Original Article

Hypertension Screening and Follow-up Management by Primary Health Care System among Chinese Population Aged 35 Years and Above

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Abstract

Objective To describe hypertension screening and follow-up management among Chinese population aged 35 years and above within the primary health care system.

Methods Data from 2010 China Chronic Disease and Risk Factor Surveillance System were used. We investigated previous hypertension diagnosis, screening, and follow-up assessments within the primary health care system. The prevalence of self-reported and criterion-based hypertension, screening rates, demographic and socioeconomic characteristics associated with screening, and patterns of follow-up assessments were recorded. The SAS software system was used for statistical analyses.

Results About 17.1% reported a previous hypertension diagnosis. The rate difference between the two measures of prevalence was 27.2%. Among those without self-reported hypertension, 27.7% reported never visiting a clinic during the past 1 year and 60.4% of those attending a clinic reported ever being screened. Younger age group was associated with lower screening proportion; odds ratios of 35-, 45-, 55-, and ≥65 years were 1.7 (95% CI: 1.5-1.9), 1.5 (95% CI: 1.3-1.7), 1.3 (95% CI: 1.2-1.4), and 1.0, respectively. About 35.1% of the patients had undergone follow-up assessments four or more times during the past 1 year.

Conclusion Majority of the Chinese population aged 35 years and above, particularly the less educated, elderly population, and rural residents were unaware of that they were suffering from hypertension. Most patients did not receive enough management services by the primary health care system. Thus, strengthening both the screening and follow-up management is needed.

Key words: Hypertension; Policy; Screening; Management

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INTRODUCTION

Hypertension is a major public health challenge globally because of its high prevalence and being a risk factor for heart disease, stroke, kidney disease, and premature mortality[1]. The World Health Organization (WHO) has estimated that high blood pressure is the leading global risk factor for premature mortality and is responsible for 13% of all deaths[2]. There are one billion adults with hypertension worldwide, and it causes four million deaths each year[3]. Although

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hypertension prevalence is higher in economically developed countries than in economically developing ones (37% and 23% among adults, respectively), about two-thirds of the total affected population currently reside in developing regions[4]. Overall, more than 80% of hypertension's attributable burden of disease occurs in low-income and middle-income countries[5].

In China, the prevalence of hypertension has increased significantly in recent decades, and currently, it is reaching epidemic proportions[6-8]. In 1979, the prevalence of hypertension was 7.7%. In subsequent national surveys conducted in 1991 and 2002, the prevalence increased to 13.6% and 18.8%, respectively[7]. The most recent national survey in 2010 reported hypertension prevalence at 33.5%, affecting an estimated 330 million adults[8-9]. Moreover, in 2002, the direct economic burden of hypertension was enormous, reaching 32 billion RMB (US$ 51 billion), which is about 5.6% of the national health expenditure during that year[10].

In the spring of 2009, the Chinese government launched the Health Care System Reform effort and issued a very important document that was the *Opinions of the CPC Central Committee and the State Council on Deepening the Health Care System Reform* (hereinafter referred to as 'the Opinions')[11]. The Opinions stated that community health services must provide management services for chronic diseases. In a subsequent government document *Implementation Plan for the Recent Priorities of the Health Care System Reform* (2009-2011)[12], hypertension prevention and control was made a basic public health service for both urban and rural residents. In the autumn of the same year, the *National Basic Public Health Service Standards* (hereinafter referred to as 'the Standards') (updated in 2011) that specified the health management service standards of hypertension was issued. It prescribed that the grass-roots health care institutions (the primary health care institutions) were responsible for hypertension screening and patient management and must address the following aspects: i) screen residents aged 35 years and above for hypertension when they visit the clinic and ii) provide at least four follow-up care services each year for continuing the management of those diagnosed with primary hypertension[13].

In the reform, the government provided more importance to the control of hypertension and other chronic diseases than that in the past and also issued formal documents to guide the health care system and provide disease management services. A good policy requires good implementation and evaluation. To evaluate the reform and policy, we need to learn what the hypertension control situation was at the beginning. Moreover, hypertension screening among a large population and follow-up management for the patients are the most important measures of this disease control, and community-based primary health care system can perform more cost-effective efforts in this field[14]. All these concepts were included in the content of the reform and the Standards policy. Since the reform started, no nationally representative study of hypertension screening and management within the primary health care system has been published. In this study, we aim to describe hypertension screening and hypertension follow-up management among residents aged 35 years and above within the primary health care system in 2010. The findings from this study can be used as a baseline survey that contribute to evaluate some important aspects of the health care system reform and some core contents of the Standards policy; the results can also be used to develop and target priority strategies of hypertension control in China.

SUBJECTS AND METHODS

We obtained data from the 2010 China Chronic Disease and Risk Factor Surveillance (CCDRFS) System. This surveillance system conducts a face-to-face survey every 3 years using a nationally representative random sampling of the general population, based on the China National Disease Surveillance Points (DSP) system[15]. The 2010 CCDRFS covered all 31 provinces, autonomous regions, and municipalities in mainland China, which included 162 surveillance points: 63 from urban districts and 99 from rural districts. The multistage stratified cluster random sampling method was used. The inclusion criterion for the subjects in this study was Chinese adult population aged 18 years and above living in local districts for 6 months or more during the past 12 months. Subjects unable to provide informed consents, with any cognitive or psychiatric disorders, or pregnant women were excluded from the study. Detailed descriptions of the 2010 survey's design, content, and methods are published elsewhere[8,16-18]. A total of 109,023 people were selected and 98,658 participated in the survey conducted between August and December, 2010. The overall response rate was 90.5%

(replacement rate 9.3%). Corresponding to the target population of the Standards policy, in our study, we selected all subjects aged 35 years and above.

The study protocol was approved by the ethical review committee of the Chinese Center for Disease Control and Prevention and other participating institutes. Written informed consent was obtained from all study participants.

The blood pressure of the participants was measured using an automated device (OMRON Model HEM-7071, Omron Co.) in the nondominant arm three times consecutively with a 1-min interval between each measurement with the participant in a seated position after 5 min of rest. The average value of the last two measurements was calculated to be used for the final outcome. Hypertension (also called criterion-based hypertension in this study) was defined as a systolic blood pressure ≥140 mmHg or a diastolic blood pressure ≥90 mmHg, or a self-reported previous diagnosis by a health care professional. Self-reported hypertension refers to only those people with a previous hypertension diagnosis by doctors and reported in the survey.

Participants were first asked 'Have you ever had your blood pressure measured before?.' For a negative response, no further hypertension questions were asked. If yes, they were asked secondly, 'Have you ever been diagnosed with hypertension by a doctor?' Those who answered 'yes' were asked 'How many times did you have your hypertension checked by primary care clinics during the year prior to the survey?'; those who answered 'no' to the second question were asked 'Did the doctors measure your blood pressure when you attended the clinic during the year prior to the survey?'

We estimated the hypertension screening efforts in various aspects. The first was the rate difference between the prevalence of criterion-based hypertension and self-reported hypertension. The second was the pattern of the hypertension screening among those who did not report any previous diagnosis of hypertension, by examining whether they had ever visited clinics and whether they had ever been screened when attending clinics. We also analyzed whether there were any differences in screening among the various levels of socioeconomic and demographic characteristics. For the follow-up management of hypertension, we prescribed the number of times of follow-up blood pressure assessments that the grass-roots health care institutions provided.

The proportion that was screened for hypertension was defined as the number of individuals not reporting previous hypertension diagnosis and reporting having their blood pressure measured by health care professionals when attending clinics. Grass-roots health care institutions refer to the community health centers or stations in urban areas and township health centers or village clinics in rural areas.

We used four age groups (35, 45, 55, and ≥65 years), three levels of education (≤6 years: elementary school and below; 7 years: middle school; ≥10 years: high school and above), three types of marital status (single, married or cohabiting, and separated or divorced or widowed or others), and three medical insurance categories (urban insurance, rural insurance, and no insurance). For urban residents, the insurance included a basic medical insurance system for urban employees, government-sponsored insurance for government employees, commercial medical insurance, and supplementary medical insurance for urban residents, as well as specific insurance for serious diseases. The rural insurance included coverage from the New Rural Cooperative Medical System.

We used the SAS software, version 9.3 (SAS Institute Inc.), considering the complex sampling design for these analyses. Estimates were adjusted to the national population, which was consistent with the CCDRFS complex sampling design and accounted for stratification, primary sampling units, and clustering. We weighted all calculations to obtain DSP-representative results consistent with the sampling scheme. Post-stratification adjustments for age and gender using data from the 2009 National Sample Survey on Population Changes were also made.

Descriptive statistics were used to examine demographic and socioeconomic characteristics. To further explore the determinants that were associated with hypertension screening, we applied logistic regression to examine the socio-demographic status by calculated crude and adjusted odds ratios (OR). Statistical significance was assessed using the likelihood ratio test. All the study parameters (age, gender, residence, education, marital status, and medical insurance) were included in the logistic analysis model; family income and individual health status may be the potential confounders. Ridit analysis method[19] was used to compare the number of blood pressure assessments

among the different subgroups of residence and medical insurance. Statistical significance was assessed using the Cochran-Mantel-Haenszel test, based on Ridit scores. The 95% confidence intervals (95% CI) were computed for the estimates and $P<0.05$ was used to define statistical significance.

RESULTS

Overall Characteristics of Study Subjects

A total of 76,752 respondents aged 35 years and above were selected in this study. The majority of the respondents were aged between 35 and 44 years (35.4%), men (50.3%), living in rural areas (67.5%), either married or cohabiting (87.4%), and with the education level of elementary school graduate or below (49.0%). The most common insurance type was rural medical insurance (70.8%) (Table 1).

The Rate Difference Between the Prevalence of Criterion-based Hypertension and Self-reported Hypertension

Overall, the estimated prevalence of hypertension among the study population was 44.3% (95% CI: 42.3%-46.3%), ranging from 26.7% in the 35-year age group to 70.0% in the ≥65-year age group. However, the prevalence of self-reported hypertension was 17.1% (95% CI: 16.1%-18.1%) in the general study population, ranging from 7.0% to 31.8% among the different age groups. In total, the rate difference between the two kinds of prevalence was 27.2%, which represented the proportion unaware of their hypertension among the total study population. The rate differences for each subgroup are shown in Table 2.

Among the subgroups, the rate difference for the total and those unaware increased from the youngest age group (19.7% of 35 years) to the oldest (38.2% of 65 years and above) (P for trend <0.001) and decreased from the lowest education level to the highest education level (21.7% *vs.* 30.2%). This rate difference in men (28.8%) was higher than that in women (25.6%) and was greater among rural residents (28.3%) than among urban residents (24.6%).

Hypertension Screening Pattern

Among all respondents, about 27.7% (21,246/76,752) reported that they never had their blood pressure measured before. Among those who had their blood pressure measured before the survey but without a hypertension diagnosis, about 22.7% (9,408/41,419) reported never visiting a clinic during the year prior to the survey; of those attending a clinic, 61.3% (19,616/32,011) reported having blood pressure measured by health care professionals, with an age-gender-adjusted prevalence of 60.4% (95% CI: 57.8%-62.9%). The weighted percentages of the subjects screened among the different groups are shown in Table 3. The multiple logistic regression analysis for the odds of study parameters and those ever screened showed that the adjusted ORs of the age groups 35-, 45-, 55-, and ≥65 years were 1.7 (95% CI: 1.5-1.9), 1.5 (95% CI: 1.3-1.7), 1.3 (95% CI: 1.2-1.4), and 1.0,

Table 1. Characteristics of the Study Participants (N=76,752)

Characteristics	Sample Number	Percent %[a]	Weighted Percent %[a] (95% CI[b])
Age, y			
35-	23,271	30.3	35.4 (33.9-36.9)
45-	22,837	29.8	27.7 (26.7-28.7)
55-	18,362	23.9	20.8 (19.9-21.6)
≥65	12,282	16.0	16.2 (15.0-17.4)
Gender			
Men	34,681	45.2	50.3 (49.3-51.2)
Women	42,071	54.8	49.7 (48.8-50.7)
Residence			
Urban	30,298	39.5	32.5 (29.2-35.8)
Rural	46,454	60.5	67.5 (64.2-70.8)
Education, y			
≤6	38,624	50.3	49.0 (46.9-51.1)
7-	22,595	29.4	31.1 (29.8-32.5)
≥10	15,533	20.2	19.9 (18.2-21.5)
Marital status			
Single	1,068	1.4	1.4 (1.2-1.6)
Married/cohabiting	66,372	86.5	87.4 (86.2-88.5)
Other status[c]	9,312	12.1	11.3 (10.2-12.4)
Medical insurance[d]			
Urban insurance	22,649	29.7	26.3 (22.8-29.8)
Rural insurance	51,287	67.2	70.8 (67.1-74.5)
No insurance	2,329	3.1	2.9 (2.4-3.4)

Note. [a]The percentages were weighted to represent the total population of the national disease surveillance points system with post-stratification for age and gender; [b]CI: confidence interval, considering the complex survey design; [c]Other marital status included the response of separated, divorced, widowed, and others; [d]487 participants who responded 'other' or 'not sure' were excluded.

respectively, which showed the trend that the younger age group was associated with a lower proportion of hypertension screening. The adjusted ORs were 0.8 (95% CI: 0.7-1.0) for urban insurance and 0.8 (95% CI: 0.6-1.0) for rural insurance, which indicated that the proportion of residents screened for hypertension among those with either urban insurance or rural insurance was higher than that among those without any insurance. The results of the logistic analysis are shown in Table 3 and Figure 1.

Table 2. Prevalence of Criterion-based Hypertension and Self-reported Hypertension Among the Study Population (*N*=34,628)

Characteristics	Criterion-based Hypertension (%[a], 95%CI[c])	Self-reported Hypertension (%[b], 95%CI[c])	Rate Difference[d] %
Total	44.3 (42.3-46.3)	17.1 (16.1-18.1)	27.2
Age, y			
35-	26.7 (24.6-28.7)	7.0 (6.2-7.8)	19.7
45-	42.1 (40.1-44.1)	15.9 (14.7-17.1)	26.2
55-	57.1 (54.8-59.4)	24.6 (23.4-25.9)	32.5
≥65	70.0 (68.3-71.8)	31.8 (30.2-33.3)	38.2
Gender			
Men	45.1 (43.0-47.1)	16.3 (15.3-17.4)	28.8
Women	43.5 (41.3-45.6)	17.9 (16.9-19.0)	25.6
Residence			
Urban	44.5 (42.4-46.5)	19.9 (18.7-21.1)	24.6
Rural	44.1 (41.6-46.6)	15.8 (14.4-17.1)	28.3
Education, y			
≤6	48.7 (46.2-51.2)	18.5 (17.3-19.8)	30.2
7-	40.5 (38.3-42.7)	14.6 (13.5-15.8)	25.9
≥10	39.2 (37.2-41.1)	17.5 (16.3-18.8)	21.7
Medical insurance[e]			
Urban insurance	45.1 (43.2-46.9)	22.2 (21.2-23.3)	22.9
Rural insurance	44.1 (41.6-46.5)	15.3 (14.2-16.5)	28.8
No insurance	41.3 (37.9-44.7)	14.2 (12.2-16.3)	27.1

Note. [a]The prevalence rates of criterion-based hypertension among all the study populations, which were weighted to represent the total population of the national disease surveillance points system with post-stratification for age and gender; [b]The prevalence rates of self-reported hypertension among all the study populations, which were weighted to represent the total population of the national disease surveillance points system with post-stratification for age and gender; [c]Confidence intervals considering the complex survey design; [d]The difference between the two measures of hypertension; [e]487 participants who responded 'other' or 'not sure' were excluded.

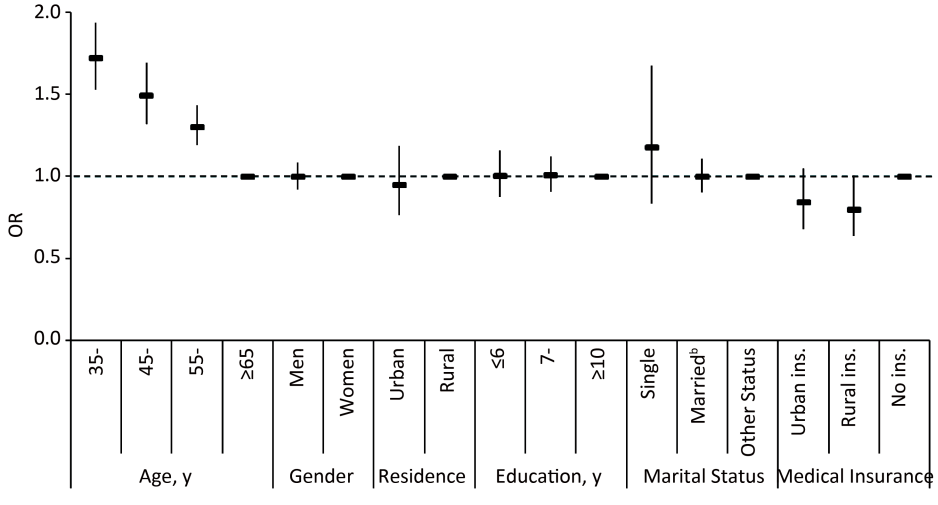

Figure 1. Odds ratio (95% confidence intervals)[a] of study parameters and hypertension screening among those not reporting a previous diagnosis of hypertension. *Note.* [a]Multiple logistic regression analysis for the odds of those ever screened was weighted to represent the total population of the national disease surveillance points system with post-stratification for age and gender; [b]Married group included the status of 'married' or 'cohabiting'.

Follow-up Blood Pressure Assessments

Among the respondents who self-reported hypertension, the estimated overall proportions of those having undergone follow-up blood pressure assessments by primary health care institutions four or more times and one to three times were 35.1% (95% CI: 32.1%-38.1%) and 21.2% (95% CI: 19.7%-22.7%), respectively, and 43.8% (95% CI: 40.3%-47.2%) of the total respondents reported 'never' or 'were unsure'.

Among the different groups, significant differences existed in different residence and insurance groups. The residents living in the rural areas received more number of follow-up blood pressure assessments by primary health care than those living in urban areas (P<0.0001). Respondents without any medical insurance had less follow-up assessments than those with some medical insurance (P<0.0001) (Figure 2, Table 4).

Table 3. Proportions Screened by Health Professionals Among Those not Reporting a Previous Diagnosis of Hypertension and not Visiting a Clinic During the Year Prior to the Survey (N=32,011)

Characteristics	Screened %[a] (95% CI[b])	Unadjusted[c] OR (95% CI)	Adjusted[c] OR (95% CI[b])
Total	60.4 (57.8-62.9)		
Age, y			
35-	56.1 (53.4-58.8)	1.7 (1.6-1.9)[e]	1.7 (1.5-1.9)[e]
45-	59.6 (56.6-62.6)	1.5 (1.4-1.6)[e]	1.5 (1.3-1.7)[f]
55-	62.9 (59.7-66.1)	1.3 (1.2-1.4)[g]	1.3 (1.2-1.4)[g]
≥65	68.6 (66.0-71.3)	1 [reference]	
Gender			
Men	60.4 (57.5-63.4)	1.0 (0.9-1.0)	1.0 (0.9-1.1)
Women	60.3 (57.7-62.9)	1 [reference]	
Residence			
Urban	60.6 (56.0-65.2)	0.9 (0.9-1.0)[g]	1.0 (0.8-1.2)
Rural	60.2 (57.1-63.4)	1 [reference]	
Education, y			
≤6	62.0 (59.3-64.6)	1.0 (0.9-1.1)	1.0 (0.9-1.2)
7-	59.2 (56.2-62.1)	1.0 (0.9-1.1)	1.0 (0.9-1.1)
≥10	58.9 (55.4-62.5)	1 [reference]	
Marital status			
Single	55.7 (47.8-63.5)	1.2 (1.0-1.5)	1.2 (0.8-1.7)
Married/cohabiting	60.0 (57.3-62.7)	1.0 (0.9-1.1)	1.0 (0.9-1.1)
Other status	63.8 (60.6-67.1)	1 [reference]	
Medical insurance[d]			
Urban insurance	60.1 (55.4-64.8)	0.8 (0.7-0.9)[g]	0.8 (0.7-1.0)
Rural insurance	60.8 (58.0-63.6)	0.7 (0.6-0.9)[e]	0.8 (0.6-1.0)[e]
No insurance	55.4 (50.6-60.2)	1 [reference]	

Note. [a]The percentages were weighted to represent the total population of the national disease surveillance points system with post-stratification for age and gender; [b]Confidence intervals considering the complex survey design; [c]All parameters identified in the table were included in the logistic analysis model; [d]212 participants who responded 'other' or 'not sure' were excluded; [e]P<0.0001; [f]0.001<P<0.01; [g]0.01<P<0.05.

Table 4. The Distribution of Follow-up blood Pressure (BP) Assessments by Primary Health Care during the Year Prior to the Survey Among Self-reported Hypertension by Residence and Insurance Status

BP Assessment (times)	Total %[a] (95% CI[b])	Residence[e] %[a] (95% CI[b])		Medical Insurance[f] %[a] (95% CI[b])	
		Urban	Rural	Insurance[c]	No insurance
≥4	35.1 (32.1-38.1)	31.6 (26.8-36.4)	37.2 (33.3-41.0)	35.3 (32.3-38.4)	25.9 (19.9-31.8)
1-	21.2 (19.7-22.7)	19.2 (17.3-21.1)	22.4 (20.2-24.5)	21.2 (19.7-22.8)	18.9 (14.0-23.8)
0/not sure[d]	43.8 (40.3-47.2)	49.2 (44.6-53.8)	40.4 (35.8-45.1)	43.4 (40.0-46.9)	55.2 (49.1-61.3)

Note. [a]The percentages were weighted to represent the total population of the national disease surveillance points system with post-stratification for age and gender; [b]Confidence intervals considering the complex survey design; [c]Group insurance including groups of urban insurance and rural insurance; [d]The total proportion of respondents 'not sure' was 25.8%; [e]The difference between urban and rural residents, P<0.0001; [f]The difference between residents with medical insurance and without medical insurance, P<0.0001.

DISCUSSION

The large disparities between the prevalence of criterion-based hypertension and self-reported hypertension indicate that large numbers of hypertensive patients are not diagnosed among the general population aged 35 years and above. About one in every five persons was suffering from hypertension but without being aware of it. One of the recent studies using the WHO SAGE survey also found similar marked differences in the prevalence levels between self-reported and criterion-based measures of hypertension among adults in China and some other low- and middle-income countries[20]. Furthermore, our study shows that the prevalence rate difference among these two groups was even more prominent among the older population, less educated people, and rural residents. Although older people have more opportunity to accept hypertension screening than the younger ones, the much higher prevalence of hypertension in the older population exceeds the more numbers screened, which might be primarily caused due to their less awareness. The less educated people and rural residents may have less knowledge of hypertension and care less about their blood pressure. To confirm the reason for the disparities in the awareness levels among the different socioeconomic groups, further research is needed.

The prevalence of hypertension awareness among all the adults in China was 36% in 2010. Compared with younger age groups, the prevalence of hypertension awareness increases among older age groups (from 22% to 45%)[8]. However, in our study, among the general population (with or without hypertension) with increasing age group, a contrasting trend was observed, that is, the proportion of those with an unawareness of hypertension was higher, especially in the elderly population, with nearly two-fifths of the subjects aged 65 years and above being 'blind identified' hypertensive by the health care system. This finding may imply a more realistic meaning for implementing more hypertension screening efforts, because in the real world we encounter the general population, and the biggest challenge for public health professionals is how to improve the capability and broaden the coverage of hypertension screening so that the large number hypertensives 'hiding' among the huge general population could be screened out.

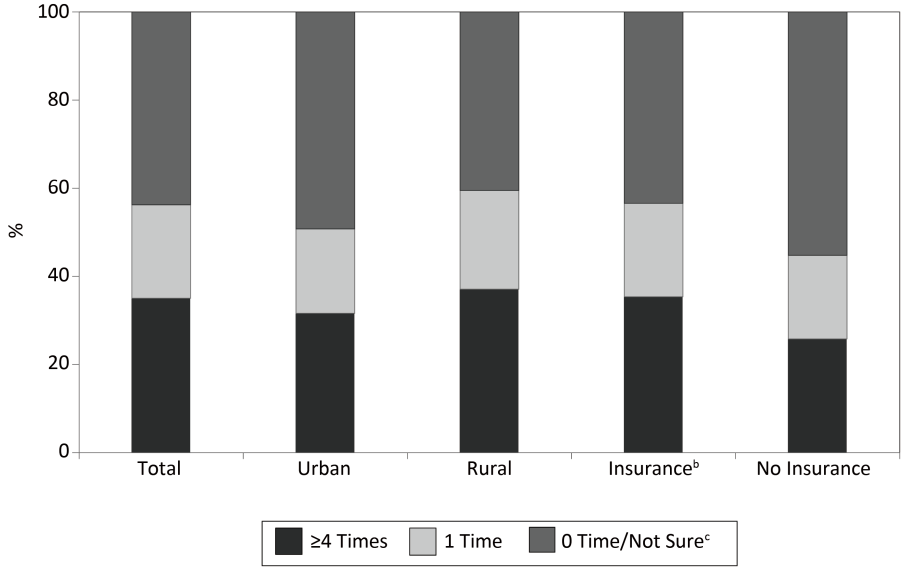

Figure 2. Percentages of follow-up times for blood pressure assessments by primary health care during the year prior to the survey among self-reported hypertension (%[a]) [A tabular version of this figure is also available (Table 4)]. [a]The percentages were weighted to represent the total population of the national disease surveillance points system with post-stratification for age and gender; [b]Group insurance including groups of urban insurance and rural insurance; [c]The total proportion of respondents 'not sure' was 25.8%.

Screening for hypertension allows clinicians to identify adults at increased risk for cardiovascular disease so that they can start treatment and reduce this risk[21-22]. The community approach to hypertension prevention has a high degree of generalization and cost-effectiveness[14]. The WHO recommends that primary health care professionals should measure blood pressure regularly in all persons above 40 years of age, even if they are normotensive, at least once every 2 years[23]. Some American academic organizations recommend that clinicians screen all adults aged 18 or 20 years and above for hypertension[22,24-25].

In the Standards policy of China, hypertension screening was specified as a content of basic public health services provided by the government for residents aged 35 years and above since 2009. However, the significant difference between the two prevalence measures of hypertension indicated that the screening efforts were obviously far from enough. The data also showed that younger populations had lower screening rates than the elder. One primary possible reason for this situation was that the Standards policy targets the screening people among those having a chance to see doctors in a certain frequency. Since there are very few family doctors in China, an overwhelming majority of people could have had the opportunity to be screened for hypertension by health care professionals only when visiting clinics by their own initiative. Unfortunately, the survey showed that there was about one-fourth of the study population not visiting any clinics during the year prior to the survey, which implies that a large proportion of people were kept away from early screening if the screening approach was too limited. Moreover, we can also imagine that younger people usually have a less tendency to visit the doctors. Another explanation for this situation is that even among those residents visiting clinics, there were only three-fifths who reported having measured their blood pressure by health care providers. This reflects that some of the health care professionals had not taken the hypertension screening as a rule as the Standards policy stated.

Treating and controlling high blood pressure can significantly decrease the prevalence of cardiovascular disease[21-22]. The WHO has proved that the majority of hypertension cases can be managed effectively by follow-up assessments at the primary health care level. Primary health care physicians as well as trained non-physician health workers can play a very important role in the management of hypertension[26]. The most important element in the management of hypertension is follow-up assessments; routine blood pressure check-ups are important to monitor readings and decide upon a treatment plan. As for the appropriate frequency of follow-up assessments, once antihypertensive drug therapy is initiated, most patients should return for follow-up and adjustment of medications at monthly intervals or until the blood pressure goal is reached; after the blood pressure is at goal and stable, follow-up visits can usually be at 3- to 6-month intervals, or more often if necessary[1]. The Opinions for the reform of China was consistent with the WHO guidelines, and the Standards defined the number of times of follow-up assessments each year for hypertension by the grass-roots health care services institutions. Therefore, the frequency of follow-up blood pressure assessments can be a very simple and persuasive indicator in reflecting the efficiency of hypertension management services at grass-roots levels.

In China, the prevalence of hypertension control was no more than 10%[27], much lower than in England (27%), USA (53%), and Canada (66%)[28]. In our study, only about one-third of those who self-reported hypertension reported having had follow-up blood pressure assessments four or more times by the grass-roots health care institutions during the year prior to the survey, and this proportion was especially low among urban residents or those without any insurance. Such low frequencies indicated that most hypertension individuals could not receive the Standard's services for management of their blood pressures from the grass-roots health care levels. This situation may partly explain the very low prevalence of hypertension control in China.

Hypertension management services had been involved in the items of basic public health services in China's Health Care System Reform starting from 2009. A large number of hypertension patients will get long-term benefits by the implementation of this policy. Under the guidance of the Opinions and the Standards by the central government, many local governments have been making efforts to gradually press ahead with the standardization of hypertension screening and management in the system of health care services at grass-roots levels. They explored and developed various management service forms that seemed to have had good effects,

such as organizing self-management patient groups and signing services between grass-roots institutions and patients. The reform surveillance results reported that the primary health care system had provided hypertension management services for 8.1 million patients by the end of 2013. In our study, the data were collected at the beginning of the reform, which can provide a useful baseline for understanding the hypertension control situation when the reform started and will be helpful to evaluate the progress in the future.

STRENGTHS AND LIMITATIONS

Our study has few strengths. First, it included a nationally representative sample selected from all 31 provinces, autonomous regions, and municipalities in China, and we adopted age-gender post-stratification adjustment in weight calculation to minimize a potential bias in the oversampling of older and female residents resulting from the multistage sampling process. Second, we achieved a high response rate, and to ensure an adequate sample size, we stipulated a somewhat strict replacement procedure for the non-respondents, that is, only the family who had a similar household structure to the originally sampled family could be selected as a substitute. In addition, the overall sample replacement rate was quite small (9.3%). Therefore, the impact of the replacement method on parameter estimations should be minimal.

Our study does have some limitations. First, the estimated prevalence of hypertension was based on blood pressure measured on a single occasion, and not at least three readings at different times that is usually required. This could perhaps have included the subjects without hypertension but with high blood pressure at that time. The prevalence of hypertension might have been overestimated and the estimated proportion of hypertension unawareness was not very accurate. Second, we did not collect information on other ways of hypertension screening for those residents who have never been to a clinic or hospital during the year prior to the survey. We also lacked any screening information for those residents never having blood pressure measured in their lives, due to the design of the questions. These drawbacks make it difficult to compare our findings with the screening prevalence in other countries and also might indicate that we overestimated the proportion of ever-screened hypertension individuals. Third, both the status of hypertension screening and the follow-up blood pressure assessment were self-reported, which might incur unknown information bias. Fourth, the proportion of respondents 'not sure' of the number of times of follow-up by grass-roots health care institutions was 26%; we calculated this proportion as '0 times' follow-up, which might overestimate the proportion of those never been followed up in the past year.

CONCLUSIONS

There was a very high proportion of the Chinese general population aged 35 years and above being unaware of having hypertension in 2010, and less awareness existed in older age groups, less educated people, and rural residents. The number of people screened for hypertension in the whole population was far from enough. Most hypertension patients did not receive enough services for the management of hypertension by the grass-roots health care services system in 2010. Further studies and more efforts should be conducted on hypertension screening and control.

SUGGESTIONS

Hypertension screening should be improved in two aspects. On the one hand, efforts should be made to carry out hypertension screening strategy insistently and completely. In order to ensure that all target people are screened when they attend clinics, hypertension screening should be listed in the routine work at different levels of health care services institutions. On the other hand, the government should undertake more considerations on how to broaden the coverage of screened population and to develop special projects or community activities for special group populations (such as the middle-aged) as supplemental approaches to those residents seldom visiting clinics, so that the accessibility of the national hypertension screening services will be as extensive as possible.

To undertake more public health efforts on hypertension management and control, further exploration and efforts may be needed to make the grass-roots health care system play the most important role in the management of hypertension through the reform of health care system. This is a very tough task and also a very complicated socioeconomic issue, which involves improvement of

the grass-roots health care services system, allocation of medical resources in the health care system, development of health policies, incentive mechanism for health care providers, public health education, community mobilization.

Further research is needed to contribute toward the aspect of hypertension control in China. First, the government should organize the task of follow-up evaluations by the Health Care System Reform and assess implementation of the Standards policy, which would be helpful in adjusting the strategies or in improving the implementation power of the health policies. Second, further studies are needed to understand the attitudes of the primary health care institutions toward the reform and policies to know about the challenges of conducting the Standards policy at the grass-roots health care levels and to develop some incentive mechanism of actively providing screening and management services for hypertension within the primary health care system.

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REFERENCES

1. Chobanian AV, Bakris GL, Black HR, et al. Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Hypertension, 2003; 42, 1206-52.
2. World Health Organization. Global health risks: mortality and burden of disease attributable to selected major risks. Geneva, 2009; v.
3. Danaei G, Finucane MM, Lin JK, et al. National, regional, and global trends in systolic blood pressure since 1980: systematic analysis of health examination surveys and epidemiological studies with 786 country-years and 5.4 million participants.Lancet, 2011; 377, 568-77.
4. Kearney PM, Whelton M, Reynolds K, et al. Global burden of hypertension: analysis of worldwide data. Lancet, 2005; 365, 217-23.
5. Lawes CM, Vander Hoorn S, Rodgers A. Global burden of blood-pressure-related disease, 2001. Lancet, 2008; 371, 1513-8.
6. Wu YK, Lu CQ, Gao RQ, et al. Nation-wide hypertension screening in China during 1979-1980. Chin Med J, 1982; 95, 101-8.
7. Li LM, Rao KQ, Kong LZ, et al. A description on the Chinese national nutrition and health survey in 2002. Chin J Epidemiol, 2005; 26, 478-83. (In Chinese)
8. National Center for Chronic and Noncommunicable Disease Control and Prevention, Chinese Center for Disease Control and Prevention. Report on Chronic Disease and Risk Factor Surveillance in China 2010. Beijing, China, 2012. (In Chinese)
9. Li YC, Wang LM, Jiang Y, et al. Prevalence of hypertension among Chinese adults in 2010. Chin J Prev Med, 2012; 46, 409-13. (In Chinese)
10. Wang JS, Zhang QJ, Jin SG. Burden of diseases caused by hypertension and diabetes in China. J of Pub Health and Prev Med, 2007; 18, 27-30. (In Chinese)
11. Opinions of the CPC Central Committee and the State Council on Deepening the Health Care System Reform. Available from: http://www.nhfpc.gov.cn/zhuzhan/wsbmgz/201304/ae1e98dfbcd6445b801dfe2fdbb5cfb3.shtml. (In Chinese) [2014-12-1]
12. Nation Health and Family Planning Commission of the People's Republic of China. Implementation Plan for the Recent Priorities of the Health Care System Reform (2009-2011). Available from: http://shs.ndrc.gov.cn/ygzc/200904/t20090408_359216.html. (In Chinese) [2014-12-3].
13. Nation Health and Family Planning Commission of the People's Republic of China. National Basic Public Health Service Standards, 2011. Available from: http://www.nhfpc.gov.cn/zhuzhan/wsbmgz/201304/b175eb09dfd240f6bae36d2fb67c8619.shtml, http://www.nhfpc.gov.cn/zhuzhan/wsbmgz/201304/cb5978bb42814451a26e5c97dd855254.shtml. (In Chinese) [2014-12-4].
14. Saha S, Hoerger TJ, Pignone MP, et al. The art and science of incorporating cost effectiveness into evidence-based recommendations for clinical preventive services. Am J Prev Med, 2001; 20(3 Suppl), 36-43.
15. Yang G, Hu J, Rao KQ, et al. Mortality registration and surveillance in China: history, current situation and challenges. Popul Health Metr, 2005; 3, 3.
16. Zhao WH, Ning G. Objective, Contents and methods on chronic disease surveillance in China 2010. Chin J Prev Med, 2012; 46, 477-9. (In Chinese)
17. Wang BH, He MF, Wang LM, et al. Breast cancer screening among adult women in China, 2010. Prev Chronic Dis, 2013; 10, 130-6.
18. Xu Y, Wang LM, He J, et al. Prevalence and control of diabetes In Chinese adults. JAMA, 2013; 310, 948-58.
19. Bross, Irwin DJ. How to use ridit analysis. Biometrics, 1958; 14, 18-38.
20. Vellakkal S, Millett C, Basu S, et al. Are estimates of socioeconomic inequalitiesin chronic disease artefactually narrowed byself-reported measures of prevalence in low-incomeand middle-income countries? Findings from theWHO-SAGE survey. J Epidemiol Community Health, 2015; 69, 218-25.
21. Piper MA, Evans CV, Burda BU, et al. Screening for High Blood Pressure in Adults: A Systematic Evidence Review for the U.S.

Preventive Services Task Force. Rockville, MD: Agency for Healthcare Research and Quality, 2014; 8.
22. US. Preventive Services Task Force. Screening for High Blood Pressure:US. Preventive Services Task Force Reaffirmation RecommendationStatement, 2007; 783-4.
23. Clinical guidelines of the management of hypertension. Cairo, WHO regional office for eastern mediterranean, 2005; 82.
24. American Academy of Family Physicians. Summary of Recommendations for Clinical Preventive Services. 2015; 13.
25. Pearson TA, Blair SN, Daniels SR, et al. AHA Guidelines for Primary Prevention of Cardiovascular Disease and Stroke: 2002 Update: Consensus Panel Guide to Comprehensive Risk Reduction for Adult Patients Without Coronary or Other Atherosclerotic Vascular Diseases. American Heart Association Science Advisory and Coordinating Committee, Circulation, 2002; 106, 388-91.
26. World Health Organization. A Global Brief on Hypertension. Geneva, 2013; 29. Available from: http://www.who.int/cardiovascular_diseases/publications/global_brief_hypertension/en/ [2014-10-4].
27. Writing Group of 2010 Chinese Guidelines for management of hypertension. 2010 Chinese Guidelines for management of hypertension. Chin J Cardiol, 2011; 39, 579-616.
28. Joffres M, Falaschetti E, Gillespie C, et al. Hypertension prevalence, awareness, treatment and control in national surveys from England, the USA and Canada, and correlation with stroke and ischaemic heart disease mortality a cross-section. BMJ Open, 2013; 3, e003423.