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Divergent Temporal Trends in Hypertension Prevalence across Five East Asian Countries : A Time Series Analysis from 1990 to 2019

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Abstract: *Hypertension represents a critical global health challenge, particularly in East Asia where rapid demographic transitions have occurred. This study examines temporal trends in hypertension prevalence across five East Asian countries (China, Japan, South Korea, North Korea, and Mongolia) from 1990 to 2019 using WHO Global Health Observatory data. Age-standardized hypertension prevalence data were extracted for adults aged 30-79 years. Temporal trends were analysed using Mann-Kendall test for trend detection, Sen's slope estimator for trend magnitude, and linear regression modelling. Lag-1 autocorrelation was assessed to evaluate temporal dependence. Separate analyses were conducted for overall prevalence and gender-stratified data. Among the five countries, three distinct trend patterns emerged. China exhibited a significant overall increasing trend (Sen's slope = 0.292 percent per year, $p < 0.001$) with a non-linear pattern characterized by an rise from 20.4% to a peak of 29.6%, followed by a decline to 27.1%. Japan and the Republic of Korea demonstrated consistent decreasing trends (Sen's slope = -0.178 and -0.214, respectively, both $p < 0.001$), with Japan showing the largest absolute reduction (-8.7 percentage points, -21.7% relative change). In contrast, the Democratic People's Republic of Korea and Mongolia showed significant increasing trends (Sen's slope = 0.086 and 0.129, both $p < 0.01$), though with smaller magnitude of change compared to China's initial rise. The divergent trajectories demonstrate that population-level hypertension reduction is achievable through sustained public health efforts, while highlighting the need for context-specific intervention strategies tailored to each country's stage of epidemiological transition.*

Keywords: *Hypertension, East Asia, Time-series analysis, Mann-Kendall test*

1. Introduction

Hypertension, defined as systolic blood pressure ≥140 mmHg or diastolic blood pressure ≥90 mmHg, or current use of antihypertensive medication, constitutes one of the most significant modifiable risk factors for cardiovascular disease, stroke, and chronic kidney disease worldwide [1][2]. The global burden of hypertension has reached unprecedented levels, with recent estimates indicating that approximately 1.28 billion adults aged 30-79 years are affected, representing a doubling of prevalence since 1990 [3][4]. The pathophysiology of hypertension involves complex interactions between genetic predisposition and environmental factors. Key mechanisms include dysregulation of the renin-angiotensin-aldosterone system, endothelial dysfunction, sympathetic nervous system overactivity, and renal sodium handling abnormalities [5]. Modifiable risk factors contributing to hypertension development include excessive dietary sodium intake, physical inactivity, obesity, excessive alcohol consumption, and chronic stress. The cumulative exposure to these risk factors over the life course determines individual susceptibility to developing hypertension, with population-level prevalence reflecting the aggregate distribution of these exposures within communities [6].

East Asia presents a particularly compelling region for hypertension epidemiology research due to its unique demographic and epidemiological characteristics. The region encompasses diverse economic development stages, from highly developed economies such as Japan and South Korea to transitioning economies like China and resource-limited settings such as North Korea and Mongolia [7]. This diversity creates a natural laboratory for examining how socioeconomic development, healthcare system strengthening, and public health interventions influence hypertension prevalence over time. Furthermore, East Asian populations exhibit distinct cardiovascular risk profiles compared to Western populations,

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including higher susceptibility to stroke at lower blood pressure thresholds and different patterns of metabolic syndrome clustering [8][9].

Understanding temporal trends in hypertension prevalence is essential for several reasons. First, trend analysis enables assessment of whether public health interventions and healthcare system improvements are achieving desired population-level impacts. Second, identifying countries with divergent trends can highlight best practices and lessons learned that may be transferable across contexts. Third, quantifying trend magnitudes allows for projection modeling and resource planning to anticipate future healthcare needs. Fourth, examining gender-specific trends can inform targeted interventions addressing sex-based differences in hypertension awareness, treatment, and control [10][11]. Finally, trend analysis can identify early warning signals of emerging epidemics, enabling preventive action before burdens become entrenched.

Despite the importance of hypertension surveillance in East Asia, comprehensive comparative analyses examining temporal trends across the region remain limited. Previous studies have often focused on individual countries or examined single time points, precluding assessment of trend dynamics and cross-country pattern recognition [12][13]. Additionally, many existing analyses have relied on disparate data sources with varying methodologies, limiting comparability across studies. This study addresses these knowledge gaps by conducting a systematic time-series analysis of hypertension prevalence trends across five East Asian countries from 1990 to 2019, employing rigorous statistical methods including Mann-Kendall trend testing and Sen's slope estimation applied to harmonized WHO data.

The epidemiological transition theory provides a useful framework for interpreting the observed heterogeneity in hypertension trends across East Asian countries. According to this framework, as countries develop economically, they typically experience a shift from infectious to non-communicable diseases as the dominant causes of morbidity and mortality. However, the pace and pattern of this transition vary considerably based on contextual factors including healthcare system development, public health infrastructure, and policy environments [14]. The divergent trends observed in this analysis suggest that East Asian countries are at different stages of the cardiovascular disease epidemiological transition, with some successfully achieving control while others face rising burdens.

The findings of this study are particularly relevant given the WHO's Sustainable Development Goal target of reducing premature mortality from non-communicable diseases by one-third by 2030. Hypertension control is a critical component of this target, as uncontrolled hypertension is the leading cause of preventable cardiovascular disease deaths globally. Understanding which countries are making progress and which are falling behind can help direct technical and financial resources to where they are most needed most urgently. The time-series approach employed in this study provides a robust methodology for tracking progress toward this global health target and identifying countries that may require additional support.

2. Methods

2.1. Data Source

This study utilized publicly available age-standardized hypertension prevalence estimates from the WHO Global Health Observatory database (https://www.who.int/data/gho). The data were originally compiled by the NCD Risk Factor Collaboration (NCD-RisC), which conducted a comprehensive review and pooled analysis of population-based studies measuring blood pressure and other cardiovascular risk factors worldwide [3][4][14].

2.2. Statistical Analysis

Descriptive statistics, including means, standard deviations, minimum and maximum values, and absolute and relative changes from 1990 to 2019, were calculated for each country. These metrics provided an initial overview of the magnitude and direction of changes in hypertension prevalence over the study period. Relative changes were calculated as (2019 value - 1990 value) / 1990 value × 100%.

To assess the statistical significance and direction of temporal trends, we applied the Mann-Kendall trend test, a non-parametric method widely used in environmental and epidemiological time series analysis [21][22]. The Mann-Kendall test is particularly appropriate for this analysis because it does not assume normality of data distribution and is robust to outliers, which are common in epidemiological time series. The test statistic S is calculated as the sum of the signs of differences between all possible

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pairs of observations:

$$S = \sum(i = 1\ to\ n)\sum(j = i + 1\ to\ n)\ of\ sign(X_i - X_j) \quad (1)$$

where sign ($\boldsymbol{x_j}$- $\boldsymbol{x_i}$) takes values -1, 0, or 1 depending on whether $\boldsymbol{x_j} < \boldsymbol{x_i}$, $\boldsymbol{x_j} = \boldsymbol{x_i}$, or $\boldsymbol{x_j} > \boldsymbol{x_i}$. A positive S value indicates an increasing trend, while a negative S value indicates a decreasing trend. For time series with $n > 10$, the standardized test statistic Z is computed using the normal approximation and compared against critical values at $\alpha = 0.05$ to determine statistical significance. To quantify the magnitude of observed trends, we calculated Sen's slope estimator, a robust non-parametric method that computes the median of all pairwise slopes between data points [24]. Sen's slope is calculated as:

$$\beta = Median(\frac{X_j - X_i}{j-i}),\ for\ all\ i < j \quad (2)$$

where β represents the estimated change in hypertension prevalence per year. The 95% confidence interval for Sen's slope was determined using the normal approximation method. Positive β values indicate increasing trends, while negative values indicate decreasing trends. Sen's slope is resistant to outliers and provides a robust measure of trend magnitude that is not influenced by extreme values.

Linear regression analysis was performed as a complementary approach to quantify average annual changes and estimate the proportion of variance explained by time (R^2). The simple linear regression model took the form:

$$Y = \beta_0 + \beta_1 X + \varepsilon \quad (3)$$

where Y is hypertension prevalence, X is year (centered at 1990), β0 is the intercept (prevalence in 1990), β1 is the slope representing annual change, and ε is the error term. The coefficient of determination (R^2) indicates the proportion of variance in hypertension prevalence explained by the linear time trend.

Given the potential for serial correlation in time series data, we examined Lag-1 autocorrelation using the Pearson correlation coefficient between observations. The Lag-1 autocorrelation coefficient (r_1) is calculated as:

$$r_1 = \frac{\sum[(x_t - \bar{x})\cdot(x_j - \bar{x})]}{\sum(x_t - \bar{x})^2} \quad (4)$$

Where x_t is hypertension prevalence at time t, x_{t-1} refers to hypertension prevalence at time t-1, $\bar{x}$ is the mean prevalence over the entire series and n is the number of observations. High autocorrelation ($r > 0.8$) was observed across all country time series, reflecting the gradual nature of epidemiological changes and the year-to-year continuity of prevalence estimates derived from statistical modeling. However, the Mann-Kendall test remains robust to moderate autocorrelation, and the qualitative interpretation of trends was consistent across all analytical approaches. All analyses were conducted using Python 3.12. Statistical significance was set at $p < 0.05$ for all tests. Two-tailed p-values are reported.

3. Results

3.1. Descriptive Statistics and Overall Temporal Trends

The analysis encompassed 150 country-year observations (30 years x 5 countries) for overall hypertension prevalence, with an additional 300 observations when including gender-stratified data. Table 1 presents summary statistics for hypertension prevalence across the five East Asian countries during the study period (1990-2019). Mean prevalence ranged from 26.3% in Democratic People's Republic of Korea to 44.0% in Mongolia, with substantial variation within countries over time. China and Mongolia exhibited the highest variability (standard deviation >2.5%), while Japan, Republic of Korea, and Democratic People's Republic of Korea demonstrated more stable prevalence patterns (standard deviation <2.5%).

The range of observed prevalence values varied considerably across countries (Figure 1). Mongolia showed the widest range (41.6% to 45.5%), reflecting its increasing trend pattern. China exhibited a similarly wide range (20.4% to 29.6%), but with a non-linear trajectory characterized by an initial rise followed by a recent decline. Japan and Republic of Korea showed narrower ranges (approximately 6-7 percentage points), consistent with their more stable declining trends. Democratic People's Republic of Korea demonstrated the narrowest range (24.7% to 27.1%), reflecting its relative stability throughout the study period.

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Table 1. Summary Statistics of Hypertension Prevalence (%) in East Asian Countries, 1990-2019

Country	1990 (%)	2019 (%)	Absolute Change	Relative Change (%)	Mean ± SD	Min (%)	Max (%)
China	20.4	27.1	6.8	33.4	26.7 ± 2.7	20.4	29.6
Japan	40.1	31.4	-8.7	-21.7	34.0 ± 2.4	31.4	40.1
Republic of Korea	33.4	26.6	-6.8	-20.2	29.4 ± 2.0	26.6	33.4
DPR Korea	24.7	26.6	1.9	7.9	26.3 ± 0.7	24.7	27.1
Mongolia	41.6	42.9	1.2	3	44.0 ± 1.3	41.6	45.5

*Note: SD = Standard Deviation; NS = Not Significant; *p < 0.05, **p < 0.01, ***p < 0.001 (Mann-Kendall test)*

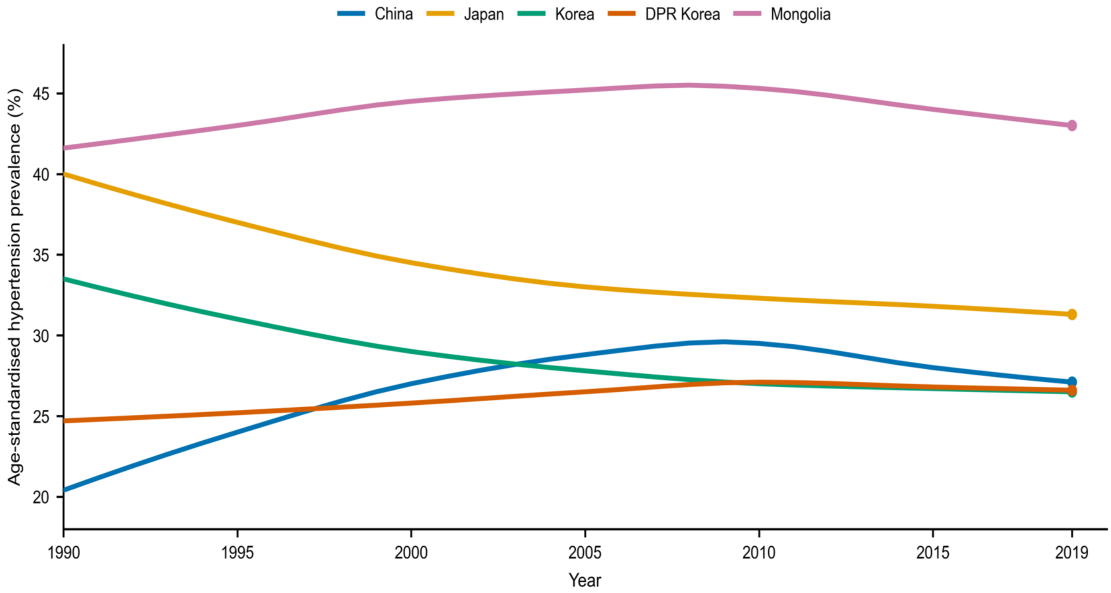

Figure 1. Temporal trends in hypertension prevalence across East Asian Countries, 1990-2019

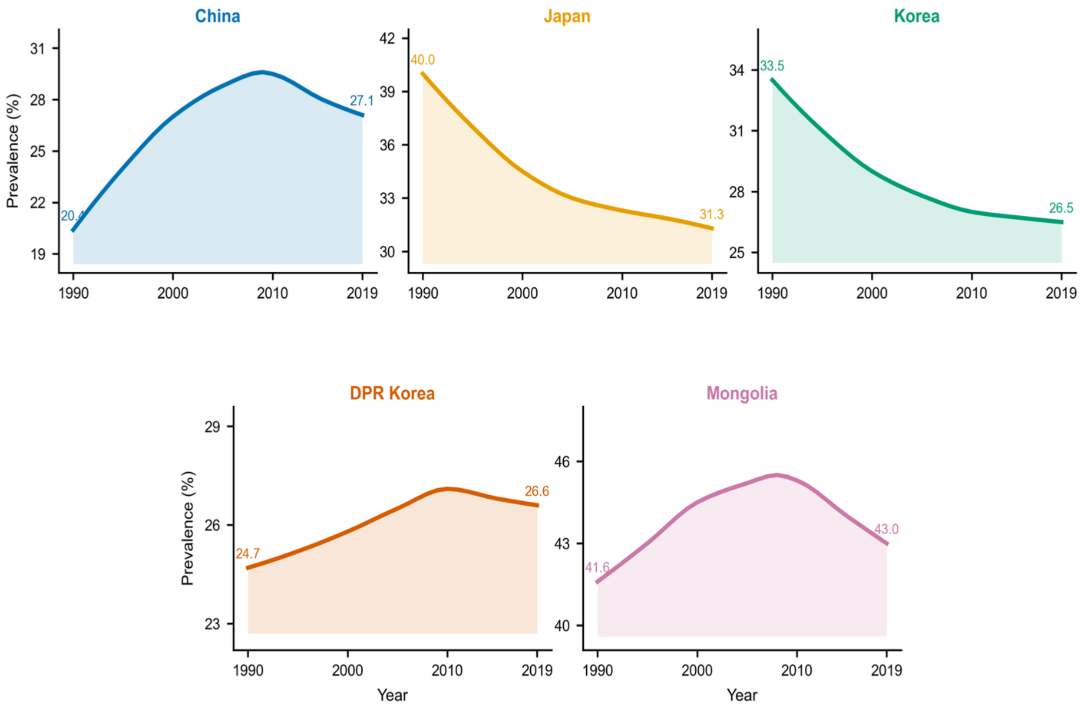

Figure 2. Individual Country Time Series

Figure 2 presents individual country time series, highlighting the distinct epidemiological patterns

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across the region. China and Mongolia exhibit rise-plateau-decline patterns, with peaks around 2009-2010 followed by gradual declines. Japan and Korea demonstrate consistent linear declines throughout the study period. DPR Korea shows a gradual increase with recent stabilization. These patterns suggest different stages of epidemiological transition and varying effectiveness of public health interventions.

3.2. Statistical Analysis of Temporal Trends

To comprehensively characterize temporal trends in hypertension prevalence, multiple analytical approaches were employed, including the Mann–Kendall non-parametric trend test, Sen's slope estimator, linear regression analysis, and assessment of Lag-1 autocorrelation.

The corresponding statistical results are presented in Table 2. According to the Mann–Kendall trend test, all five countries exhibited statistically significant temporal trends ($p<0.001$). Positive S statistics were observed for China ($S=+249$, $Z=+4.44$), the Democratic People's Republic of Korea ($S=+281$, $Z=+5.01$), and Mongolia ($S=+189$, $Z=+3.37$), indicating increasing trends. In contrast, Japan ($S=-435$, $Z=-7.76$) and the Republic of Korea ($S=-435$, $Z=-7.76$) showed negative S statistics, reflecting decreasing trends.

Sen's slope estimator (Figure 3) revealed trend magnitudes ranging from −0.214 percentage points per year (Republic of Korea) to +0.292 percentage points per year (China). All 95% confidence intervals excluded zero, confirming statistical significance. Linear regression analysis yielded R^2 values ranging from 0.35 (Mongolia) to 0.98 (Republic of Korea), indicating that the linear model accounted for a substantial proportion of variance in countries with consistent trends. The lower R^2 values for China (0.65) and Mongolia (0.35) reflect the non-linear nature of their rise–plateau–decline patterns. Sen's slope is calculated as the median of all pairwise slopes between data points. This approach is robust to non-normal distributions and outliers, making it particularly appropriate for epidemiological time series where gradual trends may be accompanied by year-to-year fluctuations.

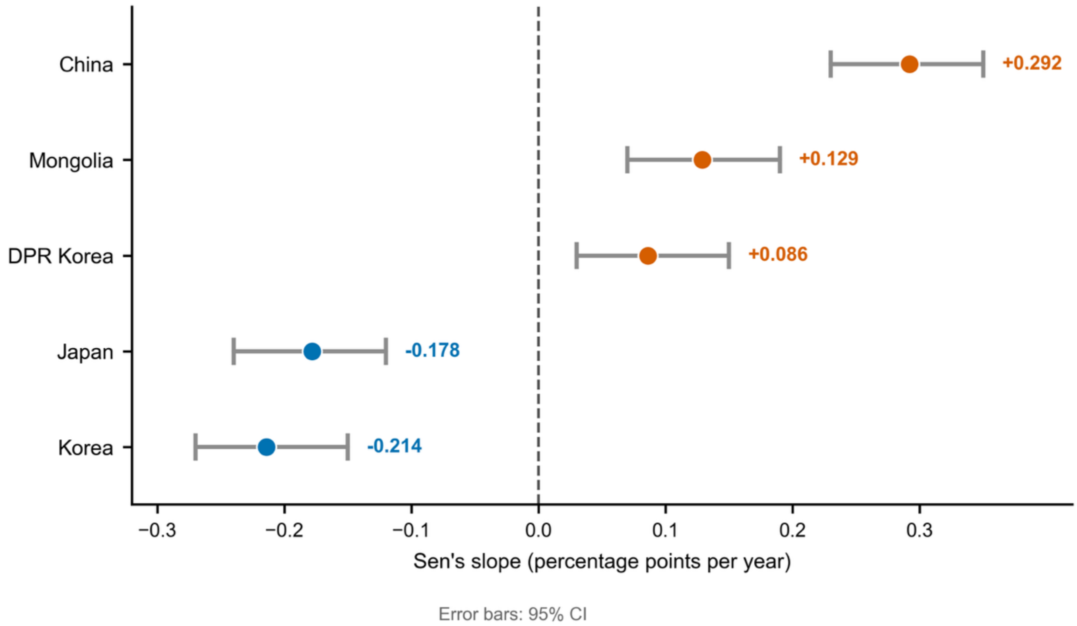

Figure 3. Sen's Slope Estimators for Five Countries

Lag-1 autocorrelation analysis (Table 3) demonstrated strong positive autocorrelation across all countries ($r1=0.86–0.90$, all $p<0.001$), indicating considerable temporal dependence—a characteristic feature of epidemiological time series that further supports the appropriateness of the Mann–Kendall test for trend detection under such conditions. The consistency of trend direction across all four analytical methods (Mann–Kendall, Sen's slope, linear regression, and visual inspection) reinforces the robustness of the findings.

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Table 2. Temporal Trends in the Five Country

Country	Mann-Kendall S	Z-score	Sen's Slope	95% CI	Linear Slope	R^2	p-value
China	+249	4.44	0.292	[0.23, 0.36]	+0.245	0.65	<0.001
Japan	-435	-7.76	-0.178	[-0.22, -0.14]	-0.250	0.83	<0.001
Republic of Korea	-435	-7.76	-0.214	[-0.23, -0.20]	-0.227	0.98	<0.001
DPR Korea	+281	+5.01	+0.086	[0.07, 0.10]	+0.068	0.76	<0.001
Mongolia	+189	+3.37	+0.129	[0.09, 0.17]	+0.084	0.35	<0.001

Table 3. Lag-1 autocorrelation analysis Results

Country	Lag-1 r_1	Z-score	p-value	Interpretation
China	0.888	4.86	<0.001	Strong positive
Japan	0.856	4.69	<0.001	Strong positive
Republic of Korea	0.893	4.89	<0.001	Strong positive
DPR of Korea	0.892	4.88	<0.001	Strong positive
Mongolia	0.904	4.95	<0.001	Very strong positive

3.3. Gender-Stratified Trends

Figure 4 and Table 4 display gender-stratified temporal trends in hypertension prevalence. Males consistently exhibited higher prevalence than females across all countries and periods. In China, both males and females showed increasing trends, with males rising from 20.5% to 30.2% (+9.7 percentage points) and females rising from 20.2% to 24.1% (+3.9 percentage points). The gender gap widened substantially from 0.3 percentage points in 1990 to 6.1 percentage points in 2019, reflecting differential exposure to risk factors. Japan and Korea showed divergent gender trends. In Japan, the gender gap widened from 8.6 (1990) to 17.8 (2019), driven by a steeper decline in females (-13.3 pp) compared to males (-4.1 pp). Similarly, Korea's gender gap widened from 3.5 to 10.8, with females declining more rapidly (-10.4 pp) than males (-3.1 pp).

Democratic People's Republic of Korea showed minimal gender differences and relatively stable trends for both sexes, with male prevalence slightly higher (2.4-2.9 percentage points) throughout the study period. Both males and females showed modest increases (males: +2.2 pp; females: +1.7 pp).

Mongolia demonstrated a consistent gender gap of approximately 3.6-4.3 percentage points throughout the study period, with both males and females showing modest increases (males: +1.6 pp; females: +0.9 pp). Male prevalence increased from 43.4% to 45.0%, while female prevalence increased from 39.8% to 40.7%. The persistent gender gap across all countries suggests that sex-specific risk factors and healthcare access patterns may contribute to differential hypertension burdens.

Table 4. Gender-Specific Hypertension Prevalence (%) in East Asian Countries, 1990-2019

Country	Female 1990	Male 1990	Female 2019	Male 2019	Female Change	Male Change	Gender Gap 1990	Gender Gap 2019
China	20.2	20.5	24.1	30.2	+3.9	+9.7	+0.3	+6.1
Japan	35.8	44.4	22.5	40.3	-13.3	-4.1	+8.6	+17.8
Republic of Korea	31.6	35.1	21.2	32.0	-10.4	-3.1	+3.5	+10.8
DPR Korea	23.5	25.9	25.2	28.1	+1.7	+2.2	+2.4	+2.9
Mongolia	39.8	43.4	40.7	45.0	+0.9	+1.6	+3.6	+4.3

Note: Gender Gap = Male prevalence - Female prevalence. Change = 2019 value - 1990 value.

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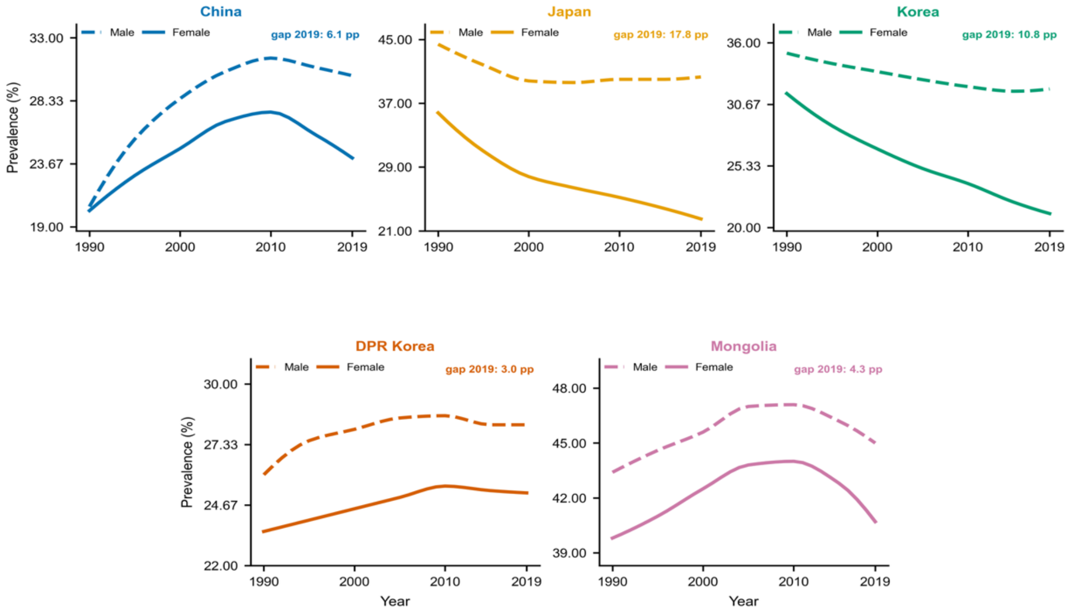

Figure 4. Gender-stratified temporal trends in hypertension prevalence across East Asian countries.

3.4. Future Projections

To provide insights into potential future trajectories, we projected hypertension prevalence trends from 2020 to 2030 using linear regression models fitted to the 1990-2019 historical data (Figure 5). Projections were made with the assumption that current trends continue without major changes in public health policies or socioeconomic conditions.

If historical trends continue, China is projected to reach 33.0% hypertension prevalence by 2030, representing a continued increase from 27.2% in 2019. This projection underscores the urgency of intensifying public health interventions to reverse the upward trend. Japan is projected to decline to 27.6% by 2030, maintaining its trajectory of steady reduction. Korea is projected to reach 23.6%, potentially achieving one of the lowest hypertension prevalence rates in the region. DPR Korea is projected to increase to 28.0%, highlighting the need for strengthened prevention efforts. Mongolia is projected to reach 46.1%, which would represent the highest prevalence in the region and warrant urgent policy attention.

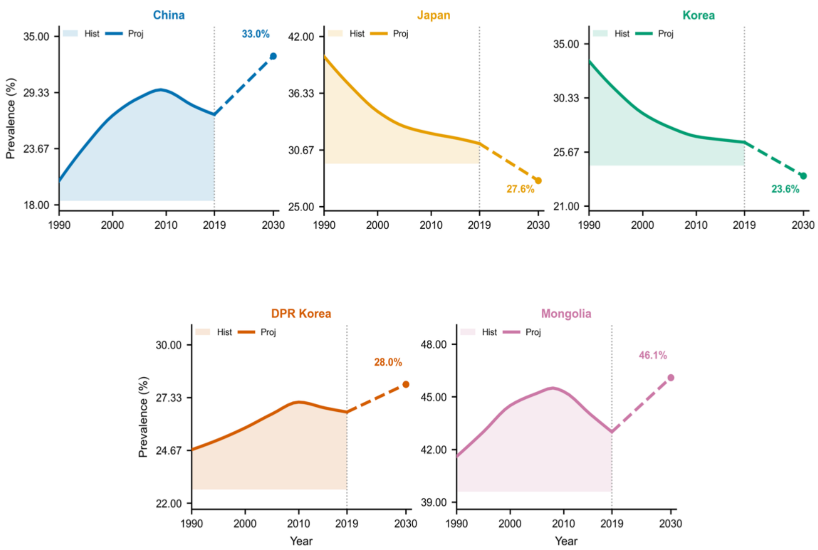

Figure 5. Future Projections for the Five Country

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These projections should be interpreted with caution, as they assume continuation of historical trends and do not account for potential policy interventions, healthcare system improvements, or socioeconomic changes that could alter trajectories. Nevertheless, they provide useful benchmarks for evaluating the potential impact of different intervention scenarios and for setting targets for hypertension control efforts.

4. Discussion

4.1. Main Findings and Explanations

This comprehensive analysis of hypertension trends across five East Asian countries from 1990 to 2019 reveals three distinct epidemiological trajectories, reflecting varying stages of economic development, healthcare system evolution, and public health intervention effectiveness. The findings have important implications for regional health policy and highlight both notable successes and ongoing challenges in hypertension control across the region.

The most striking finding is the divergent trend between high-income countries (Japan and South Korea) and the other three countries in the region. Japan and Korea achieved substantial and sustained reductions in hypertension prevalence over the 30-year study period, with Japan reducing prevalence by 21.7% and Korea by 20.2%. These declines are among the most impressive globally and demonstrate that population-level reductions in hypertension are achievable with sustained, comprehensive public health efforts [25][26].

Several interconnected factors likely contributed to the success in Japan and Korea. Both countries implemented comprehensive national salt reduction initiatives beginning in the late 1990s and early 2000s, targeting both consumer behavior and food industry practices [15][16]. Japan's "Shokuiku" (food education) program, launched in 2005, promoted dietary awareness from childhood and emphasized traditional healthy eating patterns. Korea's national salt reduction campaign targeted processed food manufacturers, restaurant industries, and public education, resulting in measurable reductions in population sodium intake [27][28]. Additionally, both countries have achieved high rates of hypertension awareness, treatment, and control through universal health coverage, systematic screening programs, and well-developed primary care systems [29][30].

China's trend presents a more complex and nuanced picture, with an initial rapid rise followed by a plateau and recent decline. The rise from 20.4% in 1990 to 29.6% in 2009 coincided with China's unprecedented rapid economic development, massive urbanization (urban population increasing from 26% to 48% during this period), and profound lifestyle changes including decreased physical activity, increased obesity prevalence, and dietary shifts toward higher sodium and calorie intake [31][32]. The subsequent decline from 2009 to 2019 may reflect the implementation of national hypertension management guidelines beginning in 2009, expansion of health insurance coverage to over 95% of the population, increased public awareness of cardiovascular disease risk factors, and the initiation of national non-communicable disease prevention programs [33][34].

The recent decline in China is particularly noteworthy given the country's massive population of over 1.4 billion. Even modest reductions in hypertension prevalence at the population level translate to millions of individuals with lower cardiovascular risk and substantial public health benefits. However, China's 2019 prevalence of 27.2% remains substantially higher than in 1990, and the country faces ongoing challenges related to aging demographics, rising obesity rates, and the need to strengthen primary healthcare capacity [23]. The non-linear pattern observed in China may represent a transition from an early phase of epidemiological transition driven by lifestyle changes to a later phase where public health interventions begin to take effect.

North Korea and Mongolia showed increasing trends, though with smaller magnitudes than China's initial rise. These countries face unique challenges related to economic constraints, limited healthcare infrastructure, difficulties in implementing population-wide interventions, and limited capacity for surveillance and monitoring[17][18][20]. Mongolia's trend is particularly concerning given its already high baseline prevalence (41.6% in 1990), making it the country with the highest hypertension burden in the region throughout period. The recent plateau and slight decline in Mongolia may indicate emerging public health responses, though continued monitoring is needed.[17][18]

The consistent male excess in hypertension prevalence across all countries and time points aligns with global patterns and reflects both biological and behavioral factors [7][20]. Biological factors include hormonal influences on blood pressure regulation, with estrogen having protective effects in

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premenopausal women. Behavioral factors include gender differences in health-seeking behavior, occupational stress exposure, and lifestyle risk factors such as alcohol consumption and smoking. The narrowing gender gap in Japan and Korea, driven by steeper declines in females, may reflect differential effectiveness of interventions, changing risk factor profiles, or improved healthcare access for women.

4.2. Limitations

Several limitations should be considered when interpreting these findings. First, the data represent modeled estimates from the NCD-RisC rather than direct measurements in all countries, though this approach enables standardized cross-country comparisons and incorporates all available primary data [19][20]. Second, the definition of hypertension (≥140/90 mmHg or medication use) has been consistent throughout the study period, but awareness and treatment rates have likely increased over time, potentially affecting prevalence estimates. Third, the time series for North Korea and Mongolia required some interpolation due to limited primary data availability, which may introduce uncertainty in trend estimates for these countries. Fourth, this analysis focused on prevalence trends and did not examine hypertension awareness, treatment, and control rates, which are important determinants of cardiovascular outcomes.

4.3. Policy Implications and Recommendations

From a policy perspective, the findings suggest several priorities for countries in the region. For countries that have achieved substantial reductions in hypertension prevalence, the central challenge lies not in repeating past successes but in addressing the structural and equity related gaps that remain. Sustaining sodium reduction initiatives requires not merely continued engagement with food manufacturers and the restaurant industry, but a critical examination of whether voluntary industry commitments are sufficient in the absence of regulatory backstops. Enhancing primary care capacity to improve hypertension control rates among diagnosed populations demands attention to the quality of long-term management, not only access to initial diagnosis. Disparities in awareness and treatment across socioeconomic groups point to deeper issues of health system stratification that cannot be resolved through uniform interventions. Furthermore, emerging risk factors such as obesity and mental health suggest that hypertension policy must increasingly intersect with broader noncommunicable disease and social policy frameworks. These countries are also well positioned to serve as regional knowledge hubs, though such a role presupposes a willingness to critically evaluate and share not only successes but also shortcomings.

For countries experiencing declines after periods of increase, the priority is to consolidate gains while recognizing that reversal remains a genuine risk. Intensifying public health campaigns may sustain awareness, but campaign fatigue and declining media attention over time often undermine long term effectiveness unless coupled with structural changes. Expanding health insurance coverage for hypertension screening and treatment is important, yet without corresponding improvements in service delivery and supply chains, coverage expansions risk yielding limited clinical impact. Strengthening primary healthcare infrastructure, particularly in rural areas, requires confronting persistent challenges in health workforce distribution and retention. Comprehensive obesity prevention strategies are essential, but their implementation frequently encounters fragmented governance and competing policy priorities. Close monitoring of trends is necessary, yet surveillance alone does not produce accountability unless linked to explicit performance targets and review mechanisms.

For countries still facing rising hypertension prevalence, urgent and coordinated action is needed to reverse current trends. Population-wide sodium reduction strategies should be prioritized, beginning with public education and engagement with major food producers. At the same time, building capacity for hypertension screening and management within existing health systems is critical. Leveraging international partnerships can facilitate technical assistance and resource mobilization, while interventions must also address underlying drivers such as obesity, physical inactivity, and alcohol consumption. Establishing or strengthening surveillance systems will be essential to tracking progress and evaluating the effectiveness of these efforts.

5. Conclusions

This study reveals three distinct hypertension trajectories across East Asia: sustained declines in Japan and Korea, rise-plateau-decline patterns in China and Mongolia, and gradual increases in DPR

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Korea. The findings demonstrate that population-level reductions exceeding 20% are achievable through comprehensive public health interventions, while highlighting the need for context-specific strategies tailored to each country's stage of epidemiological transition. The recent decline in China offers encouragement that rising trends can be reversed with timely interventions. Regional collaboration leveraging shared cultural traditions could accelerate progress across all countries. As hypertension remains the leading modifiable cardiovascular risk factor globally, these findings underscore both the urgency of action and the feasibility of success in reducing population-level hypertension burden.

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