

REVIEW ARTICLE



Hypertension in China: burdens, guidelines and policy responses: a state-of-the-art review

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Hypertension is a leading risk factor of cardiovascular disease and it is becoming increasingly prevalent globally. Correspondingly, the Chinese government and public health institutions have issued a series of policy documents and guidelines for hypertension. However, no comprehensive review of such documents has been conducted. Hence, this review aims to provide an up-to-date and comprehensive assessment of not only the disease burden, but also hypertension management policies and guidelines in China. A total of 15 epidemiological studies based on national population surveys, 15 Chinese Hypertension Guidelines, and seven policy documents were identified. We found a larger burden of hypertension in men, while the awareness, treatment, and control rates have remained low in both sexes. The ranges of hypertension prevalence, awareness, treatment, and control rate among hypertensive patients were 18.0–44.7%, 23.6–56.2%, 14.2–48.5%, and 4.2–30.1% respectively. Chinese hypertension guidelines provide evidence-based instructions to healthcare practitioners over hypertension management in which primary healthcare is increasingly emphasized. Finally, the policy documents set national goals for hypertension management and standardized the services provided in primary healthcare. The findings highlight the importance of integrating new guidelines into hypertension management provided by primary healthcare practitioners and the need to evaluate the implementation of guidelines and policies.

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INTRODUCTION

High blood pressure is one of the leading risk factors for cardiovascular disease (CVD) and premature deaths worldwide [1, 2]. In 2010, it was estimated that 1.39 billion adults had hypertension globally, with higher prevalence in Low- and Middle-Income Countries (LMICs) [3]. China has also experienced an increasing prevalence of hypertension over the decades according to a systematic review published in 2014 [4]. Although the awareness, treatment and control of hypertension are crucial to prevent complications, these rates in China remained low compared with those in developed countries [5]. A few observational studies over hypertension in China have been conducted using nationally representative samples [6, 7], but research that systematically examined their changes over time is limited.

Clinical guidelines provide up to date guidance for preventing and managing diseases. Periodically, China publishes and updates national hypertension guidelines, based on international guidelines but with substantiated China-specific findings. Since 1999, five national hypertension guidelines have been developed [8–12]. Although a previous review published in 2015 described the development of guidelines in China [13], two more national guidelines and subgroup specific guidelines, focusing on the elderly and community-based efforts, have been published since then. Therefore, it is timely to provide a systematic and comprehensive overview of hypertension guidelines in China.

In response to the rapid increase in hypertension disease burden, the Chinese government and public health institutions have increased efforts to develop policies aimed to improve hypertension management [14]. Noncommunicable disease (NCD) prevention and control has been increasingly emphasized in political agendas, especially after China's healthcare reform in 2009 [15]. In that same year, the Basic Public Health Services (BPHS) policy was released and set out to provide affordable and equitable care for diabetes and hypertension, thus potentially improving the management of hypertension [16]. Several Chinese policies on hypertension are embedded in national broad health-related policies, but this review will focus on the hypertension-specific content in effort to increase our understanding of policy response in China to address the rising burden of hypertension.

In this state-of-the-art review, we aim to provide an updated and comprehensive assessment of the following three areas: (1) a systematic review of the prevalence, awareness, treatment, and control of hypertension since 2000; (2) national clinical guidelines on hypertension since 1999; and (3) policies and guidelines in relation to hypertension management in China.

MATERIALS AND METHODS

Corresponding to the three aims stated above, we describe the methods used in the sections below.

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Disease burden of hypertension

Search strategy. The search terms used in PubMed were: “hypertension,” “hypertensive,” “hyperpiesis,” “hyperplasia,” “high blood pressure,” “elevated blood pressure,” “normotension,” “raised blood pressure,” OR “prehypertension” in Title, AND “China,” “Chinese,” “Mainland,” OR “PRC” in Title/Abstract, AND “prevalence,” OR “aware” AND “treatment” AND “control” in Title/Abstract. Criteria for inclusion were: [1] The study must have been published between January 2000 and June 2020; [2] based on a nationally representative adult population living in mainland China; [3] study focuses on hypertension; [4] the full text was written in English. Studies that met the following criteria were excluded: [1] targeted population was a specific subgroup of Chinese residents, such as specific occupations, ethnic groups, or co-morbid diseases, etc; [2] total sample size of less than 1000 individuals; [3] study samples restricted to a single geographic region in China, such as Northern, Southern, Eastern, Western China, or fewer than 6 provinces; [4] failure to report data concerning hypertension prevalence, awareness, treatment, or control; [5] the study was a systematic review or meta-analysis; and [6] multiple papers from a same database.

Hypertension was defined as systolic blood pressure over 140 mmHg, diastolic blood pressure over 90 mmHg, or taking antihypertensive medicine [17]. Prevalence was the proportion of people with hypertension in the whole population. Awareness was considered as the proportion of those who had been diagnosed by a doctor to have hypertension or self-reported to be hypertensive. The proportion of people with hypertension who

were treated with antihypertensive medication was defined as treatment rate. Control was the proportion of those whose blood pressure was under control (systolic blood pressure <140 mm Hg or/and diastolic blood pressure <90 mm Hg) [16, 18]. The hypertension awareness, treatment and control rates were formed using persons with hypertension as the denominator to increase comparability across studies, which also applies to studies that defined controlled hypertension as associated with pharmacological treatment [7, 19–22]. One study reported the control rate among those who were aware of their diagnosis, but we recalculated it using persons with hypertension as the denominator [7].

Screening and data extraction. Two reviewers independently conducted the literature search, screening and data extraction. A designated third reviewer was consulted to resolve any incongruities.

Quality and bias assessment. We followed the “NIH Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies” for quality assessment of included cohort and cross-sectional studies [23]. Studies were then ranked as “Good,” “Fair,” or “Poor” by two reviewers. A third reviewer was involved to resolve any discrepancies.

Data analysis. The overall hypertension prevalence in the general population and awareness, treatment, control rates among participants with hypertension were illustrated in

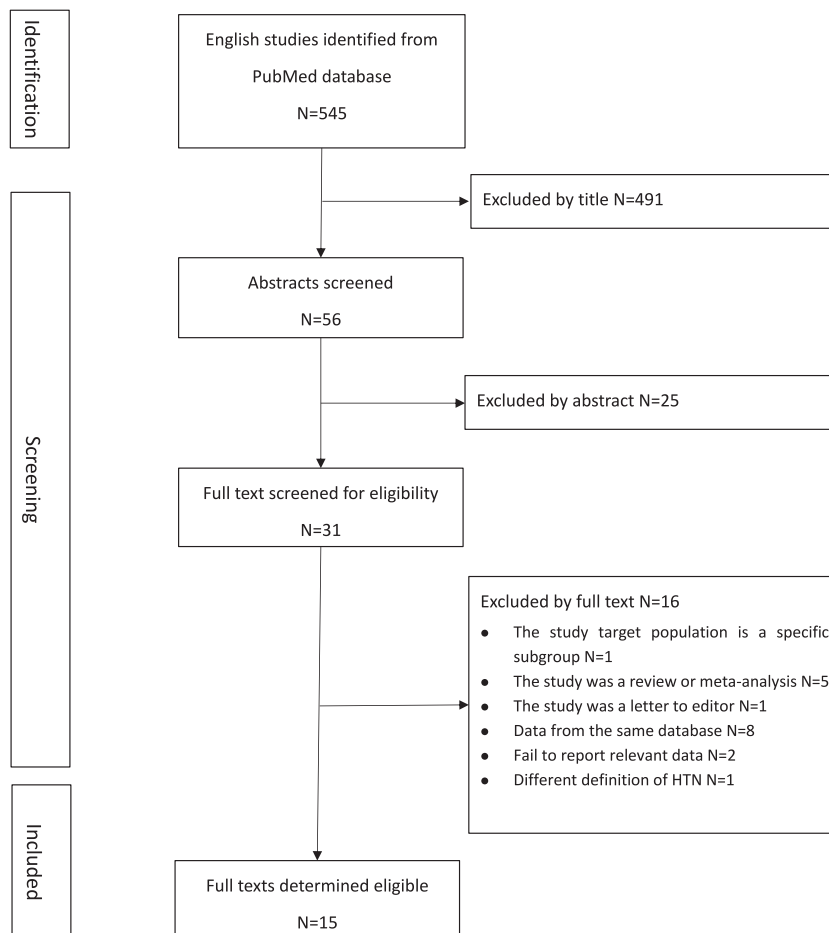


Fig. 1 Flow chart of literature search and screening of the epidemiological studies on burden of hypertension in China.

Table 1. The characteristics of included studies on hypertension in China.

First author	Journal	Last year of data collection	Sample	Male	Age range	Number of provinces included	Quality assessment
Gu, D.	Hypertension	2001	15,838	50.6%	35–74	10	Good
Wang, Y.	Journal of Human Hypertension	1997	42,751	44.0%	20–74	11	Fair
Wu, Y.	Circulation	2002	14,1892	N/A	≥ 18	31	Fair
Gao, Y.	PloS one	2008	46,239	40.1%	≥20	14	Good
Feng, X. L.	Bulletin of the World Health Organization	2012	13,707	47.0%	≥45	28	Good
Wang, J.	American Journal of Hypertension	2010	50,171	50.2%	≥18	13	Good
Feng, Y.J.	Biomedical and Environmental Sciences	2010	76,752	50.3%	≥35	31	Good
Guo, J.	Journal of Hypertension	2011	75,528	47.4%	≥18	9	Good
He, M.	The Journal of Headache and Pain	2010	4987	50.8%	18–65	31	Good
Lewington, S.	The Lancet	2015	500,233	41.0%	35–74	10	Good
Li, W.	Journal of Hypertension	2009	45,108	41.1%	35–70	12	Fair
Li, Y.	International Journal of Cardiology	2014	174,621	42.8%	≥18	31	Good
Lu, J.	The Lancet	2017	1,738,886	40.5%	35–75	31	Fair
Wang, Z.	Circulation	2015	451,755	47.8%	≥18	31	Fair

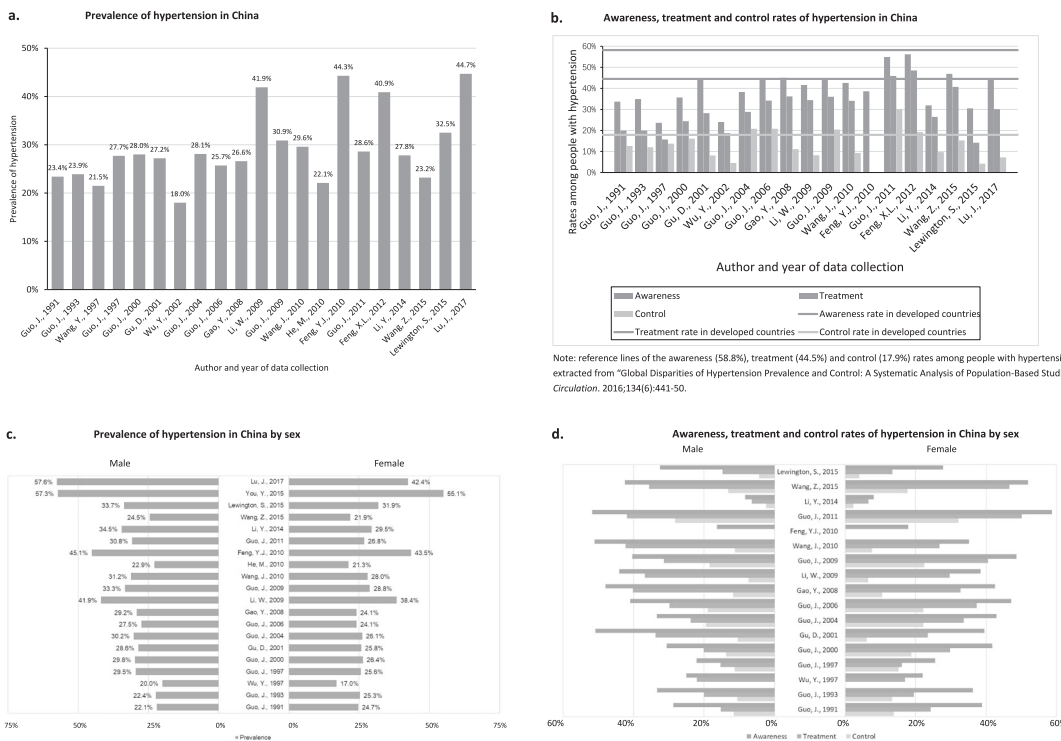


Fig. 2 Disease burden of hypertension in China. **a** Prevalence of hypertension in China. **b** Awareness, treatment and control rates of hypertension in China. **c** Prevalence of hypertension in China by sex. **d** Awareness, treatment and control rates of hypertension in China by sex.

histograms, while sex-specific data were displayed in clustered histograms. Reference lines of the awareness, treatment and control rates among people with hypertension in developed countries in 2000 were extracted from a systematic analysis of 90 countries and shown in the figure, which are 58.8%, 44.5% and 17.9% [24].

Chinese hypertension guidelines

The search for Chinese hypertension guidelines was conducted using the China National Knowledge Infrastructure digital database (CNKI). The search terms used in CNKI was “Hypertension” AND “Guidelines”. The Website of National Center for Cardiovascular Diseases was also searched to identify released

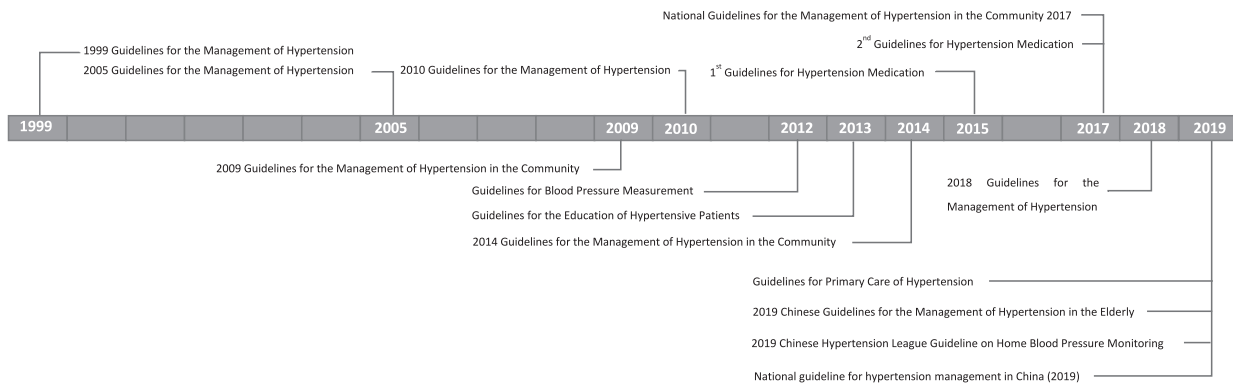


Fig. 3 Publication Timeline of Hypertension Guidelines in China.

guidelines that were not published in journals. Only documents released by the Chinese Hypertension League, National Center for Cardiovascular Diseases, or the Chinese Society of Medicine aiming at guiding the comprehensive clinical and community primary hypertension management were included in this review. All retrieved papers were written in Chinese and examined by Chinese - English speaking reviewers.

We identified 15 guidelines for hypertension management published between 1999 and 2020 [8–12, 25–34]. Based on the selection criteria, this review extracted data from nine major guidelines that provide comprehensive instructions for general clinical hypertension management and the community hypertension management.

Chinese policy documents for hypertension

We searched the State Council website with keyword “NCDs” or “hypertension” or “diabetes” or “primary healthcare.” A total of 74 documents were found. The inclusion criteria were: (1) it must be a policy targeting all groups (*some policies are for the minorities or the poor*); (2) it must have specific clauses related to hypertension management. After reviewing the full texts, 27 policies were included. Seven policies published by the State Council were presented using a table while the other 20 government documents were reviewed and summarized.

RESULTS

Disease burden of hypertension

As demonstrated in (Fig. 1), 545 papers were retrieved from PubMed. The publication titles and abstracts were screened using the eligibility criteria, and 516 of them were excluded. Thirty-one publications were selected into full text review. For those studies derived from the same databases, those that reported the prevalence, awareness, treatment, and control rate of hypertension were included. After excluding 16 articles according to the pre-specified criteria, a total of 15 articles were included in the review [7, 16, 19–22, 35–43].

The characteristics of the studies included were shown in Table 1. Sample sizes ranged from 4,987 to 1,738,886 and all participants were 18 years of age or older. The response rate varied from 66.4 to 99.65%. The last year of data collection ranged from 1997 to 2017, and all studies included nine or more provinces.

Figure 2 shows the disease burden of hypertension according to the data collection year. The range of hypertension prevalence among the general population, and the awareness, treatment, and control rates in people with hypertension were 18.0–44.7%, 23.6–56.2%, 14.2–48.5%, and 4.2–30.1%, respectively [7, 16, 19–22, 35–43] (Fig. 2a, b, and Supplementary Table 1). Variations in burden of hypertension among the included studies were due to

many factors such as inconsistencies in age ranges, age-standardization methods, years of data collection, and sampling schemes. For instance, on account of different age ranges, in Wu’s [7] study the prevalence of hypertension was 18.0% with participants aged 18 years or older, whereas the prevalence in Lu et. al [40] was 56.1% with participants aged between 35 and 75 years. The awareness and treatment rates increased over time, but the hypertension control rate remained low. As per sex differences (Fig. 2c, d), generally a higher prevalence was found in men than that in women, and women were more likely to have higher rates of awareness, treatment, and control.

Guidelines

Figure 3 shows the timeline of guidelines publication from 1999 to 2020. Out of 15 guidelines depicted in this timeline, 12 were published after 2010 and 7 were published within 2017–2019. Six guidelines did not meet the inclusion criteria. Table 2 summarizes the changes over time and reflects the trend of hypertension management [8–12, 25, 28, 32, 34]. These national documents aimed to provide evidence-based instruction for hypertension management to health care providers, to translate new research results into clinical practice, and to promote management and prevention of hypertension and other chronic diseases in China. The first Chinese Guidelines for the Management of Hypertension was published in 1999, introducing a 6-level blood pressure classification (Supplementary Table 2). This was largely based on WHO/ISH and the Joint National Committee (JNC) 5 recommendations [8]. The second guideline was issued in 2005 [9], whereby modifications included a 5-level blood pressure classification and removal of “optimal” blood pressures for age groups (Supplementary Table 2). The definition and classification of hypertension changed again in the 2010 guidelines and control of hypertension risk factors was addressed for the first time. The risk factors recognized in the 2010 guidelines include high sodium and low potassium intake, being overweight or obese, alcohol consumption, long term mental stress, age, family history of hypertension, physical inactive, smoking, dyslipidemia, and diabetes [10]. In addition, the 2010 guidelines modified risk factors and risk stratification for cardiovascular diseases (Supplementary Table 3). In the 2018 guidelines [11], blood pressure goals for diabetes and renal diseases were lower than those in previous guidelines. Other guidelines on specific topics included medications for hypertension, health education for hypertensive patients, and blood pressure measurement instructions for healthcare providers.

Community-based hypertension management has been increasingly emphasized in subsequent editions since the 1999 guideline (Table 2). In 2009, as a response to the national BPHS policy, the Chinese Hypertension League issued a guideline focusing on community management for general physicians working at the community level [28]. The awareness, control

Table 2. Blood pressure goals, prevention and management strategies in hypertension guidelines in China.

Year	Title	Institution	Blood pressure (BP) goals for hypertension control	Content update
1999	1999 Chinese Guidelines for the Management of Hypertension	Chinese Hypertension League Chinese Ministry of Health	<ul style="list-style-type: none"> BP < 130/85 mmHg for middle-young aged patients and patients with diabetes BP < 140/90 mmHg for elderly patients 	<ul style="list-style-type: none"> High-risk strategy in the community management
2005	2005 Chinese Guidelines for the Management of Hypertension	Chinese Hypertension League Chinese Ministry of Health	<ul style="list-style-type: none"> BP < 140/90 mmHg SBP < 150 mmHg for elderly population BP < 130/80 mmHg for patients with diabetes and renal diseases 	<ul style="list-style-type: none"> To control the exposure to the risk factors To realize early diagnosis and early treatment, and standardized management of hypertensive patients To provide detailed guidance for community-level hypertension management
2009	Chinese Guidelines for the Management of Hypertension in the Community	Chinese Hypertension League Chinese Ministry of Health	<ul style="list-style-type: none"> BP < 140/90 mmHg BP < 150/90 mmHg for elderly population aged over 65 BP < 130/80 mmHg for patients with other NCDs and young population BP < 120/80 mmHg if patients have a high tolerability to treatment 	<ul style="list-style-type: none"> Tertiary management for hypertension Two-way referral system for hypertensive patients in the community. Creation of an evaluation method for community-based hypertension prevention and management
2010	2010 Chinese Guidelines for the management of Hypertension	Chinese Hypertension League National Center for Cardiovascular Diseases	<ul style="list-style-type: none"> BP < 140/90 mmHg SBP < 150 mmHg for elderly population aged over 65 and the target BP lower is lower if patients have a high tolerability to treatment BP < 130/80 mmHg for patients with diabetes and renal diseases and the BP goals should be individualized BP < 140/90 mmHg for patients with a stroke history 	<ul style="list-style-type: none"> Hypertension management in the community was emphasized Introduction of long-term management of hypertensive patients
2014	Chinese Guidelines for the Management of Hypertension in the Community (2014 revised version)	National Health and Family Planning Commission of the People's Republic of China; National Center for Cardiovascular Diseases; Chinese Hypertension League	<ul style="list-style-type: none"> BP < 140/90 mmHg BP < 150/90 mmHg for elderly patients aged over 65 and BP < 140/90 mmHg if patients have a high tolerability to treatment BP goals for patients with diabetes and renal diseases can be appropriately lower 	<ul style="list-style-type: none"> Hypertension prevention and management in the rural area was emphasized
2017	National Guidelines for the Management of Hypertension in the Community	National Center for Cardiovascular Diseases; National Basic Public Health Service Project	<ul style="list-style-type: none"> BP < 140/90 mmHg BP < 150/90 mmHg for elderly patients aged over 80 without diabetes or chronic renal diseases 	<ul style="list-style-type: none"> Blood lipid management goals for hypertensive patients with complications. Patients' referral that transferred by ambulance
2018	2018 Chinese Guidelines for the management of Hypertension	Chinese Hypertension League National Center for Cardiovascular Diseases	<ul style="list-style-type: none"> BP < 140/90 mmHg; BP < 130/80 mmHg if tolerated BP < 150/90 mmHg for elderly patients aged over 65 and BP < 140/90 mmHg if patients have a high tolerability to treatment BP goals for patients with diabetes and renal diseases can be appropriately lower 	<ul style="list-style-type: none"> Standardized community management was emphasized
2019	Guideline for Primary Care of Hypertension	Chinese Medical Association Chinese Medical Journals Publishing House Chinese Society of General Practice Editorial Board of Chinese Journal of General Practice	<ul style="list-style-type: none"> BP < 150/90 mmHg for elderly patients aged 65–79; BP < 140/90 mmHg if tolerated; BP < 150/90 mmHg for elderly patients aged over 80 Individualized BP control suggestions for patients with different comorbidities 	<ul style="list-style-type: none"> BP goals for special group were specified. Standardized follow-up visits, including establishing electronic health records, follow-up frequency, and health education delivery Treatment of acute hypertension was emphasized

Table 2 continued

Year	Title	Institution	Blood pressure (BP) goals for hypertension control	Content update
2019	National Guidelines for Hypertension Management in China	National Center for Cardiovascular Diseases Chinese Center for Disease Control and Prevention Chinese Society of Cardiology	<ul style="list-style-type: none"> • BP < 140/90 mmHg • BP < 130/80 mmHg if patients have a high tolerability to treatment 	<ul style="list-style-type: none"> • Target group of this guideline includes community health workers, staffs in health management institution, and general public • Standardized hypertension management for different population • Included intervention methods for healthy population, high-risk group, and patients • Introduced a hierarchical hypertension management strategy including self-management, community management, and management by higher-level hospitals

and management rates were promoted as criteria for hypertension management assessment. In 2014, the second edition of community-based guidelines was published. The classification of hypertension patients changed into two levels and an emphasis on self-management and management in rural areas emerged [25]. The 2017 community guidelines standardized medical equipment, healthcare workforce and medication possession in the community clinics [34]. Following the 2017 version, guidelines for primary care of hypertension were published in 2019 with specified blood pressure goals for patients with respective comorbidities [32]. This guideline standardized the follow-up visit procedures and emphasized the treatment of acute hypertension.

Policy responses for hypertension prevention and control in China

Table 3 shows the key messages from seven documents published by the State Council. The State Council introduced chronic disease prevention in the 2007 National Disease Control System, and as one of the leading risk factors for chronic diseases, hypertension has since gained increased attention [44]. However, it was not until 2009, when major medical and health system reforms were initiated, that prevention and treatment of hypertension was directly mentioned in the plan for Healthcare System Reform [45]. Standards for hypertension management were revised in the Twelfth Five-Year Plan for Health Service Development [46]. For example, blood pressure measurements were required for people aged over 35 years when they were visiting medical institutions. Most recently, the Thirteenth Five-Year Plan for Hygiene and Health required that Basic Public Health Services (BPHS) be delivered to high-risk populations for chronic diseases at the primary care level, including individual health profiles, physical examination, regular follow-up visits, and guidance over healthy lifestyle [47, 48]. Other primary tasks proposed in 2017 were to further develop an integrated prevention and control system for NCDs focusing on grassroots healthcare facilities [47].

In total, 20 additional documents regarding the implementation of BPHS and NCD control are summarized here [49–68]. BPHS was first released in 2009 [49]. The Opinions on Gradual Equalization to Promote BPHS specified mandatory public health services, including providing blood pressure measurements for people aged over 35 at their first visits to the hospital and management for hypertensive and diabetic patients [49]. Goals for hypertension management were gradually increased in later documents. For example, the target rate of standardized management in hypertensive patients rose from 35% in 2013 to over 60% in 2017 [51, 53–55]. Meanwhile, the BPHS Service Code began to promote new patient goals, such as BMI control and blood pressure control for overweight/obese people with hypertension, and expanded the service coverage to cover patients and other high-risk individuals [60, 61]. The Chinese National Health Commission and the State Council have also issued plans on NCD control, including the Healthy China 2030 Plan published in 2016 that further stressed the comprehensive prevention and control of NCDs and set the goal of achieving population-wide and whole lifecycle health management of NCDs by 2030. Two documents that focused on special topics addressed other core pillars of the health system including finance and the utilization of information technology [67, 68].

DISCUSSION

This review summarized the changes in the burden of hypertension in China, the development of hypertension management guidelines, and the policy responses to these changes. A larger burden of hypertension was observed in men than in women, while the overall control rate in both sexes remained low. The Chinese government responded by increasing emphasis on prevention and management of hypertension and other chronic

Table 3. Summary of national five-year plans and relevant policy documents for hypertension prevention and control published by the State Council, China.

Year	Title	Key points
2007	Outline of the Eleventh Five-year Plan for Health Service Development	<ul style="list-style-type: none"> To establish a national network for the prevention and monitoring of NCDs. To strengthen the intervention of risk factors. To standardize and scale up diagnosis and treatment procedures of NCDs.
2009	Plan on Recent Priorities in Carrying out the Healthcare System Reform (2009-2011)	<ul style="list-style-type: none"> Regularly providing guidance for the prevention and treatment of patients with hypertension was incorporated into national basic public health services.
2012	The Twelfth Five-Year Plan for National System of Basic Public Health Services	<ul style="list-style-type: none"> To provide free NCDs management services (registration management, health guidance, regular follow-up and physical examination) for NCDs high-risk groups, and achieve 40% of hypertension management rate.
2012	Outline of the Twelfth Five-Year Plan for Health Service Development	<ul style="list-style-type: none"> To promote blood pressure measurement of outpatients aged over 35 years in their first visits at all levels of health institutions. Encouraging providing free medications for patients with hypertension and diabetes in disadvantaged areas. To build demonstration areas for comprehensive prevention and control of NCDs.
2016	Thirteenth Five-year Plan for Deepening the Healthcare System Reform	<ul style="list-style-type: none"> To promote the hierarchical medical system and building the treatment-rehabilitation-long-term-care service chain.
2017	Thirteenth Five-Year Plan for Hygiene and Health	<ul style="list-style-type: none"> To carry out blood pressure measurement for all first-visit outpatients aged over 35 years old, and gradually provide the risk assessment and intervention guidance for people at high risk of NCDs. The number of patients with hypertension under the health management were supposed to reach 100 million (target). To promote the hierarchical medical system through piloting integrated care of NCDs, and family doctor empanelment.
2017	The Thirteenth Five-Year Plan to Promote Equalization of Basic Public Health Services	<ul style="list-style-type: none"> To provide registration management, health guidance, regular follow-up and physical examination services for patients with essential hypertension or type II diabetes.

diseases in national policies. In addition, since the release of the first Chinese national hypertension guidelines in 1999, newer guidelines have been revised according to new scientific and empirical evidence. In recent years, more guidelines were published on specific topics and hypertension management at the primary healthcare level.

The awareness, treatment, and control rates in China have remained low, although an upward trend has been observed. A higher prevalence of hypertension was found in males, which is consistent with previous systematic reviews on hypertension prevalence in China [4, 5]. This may be explained by the larger proportion of men with smoking and drinking habits compared to women [69]. Improvements in awareness, treatment and control of hypertension might be credited to the enhanced financial support to hypertension management [5], the dramatic expansion of health insurance coverage [16, 70], and the implementation of national hypertension programs that led to the transition from institutional service to community care [71]. However, the control rates in China were still far from optimal compared with that in developed countries [24, 72]. For example, according to the National Health and Nutrition Examination Survey, the control rate of hypertension in the United States increased significantly from 31.6% in 1999–2000 to 48.3% in 2009–2010 among hypertensive patients, with a stable rate of hypertension of around 29.0% [73]. Alternatively, a national survey in China reported a slight increase in the control rate of hypertension among people with hypertension from 6.1% in 2002 [7] to 11.2% in 2010 [74].

Chinese hypertension guidelines have been constantly updated with emerging evidence-based solutions and better access to antihypertensive medications [9]. The Chinese guidelines are similar to the guidelines issued by the JNC in the United States, the European Society of Hypertension and the European Society of Cardiology (ESH/ESC), and the Canadian Hypertension Education Program (CHEP) in many aspects [75]. For example, the Chinese guidelines published in 2010 and the JNC report similarly emphasized risk management, such as blood lipid and blood glucose control, and antiplatelet therapy [10]. In addition, the ESH/

ESC guidelines gradually placed more importance to home blood pressure monitoring (HBPM) for cardiovascular risk prevention since 2003 [75]. Likewise, the Chinese Hypertension League issued a specific Guideline on HBPM in 2019. However, studies show that physicians would prescribe medications beyond the recommended list of drugs in the guidelines [40, 76]. This indicated that the guidelines need further promotion among clinical practitioners to increase their knowledge of and willingness to adhere to updated hypertension guidelines [40].

Over the years, China has attached more importance on hypertension management by specifying goals and treatment plans in its policies. These health policies showed a significant continuity in terms of hypertension management strategies. For instance, China has steadily promoted the hierarchical medical system, national demonstration areas for NCDs management, and family doctor empanelment to enhance the quality of care. China has also allocated more funding and provided policy support for strengthening the grassroots healthcare system with the focus on NCDs prevention and management [77]. In addition, the strong intersectoral collaboration seen in recent policies, such as the joint release of the National Plan on NCD Prevention and Treatment (2012–2015) by 15 Chinese ministries and commissions, suggests cohesiveness and shared commitment to stop the growth of NCD [78]. China's policies corresponded with the proposals by WHO that urge governments to create and implement national policies for NCD risk and burden reduction, generally through increased access to healthcare and establishment of healthy environments [79].

The coronavirus disease (COVID-19) started in late 2019 and quickly swept across the whole world. The unprecedented pandemic has revealed the inadequacy of health systems and society at large to tackle rapidly emerging infectious diseases. Measures to contain COVID-19 such as social distancing and lockdowns and prioritizing limited medical resources to treat COVID-19 cases have led to reduced access or lower quality of care for patients with NCDs. Furthermore, people with NCDs such as hypertension and related diseases, are at higher risk of contracting

and dying from COVID-19, exacerbating the joint consequences of NCDs and the pandemic. While low-cost and effective vaccine is the ultimate weapon against COVID-19, successful development of vaccines must be coupled with efficient delivery of vaccinations to vulnerable populations including NCD patients in low-and middle-income countries to win this battle. Such delivery will require a well-functioning primary care system and workforce.

STRENGTHS AND LIMITATIONS

A strength of this review is its wide research scope and inclusion of various literature types. Part one, or the investigation of the burden of hypertension in China, was based on nationally representative samples and captures changes in disease burden overtime. For parts two and three, national guidelines and policy document series were reviewed in a chronological fashion, thereby describing the progression and development of the national responses to hypertension. Not only did we include specific documents regarding hypertension management, but we also collected key information from policies with larger scope, such as the national five-year plans issued by the State Council.

Nevertheless, this study has some limitations. The first part on disease burden only utilized one database and one language (English), but this review was systematic and included all national and regional studies we could find. Our knowledge of Chinese literature on hypertension indicated that national studies were published in English not Chinese journals. Second, given the already broad scope of our review, we did not include information on risk factors for hypertension or hypertension-related diseases such as cardiovascular and renal disease. Third, we did not include evaluation studies on implementation and impacts of the guidelines and policies, which are important topics for future research but beyond the scope of this paper. Lastly, due to the heterogeneity of the included studies, we were unable to conclude an estimate of the prevalence of hypertension in China over time.

CONCLUSION

This review shows the increase of hypertension disease burden in China, the development of hypertension management guidelines, and the policy responses to these changes. National clinical guidelines were developed and updated over time with increasing specificity within guidelines. Prevention and management of hypertension has been featured in the National Health Commission policies and in national plans such as the five-year development plan and Healthy China 2030. The BPHS policies initiated in 2009 included hypertension management as one of the service packages and promoted nation-wide uptake of hypertension management especially at the primary care level. Our findings highlighted the importance of integrating new guidelines into hypertension management provided by primary healthcare practitioners. Future research is warranted to examine the implementation of guidelines and policies regarding hypertension management.

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COMPETING INTERESTS

The authors declare no competing interests.

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