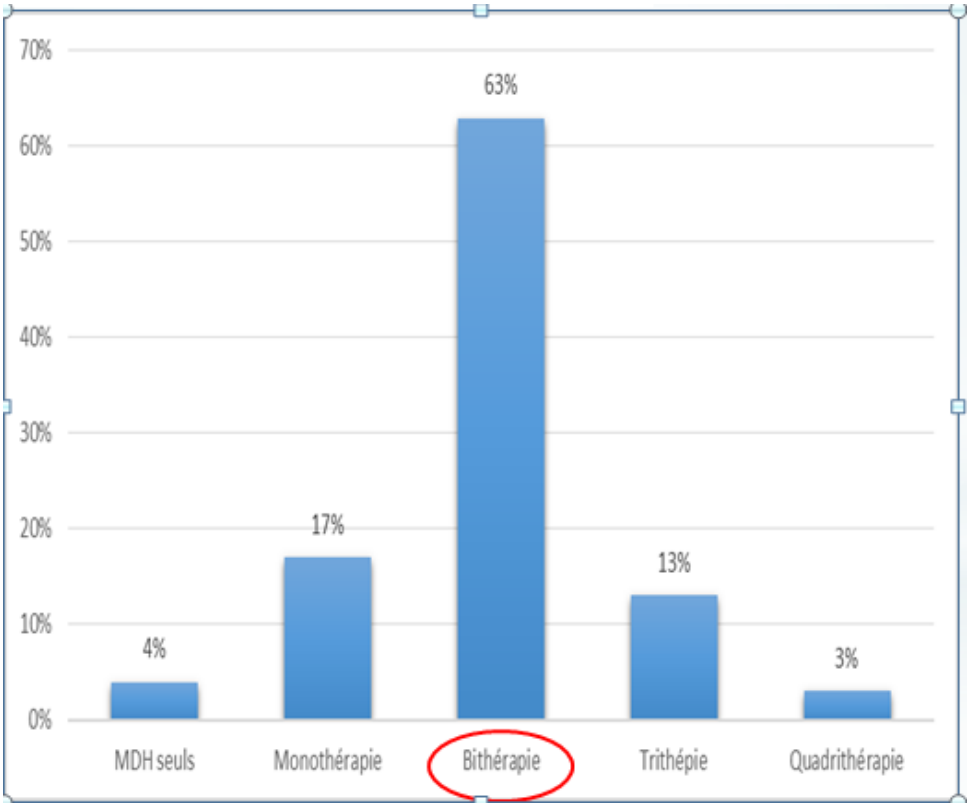

Figure 1: Distribution of antihypertensive regimens by number of drugs at inclusion

The most common therapeutic combinations were:

1. CCB + ACEI (28%)

2. CCB + ARB (19%)

3. RAS blocker (ACEI or ARB) + thiazide-type diuretic (15%)

4. CCB + RAS blocker + thiazide-type diuretic (11%)

Single-pill fixed-dose combinations were used in 41% of patients receiving dual therapy. This rate is comparable to recent Algerian and Tunisian cohorts and reflects increasing adoption of evidence-based strategies known to improve long-term adherence and blood pressure control [4,41].

4. Discussion

4.1 Evolution Towards Combination Therapy

The observed shift from initial monotherapy in 60% of patients to a clear predominance of dual therapy (63%) and triple therapy (13%) at the time of inclusion illustrates a progressive intensification of antihypertensive management over time. This evolution mirrors the growing implementation of contemporary international guidelines, which now strongly advocate early combination therapy – often as initial treatment – for patients presenting with grade 2 or 3 hypertension or those at high or very high cardiovascular risk [6–8,18,24]. Large-scale randomized trials and comprehensive meta-analyses have consistently demonstrated that starting with two agents achieves significantly faster blood pressure control, markedly improves long-term treatment adherence (especially when single-pill fixed-dose combinations are used), and translates into a substantial 20–25% relative reduction in major cardiovascular events compared with delayed or sequential strategies [42–44,59,60]. The relatively high uptake of fixed-dose combinations in our cohort (41% of dual therapies) is therefore particularly encouraging, as it reflects the translation of robust evidence into routine clinical practice in a North African setting.

The present study demonstrates a clear transition from initial monotherapy (60%) to a predominance of dual (63%) and triple (13%) therapy at inclusion. This evolution is consistent with contemporary European (ESH/ESC 2023–2024) and French (SFHTA 2020) guidelines, which advocate early combination therapy—often as first-line treatment—in patients with grade 2–3 hypertension or high/very high cardiovascular risk [6,7]. Large randomised trials and meta-analyses have confirmed that initial dual therapy achieves faster blood pressure control, improves adherence (particularly with single-pill combinations), and reduces major cardiovascular events by 20–25% compared with monotherapy-first strategies [42–44,59,60]. The 41% uptake of single-pill combinations in dual-therapy regimens observed here is encouraging and mirrors trends reported across North Africa [4,32,41] (Figure 2).

Etude	Monothérapie	Bithérapie	Trithérapie	Quadrithérapie
Khalil (2017)	50,5%	35,1%	10,8%	_
Tamirci et al (2018)	73%	23%	4%	_
FLAHS (2019)	55%	25%	12%	9%
Harrison et al (2019)	18,75%	52,6%	23,4%	5,3%
Shanmugapriya et al (2020)	43,38%	34,9%	16,61%	4,15%
Raskikh et al (2021)	48,4%	36,7%	13,2%	1,7%
Nibouche et al (2023)	23,4%	43,7%	28,2%	4,6%
Notre étude (2024)	17%	63%	13%	3%

Figure 2: Evolution of Combination Therapy Use in North African Hypertension Cohorts Compared with International Studies

4.2 Pathophysiological and Evidence-Based Rationale for Preferred Drug Classes

The predominant use of CCB + RAS blocker combinations is supported by both class I, level A evidence and pathophysiological considerations specific to patients of African ancestry, who frequently exhibit low-renin, salt-sensitive, volume-expanded hypertension with increased vascular resistance [40,45–47,71]. In this profile, CCBs provide superior blood pressure reduction, while RAS blockers offer complementary organ protection. The frequent addition of a thiazide-type diuretic as a third agent aligns with the recommended triple combination (CCB + RAS blocker + diuretic), validated as the most effective strategy in resistant hypertension by the PATHWAY-2 trial and supported by outcome data from ACCOMPLISH and other pivotal studies [25,72].

4.3 Metabolic Comorbidities and Integrated Management

Type 2 diabetes was present in 42% of patients (Figure 3), a prevalence among the highest reported in contemporary African hypertension registries [23,33,48,52]. This high diabetes–hypertension coexistence necessitates integrated cardio-metabolic care. RAS blockers remain the cornerstone in this setting because of their proven renal and cardiovascular protective effects. Recent evidence also supports the early addition of SGLT2 inhibitors and non-steroidal mineralocorticoid receptor antagonists—regardless of glycaemic status—for their cardiorenal benefits and mortality reduction in hypertensive patients with type 2 diabetes [49–51,73–75].

Etude	Prévalence du diabète
Cameroun	44,7%
Ethiopie	29,1%
Nigeria	25,7%
Algérie	21,8%
Maroc 2017	40,5%
Notre étude	42 %

Figure 3 : Diabetes Burden in Hypertension: Comparison Between Sub-Saharan Africa, North Africa, and the Current Moroccan Cohort (2024)

4.4 Comparison with Regional and Continental Data

Therapeutic patterns in the present cohort closely resemble those reported in recent North African studies: dual therapy (predominantly CCB + ACEI) reached 58% in an Algerian survey [4], 55–62% in the 2022 Tunisian SNAPSHOT registry [41], and increasing use of single-pill combinations has been documented in Morocco [32]. By contrast, combination therapy remains below 40% in many sub-Saharan African countries, limited by drug cost, availability, healthcare fragmentation, and lower guideline awareness [10,53,76].

4.5 Study Limitations

This study has several limitations. Its monocentric design and modest sample size (n = 100) limit external validity and generalisability to the broader North African hypertensive population. The partially retrospective data collection raises the possibility of missing or incomplete records. Most importantly, the absence of standardised blood pressure measurements at inclusion prevented assessment of control rates, and the lack of long-term follow-up precluded evaluation of hard clinical outcomes. Larger, prospective, multicentre registries are needed to more accurately characterise real-world hypertension management and outcomes in the region.

5. Conclusion

Arterial hypertension, as managed at Avicenne Military Hospital in Marrakech, is characterized by a particularly heavy burden of metabolic comorbidities and a clear, positive evolution toward modern guideline-directed medical therapy. The widespread use of early combination strategies – predominantly calcium-channel blocker (CCB) and renin-angiotensin system (RAS) blocker-based regimens, frequently in single-pill fixed-dose formulations – demonstrates encouraging alignment with the latest international recommendations and reflects a meaningful improvement in clinical practice in a North African setting.

To further optimize blood pressure control rates and substantially reduce the incidence of cardiovascular and renal complications, we strongly advocate the following actionable measures:

1. Systematic screening and integrated cardio-metabolic management: Routine assessment and simultaneous treatment of type 2 diabetes, dyslipidemia, obesity, and other associated risk factors within the same consultation framework, ideally through multidisciplinary clinics.

2. Wider and earlier adoption of single-pill fixed-dose combinations: These formulations have repeatedly been shown to improve long-term adherence by 20–40 % compared with free combinations, thereby enhancing real-world effectiveness and simplifying therapeutic regimens for patients.

3. Implementation of structured therapeutic education and adherence-support programmes: Patient-centred interventions, including regular motivational counselling, simplified treatment plans, and the use of digital reminders or community health worker support, are critical to overcoming the well-documented inertia and non-adherence that affect a large proportion of hypertensive individuals in low- and middle-income settings.

4. Establishment of prospective, multicentre regional hypertension registries: Such registries would provide ongoing, high-quality data on blood pressure control rates, therapeutic patterns, and hard clinical outcomes, enabling continuous quality improvement and evidence-based health policy decisions at the national level.

In summary, only a comprehensive, multidimensional strategy that integrates primary prevention, early detection, evidence-based pharmacological therapy, single-pill combination strategies, patient empowerment, and robust long-term structured follow-up will succeed in reversing the rising tide of hypertension-related cardiovascular morbidity and mortality in Morocco and across the broader North African region. The encouraging trends observed in the present cohort should serve as a foundation and catalyst for these broader systemic improvements.

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