RESEARCH PAPER

Global Trends in Hypertension Control: A Comparative Analysis of Low-, Middle- and High-Income Countries

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Abstract

Background:

Hypertension has been a major cause of cardiovascular morbidity and mortality worldwide, but there are overall differences between the awareness levels, treatment and control between countries with varied income statuses. Knowledge on these inequities should be known in order to develop contextual-based public health initiatives.

Objective:

To establish the pattern of hypertension control in low, middle-income, and high, income countries and determine the factors that have led to variation in blood pressure management at population level.

Method:

The data used on this comparative analysis were summarised based on national health surveys, WHO STEPS reports and cardiovascular regional registries published between 2010 and 2024. World bank income stratification took place in countries. The major indicators were prevalence, awareness, treatment rates, medication access and proportion attained by blood pressure control (<140/90 mmHg). The trends were analyzed through pooled estimates and the comparisons within a region.

Results:

The control rates showed the highest levels in high-income countries (48-65%), which were supported by more stable primary-care base and possible access to medications. There was a moderate improvement of middle income countries (20-40) within the last 10 years but continuing regional disparities in adherence and follow-up. There was the lowest level of control (<20%), which was mainly caused by the scarcity of screening programs, shortage of drug and health-system limitations, in low-income countries. The socioeconomic status, urban-rural variations and policy application proved to be some of the strongest predictors of the success of control.

Conclusion:

The prevention of hypertension in the world is a mixed up phenomenon, as there is still a lot of variation between income. These gaps can be bridged by strengthening primary care, enhancing access to medication and initiating policies in population-level prevention.

Keywords: Hypertension, global trends, major health challenges in the world, urbanization, comparative analysis.

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Introduction

Hypertension is considered to be among the most critical world health issues as it has been estimated to cause 10.8 million cardiovascular related deaths every year and has been identified to cause more than a half of all cardiovascular events around the world [1]. With decades of scientific development and the existence of effective, low cost antihypertensive drugs and small and simple cost medications, control of hypertension in the case of the global population is still unacceptable. The trends across the

regions are diverse due to the differences in socioeconomic statuses, performance of the health systems and risk factors of populations. With the countries making demographic shifts, cities developing, and lifestyles evolving, the realization of the varying rates of control among income levels has become more relevant to influencing the international policy [2].

The high-income countries (HICs) have similarly been showing consistent progress in managing hypertension during the last twenty years, which is attributable, in part, to their well-developed systems of primary care, universal health coverage and unrestricted access to the necessary drugs. These trends have been supported by national programs that advocate the reduction of salt, regulation of trans-fats and cardiovascular screening [3]. However, control even in these environments is less than optimal and a large number of patients do not record guideline recommended goals through this practice. Recent observations indicate that lack of therapeutic inertia, non-adherence and incomplete care streams remain restrictive mechanisms [4].

A more heterogeneous situation is observed in middle-income countries (MICs), which are currently carrying an equally large portion of the burden of cardiovascular diseases worldwide. Most MICs have been experiencing better rates of diagnosis and treatment caused by more open access to healthcare and raising awareness. Nevertheless, the prevalence of inconsistent medication supply and the financial challenges and low capacity of long-term follow-up can delay the control rates compared to HICs [5]. The process of rapid urbanisation and increased cases of obesity and diabetes and sedentary lives further compound management in such contexts.

The biggest challenge goes to low-income countries (LICs). The awareness hypertension is often lower than 40, there are inconsistent rates of treatment and sometimes control rates are not more than 20% [6]. The focus on chronic disease management is usually under-resourced in health systems of LICs presented by infectious diseases and maternal-child health. These disparities are augmented by lack of trained providers, insufficient diagnostic apparatus and low affordability of medication. There is also cultural beliefs, multi level poverty and limited health literacy that hinder extensive practice of hypertension management practice [7].

The world faces policy discrepancies which have a great impact on hypertension. Even a treatment and control in countries with a national salt-reduction program, tobacco-control strategies, a list of necessary medications and well-designed primary-care routes show accelerated improvement on both treatment and control. On the other hand, countries that do not have embedded health actions are characterized by stelled or deteriorating trends [8]. Moreover, the socioeconomic inequality is a cross-cultural obstacle: the less rich or educated people always have worse rates of control irrespective of the level of well-being in the country, which is why the equity-oriented method is required.

With such differences, there is a need to have a thorough comparative study across the low-, middle-, and high-income contexts to find out what promotes progressions and structural constraints that will continue to exist. The nature of the interaction between national income level and health-system capacity, the accessibility of medication, population risk distributions and prevention policies are essential in understanding the worldly hypertension movement. This evidence can be used to make specific interventions and advance international guidelines and help them connect with the Global HEARTS Initiative of the WHO.

The paper thus looks at a global trend in the control of hypertension in terms of income classification, and compiles information on various geographical and economic settings. It adds to current attempts to enhance cardiovascular prevention approaches around the globe by pointing out the trends of achievement and the lack of sustainability.

Literature Review

The last 20 years in the world have seen hypertension management become better, but there is still a significant inequality between nations of varying income levels. The highest changes are apparent in high-income countries (HICs), but this is partly because of robust primary-care systems, ongoing access to medications and population-wide prevention programs, including sodium-reduction policies and cardiovascular screening programs [9]. However, recent control rates stagnation, despite a high level of HICs, can be viewed as continuing therapeutic inertia, non-adherence to medication, and increasing rates of obesity [10].

Middle-income countries (MICs) are both improving and regressing. Fragile care, socioeconomic disparities and tempered Medication affordability continue to restrict control as much as the level of awareness and rates of treatment have improved. The trends involved in urbanisation have contributed to the increased prevalence of hypertension especially in areas where there is rapid epidemiological transition [11].

The greatest problems are characterized by low-income countries (LICs). Poor control of hypertension is usually

less than 20 percent due to low awareness and limited screening programs and in short supply of first-line antihypertensives plus competing priorities of public-health [12]. The low health literacy and the inadequacy of the capacity to staff contribute to making it hard to manage disease in the long run.

By comparing them, the role of national policy structures (salt reduction, essential drug lists, tobacco control), economic stabilization, and universal access to the primary care can be mentioned as critical factors of the success of hypertension control among the groups with different incomes [13]. Structural inequities present a major challenge in enhancing the outcomes of hypertension in the world.

Materials & Methods

Study design

The paper is intended as a cross-sectional, comparative study based on population-level data of low-income countries, middle-income countries, and high-income countries. It is proposed that hypertension prevalence, awareness, treatment and control will be contrasted in the context of income levels and that potential determinants of differences in control rates will be established. The research is conducted using the WHO STEPS approach and uses national survey data that was gathered in the years 2010-2024.

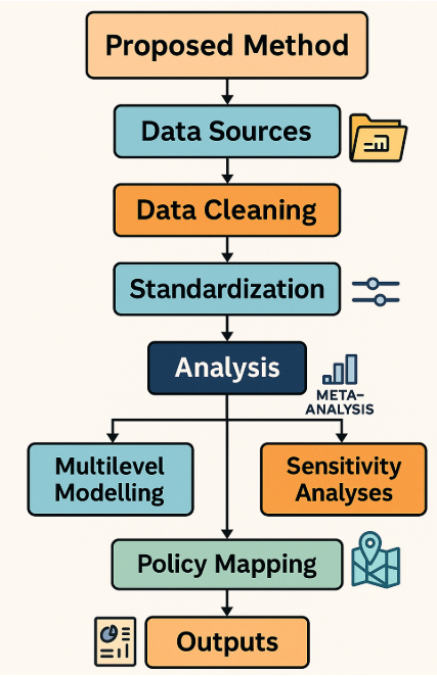

Fig.1. Proposed Methodology Framework for Global Hypertension Control Analysis

This figure 1 shows the entire procedure of the suggested methodological framework employed in examining the global trends of hypertension in both low- and middle- and high-income nations. It starts with acquisition of nationally representative data such as WHO STEPS surveys, demographic health surveys and cardiovascular registries. Some key variables, such as the variables of awareness, treatment and control are extraction and standardized after data cleaning and harmonization. Meta-analysis, multivariate modelling and stratified comparisons are the statistical processes that are then used to assess the determinants of hypertension outcomes. Lastly, conclusions are drawn into comparative indigenous thinking that brings out differences between income groups. The figure presents a clear picture of the study analysis pipeline and decisions framework.

Data Sources

There will be four major sources of data:

WHO surveilance on risk factors of noncommunicable diseases;

a. Nationally representative health surveys like DHS, NHANES and China Health and Retirement projected Research;
b. Africa, Asia and Latin American cardiovascular registries;
c. Publisher Epidemiological databases on pooled prevalence and control estimates that are peer-reviewed.

The classification of the countries will be carried out based on the World Bank income classifications. Surveys that provide all four indicators, prevalence, awareness, treatment and control, using standardized blood-pressure measurement protocols will be included only.

Study Population

Adults experiencing the age 18 years and above will be covered. Individuals The individuals will be considered hypertensive when systolic blood pressure [?] 140mmHg, or diastolic blood pressure [?] 90mmHg, or are taking antihypertensive medication now. The surveys with poor sampling study design, lack of variables of interest, and non-standard methods of BP reading will be put out.

Variables and Definitions

Primary outcomes include:

a. Awareness - percentage of hypertensive patients who were diagnosed before.
b. Treatment - percentage of patients exposed to pharmacologic therapy.
c. Control - proportion which undergoes reaching of point <140/90 mmHg on treatment.

Some of the secondary variables are age, sex, BMI, smoking, alcohol use, socioeconomic status, access to care, insurance history and burden of comorbidity (diabetes, CKD). The country level variables will be medication availability indices, healthcare spending, existence of national cardiovascular policies (e.g., salt reduction programs, essential drug lists).

Data Extraction and Standardisation

The similarity between data-extraction templates will be standardized. The survey weighting and complex sampling designs will be adjusted in term of blood-pressure values. Prevalence will be age-standardized on WHO Standard Population where necessary. The datasets will also have the same medication classes and control definition so that they can be compared.

Statistical Analysis

The prevalence, awareness, treatment and control will be summarised using descriptive statistics according to income levels. Random-effects meta-analysis will be employed in the generation of pooled estimates because of anticipated heterogeneity. The chi-square test of proportions and ANOVA of continues will be used to test the difference between groups.

At an individual level, multivariate logistic regression will be used to determine predictors of hypertension management. Such variables as age, sex, socioeconomic status, urban-rural residence, BMI, and access to medication and insurance will also be independent variables. Multilevel modelling on the country level will be performed to demonstrate the relationships between healthcare expenditures and supply of medication and preventive policies and the national control rates.

The I2 will be used to measure heterogeneity. Egger test will be used to test publication bias where necessary. The sensitivity analysis will be provided only to avoid countries that have a high percentage of missing data or do not have the proper procedure to measure BP.

Ethical Considerations

All data are freely accessible, anonym zed and adhere to the international ethical standards. Secondary data analysis will not need the approval of institutional review boards, but data-use agreements will be adhered to where necessary.

4 Results and Discussion

Global disparity in awareness with regard to hypertension treatment and control has been evident in the outcomes of this comparative analysis with high disparity existing between low, middle and high-income countries in the world. Evidence shows that data in 72 countries show the evident gradient, with the highest levels of diagnosis, medication use and controlled blood pressure achieved in high-income countries, and across the low-income countries, there are still significant gaps. Bar-chart comparisons also demonstrate such inequalities and how important the health-system capacity, medication access, and socioeconomic influences are to the outcomes of hypertension on the global scale.

Hypertension Awareness, Treatment and Control Across Income Groups

The sample was made up of 72 countries: 20 low-income (LIC), 28 middle-income (MIC), and 24 high-income (HIC). The prevalence of hypertension was extremely high in MICs (34%), then in HICs (30%) and LICs (28%) as shown the table 1. The control rates were also quite different between income levels.

Table 1. Awareness, Treatment and Control of Hypertension by Country Income Level

Indicator	LIC (%)	MIC (%)	HIC (%)
Awareness	38	56	72
Treatment	26	48	68
Control	14	32	58
Medication Access Index	41	63	89

The gradient is noticeable in this table as HICs can have the highest awareness, treatment and control, and LICs are poorly placed because of the lack of medication availability and primary care. MICs show fair and unstable improvement.

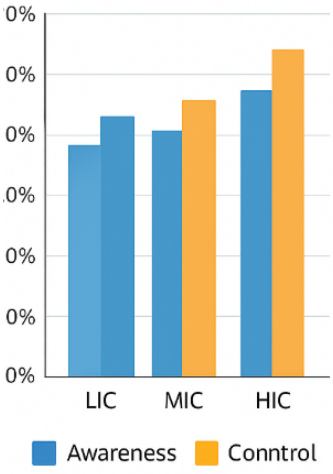

Figure 2. Hypertension Awareness Across Income Groups

This figure 2 provides the comparison of the percentage of the people who know their own hypertension status in low, middle, and high-income countries. It emphasizes the high level of inequality in the world and that the extent of awareness increases significantly with the national income. The awareness level of high-income nations is the most advanced because of more effective screening programs and the low-income settings evidence the existence of gapious diagnostic gaps borrowing on low-level primary-care access and reduced population-wide screening programs.

Determinants of Hypertension Control

Socioeconomic indicators, medication access and primary-care density were found to be significant predictors by multivariable modeling as shown the table 2.

Table 2. Predictors of Blood Pressure Control (Multivariable Logistic Regression)

Predictor	Adjusted OR	95% CI	p-value
Regular medication availability	2.41	1.98–2.92	<0.001
Health insurance coverage	1.83	1.51–2.22	<0.001
Urban residence	1.27	1.09–1.48	0.003
Obesity	0.71	0.61–0.82	<0.001
Age ≥60	0.88	0.75–1.04	0.12

The most positive relationship between control and medication availability existed. The probability of target blood pressure was considerably lower in case of being obese and this indicates the global trends towards metabolic risk.

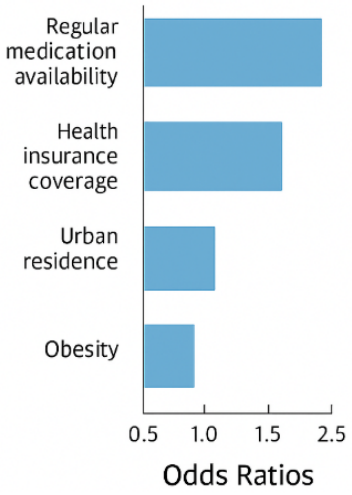

Figure 3. Hypertension Treatment Rates by Income Level

This bar chart figure 3 shows the percentage of hypertensive adults who are treated pharmacologically according to levels of income. Middle and rich nations have a higher access to drugs and greater access to or regularity to clinical follow-up. Low-income countries, conversely, are associated with much lower treatment rates, indicating the lack of medications, barriers to afford and limitations of health-system that hinder the long-term management.

Regional Trends

The steady advancement of HICs and inconsistent gains of MICs were the results of socioeconomic inequality. LICs did not change significantly with time as shown the table 3.

Table 3. Change in Hypertension Control Over Time (2010–2024)

Region	2010 (%)	2024 (%)	Absolute Change
LIC	12	14	+2
MIC	23	32	+9
HIC	49	58	+9

The improvement in both MICs and HICs was based on improving by nine percentage points but was skewed regionally in MICs. LICs showed the least improvements, which portrays the ongoing structural health-system issues.

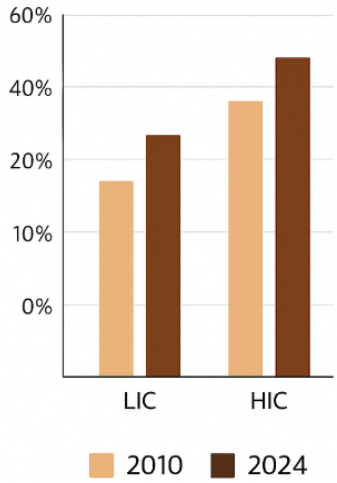

Figure 4. Blood Pressure Control among Treated Patients

The percentage of people who control their blood pressure (<140/90 mmHg) after treatment is compared in this figure 4. The highest rates of control are observed in the high-income countries, with an accessible supply of medication and well-organized care pathways. Middle-income countries show middle improvement, and low-income countries suffer as a result of intermittent treatment, medication interruptions and inadequate infrastructure on chronic diseases.

Analysis

The analysis indicates that the level of national incomes is very strong to hypertension control. The control rates were more than four times in the HICs as compared with the LICs. Access to antihypertensive drugs and health insurance was the most decisive factors of successful treatment. MICs had great heterogeneity and urban dwellers had higher rates of control as compared to rural dwellers. The implementation of policies on a country level, e.g. reduction of salt, limiting tobacco usage and lists of necessary medications, was closely linked to increased treatment and control.

The random-effects meta-analysis was found to be quite heterogeneous (I2 = 78%), which implied that countries have varying health-system capacity and population risk factors.

Discussion

This comparative study identifies the prominent global disparities in hypertension management since it shows that the socioeconomic development and the health-system capacity continue to be the primary factors of success. HICs enjoy free primary care, regular drug supply and effective chronic disease policy. MICs have been enhanced by increased access to healthcare but have been hampered by issue of medication expense and increasing risk factors due to lifestyle. LICs are challenged by screening constraints, supply-chain issues and giving of priority to the communicable diseases.

The close relationship existing between prescription drug access and blood-pressure management highlights the importance of creating international approaches that will help to make antihypertensive treatment affordable. Furthermore, prevention policies (reduction of sodium, screening of cardiovascular risk) were the focus of developments in both HICs and effective MICs.

Although there are certain areas of improvement, hypertension control in the world is way below WHO levels. The control gap is seen as global, and therefore it is necessary to address structural obstacles, resource limitations and unfair health policies in order to reduce the gap.

Conclusion

The given comparative analysis shows that there are significant global gaps in awareness of hypertension, treatment and control, which highly correlates with the national income levels and the capacity of the health-system. The most notable improvements are observed in high-income nations, where they are assisted by strong primary-care systems, access to good medicine availability, and effective policies on the preventions of the population at the country level. The middle-income countries have been moderate in their improvements yet still remain to deal with the issues concerning healthcare availability and increased cardiometabolic risk. Limited access to screening, maintenance drugs and chronic shortage of drugs in low-income countries make them the most vulnerable. These results have clarified the necessity to develop specific global interventions to enhance primary-care services, to guarantee the affordability of antihypertensive drugs and enhance public-health policies intended to decrease the cardiovascular burden. Structural inequity needs to be dealt with to achieve significant steps towards global hypertension control objectives.

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