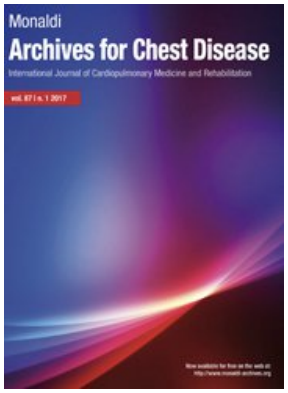

Monaldi Archives for Chest Disease

eISSN 2532-5264 https://www.monaldi-archives.org/

Monaldi Arch Chest Dis 2026 [Online ahead of print]

To cite this Article:

Benmaamar S, Maiouak M, El Harch I, et al. **Hypertension cost in primary health care facilities in Morocco: a cost-of-illness study**. *Monaldi Arch Chest Dis* doi: 10.4081/monaldi.2026.3816

Submitted: 15-11-2025
Accepted: 3-06-2026

Hypertension cost in primary health care facilities in Morocco: a cost-of-illness study

Soumaya Benmaamar,[1,2] Moncef Maiouak,[1,2] Ibtissam El Harch,[1,2]
Angela Christie Filankembo Kava,[1] Passy Conde,[1] Khalid Khilou,[3]
Noura Qarmiche,[1] Samira El Fakir,[1,2] Mohamed Berraho,[1,2] Nabil Tachfouti[1,2]

[1]Laboratory of Epidemiology, Clinical Research and Community Health, Faculty of Medicine and Pharmacy, University Sidi Mohamed Ben Abdellah, Fez; [2]Hassan II University Hospital, Fez; [3]Faculty of Medicine and Pharmacy, University Sidi Mohamed Ben Abdellah, Fez, Morocco

Correspondence: Soumaya Benmaamar, Laboratory of Epidemiology, Clinical Research and Community Health, Faculty of Medicine and Pharmacy, Fez, Morocco.
E-mail: soumaya.benmaamar@usmba.ac.ma

Contributions: Soumaya Benmaamar: writing - original draft. Moncef Maiouak, Ibtissam El Harch, Angela Christie Filankembo Kava statistical analysis. Passy Conde, Khalid Khilou: data collection. Noura Qarmiche: data management. Samira El Fakir, Mohamed Berraho, Nabil Tachfouti: conceptualization and supervision. All authors reviewed and approved final manuscript.

Conflict of interest: the authors declare that they have no conflict of interest.

Ethics approval and consent to participate: ethical approval for the study was obtained from the Fez University Hospital Ethics Committee (Ref: 21/2017). Facility managers were informed about the study and patients who agreed to participate were asked to sign a written consent form.

Informed consent: patients who agreed to participate were asked to sign a written consent form.

Patient consent for publication: not applicable. No personal or identifying information of participants is included in this manuscript.

Availability of data and materials: all data generated or analyzed during this study are included in this published article.

Acknowledgments: the authors would like to thank the participants who freely enrolled in the study as well as primary health care facility managers who facilitated study. The authors also thank the Ministry of Health responsible in Fez who gave permission for the study to be conducted. The field team are sincerely appreciated for their efforts in ensuring the success of this project.

Declaration of generative artificial intelligence and artificial intelligence-assisted technologies in the writing process: no generative artificial intelligence or AI-assisted technologies were used in the writing process of this manuscript.

Abstract

Hypertension in low- and middle-income countries such as Morocco has an economic importance due to its high prevalence and cost. The aim of this study is to estimate direct health costs (DHC) for hypertension patients followed in primary health care facilities in Morocco.

A cost of illness prevalence-based study was carried out on hypertension patients followed in public primary health care facilities in Fez. Data were collected using a questionnaire, including sociodemographic and clinical data and healthcare resources utilization: medical tests, medications, and medical visits. DHC was estimated using a bottom-up approach method from a societal perspective and a one-year time horizon. Official prices published by the national agency for health insurance were adopted as unit costs. Cost was compared to annual household income for calculating the catastrophic cost. Cost is defined as catastrophic if it exceeds 10% of annual household income.

We included 146 patients. The mean age was 60.7±11.1 years; 70.5% were men. More than half (54.2%) of participants had uncontrolled hypertension. The direct medical cost was estimated at 368.8±120.8 United States dollars per patient. Costs of medical tests and drugs represented, respectively, 58.6% and 30.5% of total direct cost. The incidence of catastrophic cost was 76.8%.

Hypertensive patients incur substantial direct costs. High rates of catastrophic costs illustrate the urgency of improving financial risk protection for these patients and strengthening primary care to ensure the affordability of hypertension care.

Key words: cost of illness, arterial hypertension, primary care, Morocco.

Introduction

Hypertension remains a major global public health challenge. The number of adults with high blood pressure has increased continuously over the years. with most of the growth occurring in low- and middle-income countries [1]. In 2024, the World Health Organization (WHO) estimated that around 1.4 billion adults aged 30–79 years were living with hypertension, with only 23% achieving adequate blood pressure control [1]. Hypertension is a major cause of premature death worldwide [1]. Each year, uncontrolled hypertension is associated with more than 10 million deaths worldwide [2].

Hypertension is also a significant economic burden. The results of a systematic review including the costs of hypertension in 15 countries showed that the average total costs of hypertension for all countries studied, calculated per person, were $ 630.14, and direct costs constituted more than 50% of total costs [3]. In low and middle countries, studies reported monthly costs for hypertension treatment around $22 [4].

In Morocco, the situation is equally concerning. According to the WHO country profile (2023), the age-standardized prevalence of hypertension among adults aged 30–79 years was 35% in 2019, corresponding to approximately 6.1 million individuals [5]. The national STEPS survey (2018) reported a prevalence of 22.8% [6], while a multicenter study conducted in 2008–2009 in primary care settings found a crude prevalence of 39.8%, and 26.6% after age- and sex-standardization [7]. The burden in terms of mortality is particularly alarming: nearly 63% of cardiovascular disease deaths in Morocco are attributable to elevated systolic blood pressure [5].

Moroccan hypertension care is provided by a mix of public and private providers. Public delivery system is organized into three levels according to a pyramidal hierarchy. Primary healthcare facilities (PHCF) known as urban and rural health centers represent the first resort for the patients; in this level health cares are free and patients can access free medication. They provide preventive and promotional cares as well as ambulatory curative cares. The second recourse corresponds to the provincial, and regional hospital centers and third recourse is the university hospital centers [8].

Knowledge of the economic burden of disease is an essential component of reasonable management of the health care system's limited resources [9]. In our country, no study to our knowledge has investigated the cost of managing hypertension. Hence, the objective of the present study was to estimate and characterize the direct ambulatory costs of hypertension

management among patients in primary healthcare facilities in a Moroccan region, including consultation, medication, and laboratory and diagnostic tests -related costs.

Materials and Methods

Study design and setting

We conducted a cost of illness study in primary health care facilities (PHCF) in Fez city [10].

Study participants

Inclusion criteria:

- Adults aged ≥ 18 years
- Diagnosed with essential (primary) hypertension
- Receiving antihypertensive treatment for at least 6 months
- Residing in Fez city
- Attending one of the selected primary healthcare facilities (PHCFs)
- Providing informed consent to participate in the study

Exclusion criteria:

- Pregnant women
- Patients with secondary hypertension
- Individuals with mental disabilities hindering the interview process
- Patients who declined to participate

Hypertension was defines according to guidelines of American College of Cardiology/American Heart Association Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults (2017 Guideline) [11] as: a mean systolic blood pressure measurement of ≥130 mm Hg, a mean diastolic blood pressure measurement of ≥ 80 mm Hg. hypertension is classified as Stage 1 when systolic blood pressure ranges from 130 to 139 mm Hg or diastolic blood pressure ranges from 80 to 89 mm Hg, and as Stage 2 when systolic blood pressure is ≥ 140 mm Hg or diastolic blood pressure is ≥ 90 mm Hg [11]**.**

Controlled hypertension refers to a condition in which a diagnosed hypertensive patient achieves the recommended blood pressure targets through antihypertensive treatment and/or lifestyle modifications. According to the 2017 ACC/AHA guidelines [11], blood pressure is

considered controlled when: Systolic BP < 130 mm Hg and Diastolic BP < 80 mm Hg, based on the average of the two most recent measurements.

Sampling method

We based our sampling on a two-stage stratified sampling method. The primary sampling units were the primary health care centers (PHCCs), while the secondary units consisted of hypertensive patients receiving medical treatment to control their blood pressure.

In the first stage, ten PHCCs were selected out of the 30 centers in the city of Fez. Selection criteria included the number of patients treated, the accessibility of the centers, and the willingness of the physicians to participate. The chosen centers were distributed across neighborhoods with low, medium, and high socioeconomic levels, ensuring a diverse representation of the population.

In the second stage, within each selected PHCC, patients were randomly selected using their order numbers to constitute the secondary sampling units. This approach ensures that patient selection is random, while preserving the stratified structure of the primary units.

This methodology allows us to obtain a representative sample of hypertensive patients followed in primary health care facilities across different socioeconomic contexts in the city of Fez. Figure 1 presents the participants selection process.

Data collection

Data collection was performed using face to face standardized structured questionnaire. Interviews were conducted in PHCF after consultation, local languages (Arabic) was used to clarify questions where necessary. Questionnaire collected information on:

- Socio-demographic data: age, gender, education level, health insurance, employment status, monthly income.
- Clinical data: Body Mass Index (BMI), duration of disease, stage of HTA, control of HTA.

Based on their body mass index (BMI), participants were classified into 4 categories: underweight (BMI< 18.5 kg/m^2), normal (BMI between 18.5 and 24.9 kg/m^2), overweight (BMI between 25 and 29.9 kg/m^2), or obese (BMI≥ 30 kg/m^2) in accordance with the WHO guidelines [12].

- Use of health service use for different care seeking episodes during the last year:

- Drugs: Cost of regular medication prescribed to manage hypertension: Calcium Channel Blockers, Angiotensin Receptor Blockers, Angiotensine Converting Enzyme Inhibitors, Beta-blockers, Diuretics and antihypertensive drug combinations.
- Laboratory tests: Cost of routine laboratory services at public and private health facilities: glycaemia, urea, creatinine, ionogram (measurement of serum electrolytes, including sodium and potassium levels and other electrolytes where available), Blood lipid measurements.
- Diagnostic test: Cost of routine diagnostic services at public and private health facilities: electrocardiogram, cardiac ultrasound, holter pressure.
- Medical consultation: Cost due to regular medical visits (general practitioner and specialist).

Measuring patient costs

A prevalence-based approach and bottom up method were used for calculating the cost of illness [9]. The prevalence approach is the most widely used in cost of illness studies and estimates the total cost of a disease in a given year [13].

In a bottom-up approach, the first step is to measure and quantify the health services used by the hypertensive patient during the year and the second step is to estimate the unit costs of the inputs used. The total cost is the result of multiplying the unit costs by the quantities of the resources used [10].

Direct health care cost was estimated as well for the public sector as for private sector for patients having attended in private sector. The costs of HT management were divided into 3 cost categories: general practitioner and specialist physician consultations, drugs and tests performed (e.g. Blood count, ECG). Direct non–health care costs included transport costs and costs associated with accommodation while were not measured.

Costs were estimated by multiplying the use of resources (health services) by the official prices (unit costs) published by the national agency for health insurance for public and private sectors [14]. Drug costs were calculated based on the commercial names of antihypertensive medications and the number of drugs per patient. Unit costs were obtained from Reimbursable Drug Guideline developed by the health insurance agency.

The time horizon adopted in the study was one year: the study measured treatment and management costs for patients followed for one year at the selected health facility.

DHC was estimated from a societal perspective that includes all direct medical costs for all members in a given society [10].

We compared the total direct costs in the overall sample against the annual household income to calculate the catastrophic cost. Cost is defined as catastrophic if it exceeded 10% of annual household income [15]. The calculation formula is:

$$\text{Catastrophic cost (\%)} = \frac{\text{Totalannualhealthexpenditureperpatient}}{\text{Annualhouseholdincome}} \times 100$$

Data management and analysis

Data were entered in Excel 2013 software to enhance data quality. Data were analysed with SPSS v 26. The total cost per patient was calculated as the sum of direct medical costs (consultations, laboratory tests, medications). Costs were converted from Moroccan Dirhams (MAD) to US dollars using the official exchange rate from the World Bank. Cost results are presented in US Dollars (USD). Means, standard deviations and percentages were used to describe patient demographic, socio-economic and costs variables. In Bivariate analyses (Student and ANOVA tests) were performed to examine associations between total cost and patient characteristics. The significance level was kept at 0.05.

Results

Participant's characteristics

In total, 146 individuals were interviewed. The mean age for participants was 60.7±11.1 years and 70.5% were male. More than half of participants (56.2%) were illiterate and 56.7 % were had a Moroccan medical assistance plan (RAMED). Monthly household income was <200US for 69.3% of the population. In terms of health characteristics, (73.8%) were overweight or obese. The mean years duration was 6.5±5.7 years and 54.2% had uncontrolled blood pressure. Table 1 shows patients and illness characteristics.

Health services utilisation

The average number of cardiology visits was 1.55±2.45 per patient per year and the mean number of general practitioners was 6.96±4.53 per patient per year. The most frequently performed diagnosis tests were cardiac ultrasound (1.65±0.62), electrocardiogram (1.33±0.64), and fundus (1.61±0.60).

Among the antihypertensive medications prescribed, Calcium Channel Blockers were the most frequently used therapeutic class (61.6%), followed by Angiotensin Receptor Blockers (23.3%), Diuretics (18.5%), and Angiotensin-Converting Enzyme Inhibitors (17.1%). Bêta-Blockers and antihypertensive drug combinations were each prescribed in 4.8% of patients.

Regarding the number of antihypertensive medications used per patient, most participants were receiving monotherapy (70.5%). Dual therapy or triple therapy was prescribed in 29.5% of patients. Table 2 describes the utilization of healthcare resources in the management of hypertension among the study participants.

Patient costs associated with health care use

The mean annual direct cost of HTA was estimated at $368.8 ±120.8 per patient. The pharmaceutical treatment cost of HTA was estimated at $112.6± 81.0 per patient per year. It represented 30.5% of the total DHC. Patients receiving antihypertensive combination therapy (dual or triple therapy) had a higher mean drug cost (142.02 ± 98.14) compared to those on monotherapy (99.69 ± 69.57). The cost of medical tests accounted for 58.6% of DHC, it was estimated at $216.7±60.5. The mean cost for medical visits represented 11.8 % of total DHC. Cost for hypertension services was catastrophic for 76.8% of the households. The distribution of costs is presented in Table 3.

Factors associated with total cost

No statistically significant differences in direct costs were observed in the overall comparisons by gender ($p = 0.16$) or age group ($p = 0.85$). However, stratified analyses revealed more nuanced patterns. Among patients aged ≥60 years, a statistically significant difference was observed between men and women ($p = 0.008$), with higher costs among women. In contrast, no significant gender difference was found among patients aged <60 years ($p = 0.20$).

Furthermore, when examining age-related differences within each gender, no significant variation in costs was observed among men ($p = 0.17$). However, a significant increase in costs was found among women aged ≥60 years compared with those aged <60 years ($p = 0.042$).

Table 4 shows the distribution of direct cost by age group and gender.

No statistically significant association was observed between direct costs and socioeconomic factors, including income level and educational level. Similarly, no significant association was found between hypertension-related costs and the clinical factors analyzed, including

hypertension stage, disease duration, and hypertension control status ($p > 0.05$ for all comparisons).

Discussion and Conclusions

This study has documented for the first time direct medical costs for adults with hypertension that sought care in primary public health care facilities in Morocco. Our findings showed that direct cost for hypertension was estimated at 368.8 USD per patient. It was catastrophic for more than 76% of households. The cost of medical tests and drugs accounted for 58.6% and 30.5% of DHC respectively.

The estimation of DHC in Moroccan patients is similar to result found in Kenya (304.8 USD) [16]. In Malaysia [17], the annual direct cost of hypertension management was estimated to range from approximately 461 to 777 USD per patient per year, depending on hypertension severity. In china this cost is estimated at 467.2 USD [18]. In other countries such as Italy, the average direct cost was higher than these estimates, reaching approximately 800 USD [19]. Differences in the cost of hypertension care across countries are largely driven by variations in cost estimation methods and healthcare pricing structures. Moreover, substantial heterogeneity in costing methodologies—particularly regarding perspective, data sources and time approach may significantly affect cost estimates and limit cross-country comparability. A detailed comparison of cost estimates and costing methodologies across countries is provided in Table 5.

In this study, the cost of medicines represented 30.5% of total DHC. This result is similar to the one found in Jamaica (32%) and higher than the proportion found in Mexico and USA (14 and 15% respectively). In Kenya and Italy cost of drugs represented more than 40% of DHC. In Malaysia this percentage exceeded 50% [16,17,19].

The high cost of drugs in the management of hypertension is a concern as the unaffordability of hypertension drugs is a likely cause of non-adherence which implies uncontrolled hypertension [20-25]. Patients only seek care when they have access to funds [26,27].

In the present study, laboratory and diagnostic tests represented the largest component of direct medical costs (216.7 ± 60.5) USD, accounting for 58.6% of the total direct cost. This proportion appears substantially higher than that reported in several other countries. In Kenya, diagnostic and laboratory investigations accounted for a relatively small proportion of hypertension-related costs, estimated at approximately 9.3 USD annually [16]. Similarly, in

Italy, laboratory and diagnostic investigations represented nearly 13% of the total direct cost, corresponding to approximately 100 Euros [19].

In contrast, the high proportion of diagnostic costs observed in Morocco may reflect the frequent use of complementary investigations for cardiovascular risk assessment and monitoring of hypertension-related complications. These investigations are routinely recommended for the evaluation of target organ damage and long-term follow-up of hypertensive patients.

In addition, the fact that approximately 17.3% of the Moroccan population is classified as poor or vulnerable [28] suggests that many patients may face substantial financial barriers in accessing hypertension treatment and recommended medical investigations. This issue is particularly concerning given the high proportion of costs attributed to laboratory and diagnostic tests in the present study.

Financial constraints may lead patients to delay or forgo consultations, laboratory monitoring, and follow-up examinations, thereby compromising adherence to long-term hypertension management. Reduced access to regular monitoring may also hinder the early detection of target organ damage and cardiovascular complications, resulting in poor blood pressure control and worsening prognosis. Previous studies [29,30] have shown that inadequate follow-up and poor adherence to antihypertensive care are associated with increased risks of cardiovascular events, hospitalization, and premature mortality.

In this study, gender differences in direct costs of hypertension were not statistically significant overall. However, a significant difference was observed among patients aged 60 years and older, with higher costs among women. This finding suggests that age may modify the relationship between gender and healthcare costs.

The higher costs observed among women aged ≥60 years may be explained by their greater healthcare-seeking behavior and higher likelihood of adhering to follow-up consultations and preventive care, which may lead to increased healthcare utilization and consequently higher costs [31-33]. In additions, older women are more likely to experience multimorbidity, requiring more frequent monitoring, consultations, and treatments [34-36].

The incidence of catastrophic health care costs in hypertension patient was 43.3% in Kenya [16]. A lower rate was found in China [18]. In this study, we found a higher rate than these estimates (76.8%). This funding indicates that medical expenditures for hypertension have become a significant source of impoverishment in our country. The higher incidence observed

can be explained by the low socioeconomic profile of our participants, which increases the risk of catastrophic expenditure even with modest medical costs. However, these results should be interpreted with caution, as our study was conducted in a primary care setting and relies on self-reported data, which may introduce bias. Despite these limitations, the results highlight the urgent need to strengthen financial protection policies, particularly for chronic diseases such as hypertension.

This study is the first to document the cost of managing hypertension in primary health care facilities in Morocco. The findings may serve as valuable inputs for cost analyses and cost-effectiveness models that incorporate patient expenditures. An additional strength of this work lies in the use of a bottom-up approach, which is considered the most appropriate methodology for this type of study. Nevertheless, several limitations should be acknowledged. First, patients treated in the private sector were not included. Since private health care often involves higher expenses, excluding these patients may underestimate the overall economic burden of hypertension. Second, we did not account for direct non-medical costs (e.g., transportation) or indirect costs (e.g., productivity loss), which further suggests that our estimates are conservative.

Despite these limitations, our study highlights that hypertension management in public facilities entails substantial costs for patients. Based on our findings, several recommendations can be made. First, efforts should focus on strengthening the availability and regular supply of affordable antihypertensive drugs in public facilities. Second, expanding financial protection mechanisms, such as insurance coverage, would help reduce out-of-pocket expenditures for vulnerable populations. Finally, future research should adopt a more comprehensive approach that incorporates both direct non-medical and indirect costs, as well as patients treated in the private sector, to better capture the true economic burden of hypertension in Morocco.

References

1. WHO. Hypertension. Available from: https://www.who.int/news-room/fact-sheets/detail/hypertension.
2. WHO. Uncontrolled high blood pressure puts over a billion people at risk. Available from: https://www.who.int/news/item/23-09-2025-uncontrolled-high-blood-pressure-puts-over-a-billion-people-at-risk
3. Wierzejska E, Giernaś B, Lipiak A, et al. A global perspective on the costs of hypertension: a systematic review. Arch Med Sci 2020;16:1078-91.

4. Gheorghe A, Griffiths U, Murphy A, et al. The economic burden of cardiovascular disease and hypertension in low- and middle-income countries: a systematic review. BMC Public Health 2018;18:975.
5. WHO. Morocco hypertension profile. Available from: https://cdn.who.int/media/docs/default-source/country-profiles/hypertension/hypertension-2023/hypertension_mar_2023.pdf?sfvrsn=b820c359_4&download=true
6. WHO. 2017-2018 STEPS country report Morocco. Available from: https://www.who.int/publications/m/item/2017-2018-steps-country-report-morocco
7. El Achhab Y, Nazek L, Maalej M, et al. Prevalence, control and risk factors related to hypertension among Moroccan adults: a multicentre study. East Mediterr Health J 2019;25:447-56.
8. WHO. Health profile 2015. Morocco. Available from: https://apps.who.int/iris/bitstream/handle/10665/253774/EMROPUB_2016_EN_19275.pdf?sequence=1&isAllowed=y
9. Tarricone R. Cost-of-illness analysis. What room in health economics? Health Policy 2006;77:51-63.
10. Jo C. Cost-of-illness studies: concepts, scopes, and methods. Clin Mol Hepatol 2014;20:327-37.
11. Whelton PK, Carey RM, Aronow WS, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: executive summary: a report of the American College of Cardiology/American Heart Association task force on clinical practice guidelines. Hypertension 2017;71:6.
12. WHO. Obésité et surpoids. Available from: https://www.who.int/fr/news-room/fact-sheets/detail/obesity-and-overweight.
13. Byford S, Torgerson DJ, Raftery J. Cost of illness studies. BMJ 2000;320:1335.
14. Caisse Nationale des Organismes de Prévoyance Sociale (CNOPS). Tarification Nationale de Référence (TNR): Consultations et visites, biologie et radiologie. Available from: https://www.cnops.org.ma/fr/Reglementation_page
15. Wagstaff A, Flores G, Hsu J, et al. Progress on catastrophic health spending in 133 countries: a retrospective observational study. Lancet Glob Health 2018;6:e169-79.

16. Oyando R, Njoroge M, Nguhiu P, et al. Patient costs of hypertension care in public health care facilities in Kenya. Int J Health Plann Manage 2019;34:e1166-78.
17. Alefan Q, Ibrahim MIM, Razak TA, Ayub A. Cost of treating hypertension in Malaysia. Asian J Pharm Clin Res 2009;2:1-5.
18. Le C, Zhankun S, Jun D, Keying Z. The economic burden of hypertension in rural south-west China. Trop Med Int Health 2012;17:1544-51.
19. Berto P, Esposti ED, Ruffo P, Buda S, Esposti LD, Sturani A, et al. The Pandora project: cost of hypertension from a general practitioner database. Blood Pressure 2002;11:151-6.
20. Kankeu HT, Saksena P, Xu K, Evans DB. The financial burden from non-communicable diseases in low- and middle-income countries: a literature review. Health Res Policy Syst 2013;11:31.
21. Murphy A, Jakab M, McKee M, Richardson E. Persistent low adherence to hypertension treatment in Kyrgyzstan: how can we understand the role of drug affordability? Health Policy Plan 2016;31:1384-90.
22. MacMahon S, Alderman MH, Lindholm LH, et al. Blood-pressure-related disease is a global health priority. Am J Hypertens 2008;21:843-4.
23. Attaei MW, Khatib R, McKee M, et al. Availability and affordability of blood pressure-lowering medicines and the effect on blood pressure control in high-income, middle-income, and low-income countries: an analysis of the PURE study data. Lancet Public Health 2017;2:e411-9.
24. Mbui JM, Oluka MN, Guantai EM, et al. Prescription patterns and adequacy of blood pressure control among adult hypertensive patients in Kenya; findings and implications. Expert Rev Clin Pharmacol 2017;10:1263-71.
25. Mohan V, Seedat YK, Pradeepa R. The rising burden of diabetes and hypertension in southeast asian and african regions: need for effective strategies for prevention and control in primary health care settings. Int J Hypertens 2013;2013:409083.
26. Goudge J, Gilson L, Russell S, et al. Affordability, availability and acceptability barriers to health care for the chronically ill: longitudinal case studies from South Africa. BMC Health Serv Res 2009;9:75.
27. Ukwaja KN, Alobu I, Abimbola S, Hopewell PC. Household catastrophic payments for tuberculosis care in Nigeria: incidence, determinants, and policy implications for universal health coverage. Infect Dis Poverty 2013;2:21.

28. World Bank & Haut-Commissariat au Plan (HCP). (2018). Poverty in Morocco: Challenges and Opportunities. Available from: https://www.worldbank.org/en/country/morocco/publication/poverty-in-morocco-challenges-and-opportunities
29. Wong MCS, Tam WWS, Cheung CSK, et al. Drug adherence and the incidence of coronary heart disease- and stroke-specific mortality among 218,047 patients newly prescribed an antihypertensive medication: a five-year cohort study. Int J Cardiol 2013;168:928-33.
30. Shin S, Song H, Oh SK, et al. Effect of antihypertensive medication adherence on hospitalization for cardiovascular disease and mortality in hypertensive patients. Hypertens Res 2013;36:1000-5.
31. Llubes-Arrià L, Briones-Vozmediano E, Mateos JT, et al. Gender differences in self-management activation among patients with multiple chronic diseases: a qualitative study. Arch Public Health 2025;83:200.
32. Golinelli D, Sanmarchi F, Guarducci G, et al. Gender differences in healthcare utilization across Europe: Evidence from the European Health Interview Survey. Health Policy 2025;162:105448.
33. Bertakis KD, Azari R, Helms LJ, et al. Gender differences in the utilization of health care services. J Fam Pract 2000;49:147-52.
34. Bähler C, Huber CA, Brüngger B, Reich O. Multimorbidity, health care utilization and costs in an elderly community-dwelling population: a claims data based observational study. BMC Health Serv Res 2015;15:23.
35. Picco L, Achilla E, Abdin E, et al. Economic burden of multimorbidity among older adults: impact on healthcare and societal costs. BMC Health Serv Res 2016;16:173.
36. Marengoni A, Angleman S, Melis R, et al. Aging with multimorbidity: a systematic review of the literature. Ageing Res Rev 2011;10:430-9.

Table 1. Patient's characteristics (n=146).

Characteristics	N (%)/(mean±SD)
Age in years (n=144)	60.7±11.1
<60 years	56 (38.9)
≥60 years	88 (61.1)
Gender (n=146)	
Male	103 (70.5)
Female	43 (29.1)
Education level(n=146)	
None	82 (56.2)
Primary	35 (24.0)
Secondary	19 (13.0)
Higher	10 (6.8)
Enrolled at health insurance scheme (n=141)	
Mandatory health insurance	42 (29.8)
RAMED	80 (56.7)
None	19 (13.5)
Household monthly income (&US) (n=101)	
<200	70 (69.3)
200 – 400	16 (15.8)
>400	15 (14.8)
Obesity (n=122)	
Underweight Normal	3 (2.5) 29 (23.8)
Overweight/obese	90 (73,8)
Illness duration (year) (n=141)	6.5±5.7
<6	86 (61.0)
≥6	55 (39.0)
Stage (n=144)	
Stage 1	60 (41.7)
Stage 2	84 (58.3)
HTA control (n=144)	
Controlled	66 (45.8)
Uncontrolled	78 (54.2)

Table 2. Utilization of health care resources in hypertension management (n=146).

Ressources typology	Mean±SD / % (utilization)
Lab/diagnosis tests	
Electrocardiogram	1.33±0.64
Cardiac ultrasound	1.65±0.62
Renal ultrasound	1.20±1.02
Ionogram (serum sodium and potassium measurements)	1.45±0.63
Urea, creatinine	1.5±0.63
glycaemia	1.28±0.55
Blood lipid measurement	1.53±0.64
fundus	1.61±0.60
Medical visits	
Cardiology	1.55±2.45
General practitioner	6.96±4.53
Drugs	
Calcium Channel Blockers	61.6%
Angiotensin Receptor Blockers	23.3%
Diuretics	18.5%
Angiotensine Converting Enzyme Inhibitors	17.1%
Bêta-blockers	4.8%
Antihypertensive drug combinations	4.8%

Note: Percentages reported for antihypertensive drug classes do not total 100% because some patients received more than one antihypertensive medication class simultaneously.

Table 3. Summary of total direct medical cost of HTA management (n=146).

Type of cost	Mean±SD (USD)	As a % of total cost
Drug	112.6± 81.0	30.5
Montherapy	99.69±69.57	
Association (dual or triple therapy)	142.02±98.14	
Medical consultation	43.8±43.5	11.8
Lab/diagnostic tests	216.7±60.5	58.6
Total direct cost	368.8 ±120.8	100

USD, United States Dollar.

Table 4. Distribution of direct cost by age group and gender.

Comparison	Group	Subgroup	Mean ± SD (USD)	p-value
Age (Male vs Female)	< 60 years	Male	378.07 ± 112.56	0.20
		Female	337.82 ± 100.00	
	≥ 60 years	Male	346.56 ± 112.03	0.008*
		Female	424.75 ± 149.74	
	Total	Male	359.81 ± 112.52	0.16
		Female	390.38 ± 137.86	
Gender (< 60 vs 60 years)	Male	< 60	378.07 ± 112.56	0.17
		≥ 60	346.56 ± 112.03	
	Female	< 60	337.82 ± 100.00	0.042*
		≥ 60	424.75 ± 149.74	
	Total	< 60	365.85 ± 109.60	0.85
		≥ 60	369.66 ± 128.57	

*p<0.05 indicates statistical significance- USD, United States Dollar.

Table 5. Comparison of direct costs of Hypertension and cost estimation methods across countries.

Countries	Total direct cost (USD)	Estimation method
Morocco	368.8	• A prevalence-based approach • Bottom-up method • societal perspective
Kenya[16]	304.8	• A prevalence-based approach • Bottom-up method • patient perspective
Malaysia[17]	Between 461 to 777 depending on hypertension severity*	• Prevalence-based and incidence-based approaches • Bottom-up method
China[18]	467.2	• A prevalence-based approach • Bottom up • societal perspective
Italy[19]	873 **	• Bottom up approch • Perspective of the Italian National Healthcare System

*These values were obtained using an approximate conversion from Malaysian Ringgit (RM) to US dollars.
**These values were obtained using an approximate conversion from Euro to USD. USD, United States Dollar.

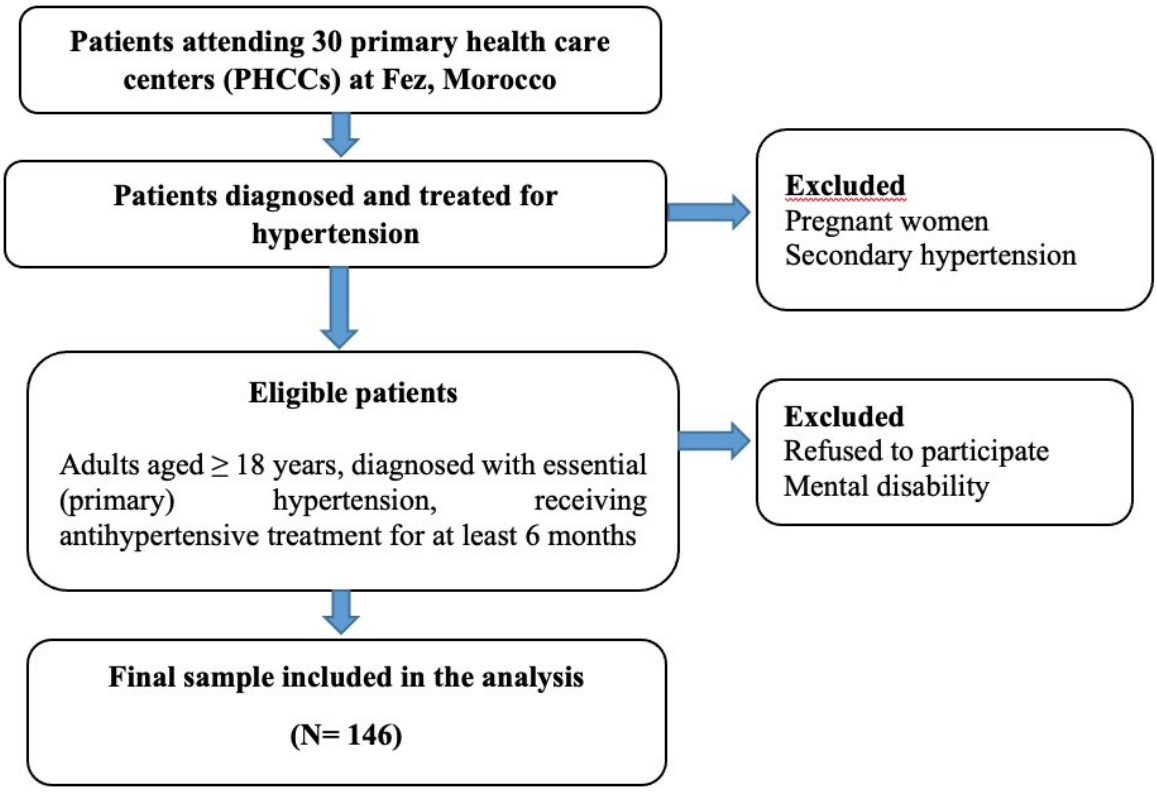

Figure 1. Flow diagram of study population selection.