

Access this article online
Quick Response Code:

Website: www.jehp.net
DOI: 10.4103/jehp.jehp_1332_21

Evaluation of medication adherence and its relevant factors among hypertensive patients: A cross-sectional study in Shahrekord health-care system

Zabihallah Ahmadi, Hossein Shahnazi¹, Akbar Hassanzadeh²

Abstract:

BACKGROUND: Medication adherence means compliance with patient adherence to medication orders, including timely and correct consumption of medication prescribed by a physician. The present study aimed to determine the extent of adherence to hypertension drug medication in patients covered by comprehensive health service centers of Shahrekord, Iran.

MATERIALS AND METHODS: A cross-sectional study examined 401 hypertensive patients registered in the Integrated Health Record System (SIB). SIB is a Persian term related to Health Record System. To collect data, Morisky Medication Adherence Scale was used. The questionnaire was completed by the patients and analyzed using SPSS (SPSS Inc., Chicago, Illinois, USA, version 26), Chi-square test, independent *t*-test, and analysis of variance.

RESULTS: The results indicated that adherence to antihypertensive medication was low in 5.7% of patients, while 63.3% of patients had sufficient compliance. Forgetting to take medications (52.9%) was the most common reason for nonadherence to medication in hypertensive patients.

CONCLUSION: Given that forgetting to take medications was the main reason for nonadherence to medication in hypertensive patients, designing and implementing necessary trainings by comprehensive health centers to realize the importance of daily use of medication by hypertensive patients and their families are recommended.

Keywords:

Care, education, hypertension, medication adherence

Introduction

Hypertension is often asymptomatic and is usually called the silent killer. It is the cause of almost half of all ischemic heart diseases and stroke and is the leading cause of death worldwide.^[1] According to the latest statistics of the World Health Organization, over one billion people are affected by this disease worldwide, and 50% of them are in developing countries.^[2] Hypertension is a major public health problem in all

countries and accounts for approximately 13% of global mortality.^[3] The prevalence of hypertension varies in different regions of the world; various studies have reported its prevalence 15% to 37% in the total population in different regions of the world.^[4,5]

Complications of hypertension, such as heart attack, stroke, and kidney failure, are very debilitating and impose a great economic burden on society. It also increases the risk of dementia and depression in old age.^[6,7] The

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Ahmadi Z, Shahnazi H, Hassanzadeh A. Evaluation of medication adherence and its relevant factors among hypertensive patients: A cross-sectional study in Shahrekord health-care system. *J Edu Health Promot* 2022;11:223.

Student Research Committee, Department of Health Education and Promotion, School of Health, Isfahan University of Medical Sciences, Isfahan, Iran, ¹Department of Health Education and Health Promotion, School of Health, Isfahan University of Medical Sciences, Isfahan, Iran, ²Department of Epidemiology and Biostatistics, Isfahan University of Medical Sciences, Isfahan, Iran

Address for correspondence:

Dr. Hossein Shahnazi, Department of Health Education and Health Promotion, School of Health, Isfahan University of Medical Sciences, Isfahan, Iran.
E-mail: h_shahnazi@yahoo.com

Received: 10-09-2021
Accepted: 26-10-2021
Published: 29-07-2022

costs of treating hypertension are also significant. In the United States, the cost of cardiovascular complications caused by hypertension is estimated to increase by 238% from 2010 to 2030.^[8] The prevalence of hypertension has been reported in various studies in Iran, most of which have been reported in review and systematic studies. For instance, a meta-analysis by Oori *et al.* with a sample size of 902,580 reported 25% hypertension prevalence. This rate was 42% in the elderly, 24% in women, and 25% in men.^[9]

Medication adherence among patients is a way to control hypertension and its dangerous side effects.^[10] Medication adherence means the amount of behavior through which patients take medication, follow a diet, change their lifestyles, and respond positively to recommendations of health-care providers.^[11] Despite effective medications, the level of patient adherence to regular medication has been reported internationally only 30% to 50%.^[10] In developed countries, the medication adherence rate is about 50% for chronic diseases. The forms and patterns of medication adherence and its measurement parameters are different. The number of drugs prescribed and the actual amount of their adherence are usually used to measure it.^[11]

Even though blood pressure management is complex, medication is the key to control blood pressure in most patients. Medication reduces complications of hypertension.^[12] Studies indicate that medication reduces the patients' mortality rate by 46%.^[13,14] Despite the proven benefits of prescribed drugs in reducing blood pressure and their side effects, many patients refuse to adhere to medication to control their blood pressure.^[15] The results of a study indicated that only 21% of patients had a medication adherence rate of above 80%.^[16]

The lack of medication adherence leads to poor blood pressure control, hospitalization, and even death.^[17-21] The results of a meta-analysis indicated that low acceptance of medication adherence compared with high and proper adherence increased the risk of cardiovascular diseases by 19% and mortality by 29%.^[22] Eighty-nine thousand premature deaths occur in the United States that can be prevented by medication adherence in patients with hypertension.^[23]

Medication adherence can decrease serious complications of this disease. It not only prevents further complications but can control and treat the disease at its early stages. The lack of medication adherence is a major obstacle to achieve positive results in the treatment program. This noncompliance may be due to a lack of awareness and information about the diseases, wrong lifestyle, etc.

Objectives

Due to the high number of patients with hypertension in Shahrekord, the importance of medication adherence,

and finding reasons for patients' noncompliance with treatment, the present study aimed to determine adherence to hypertension medication and its relevant factors in patients in Shahrekord under the coverage of comprehensive health service centers.

Materials and Methods

Study design and participants

The present cross-sectional study examined 401 hypertensive patients (diastolic blood pressure of 90 or more and systolic blood pressure of 140 or more^[11] after three measurements) living in Shahrekord county in Iran. Quota sampling was performed among those with hypertension under the coverage of health centers and registered in the Integrated Health Record System (SIB). Shahrekord County has 11 comprehensive health centers, from which several active cases of hypertensive patients were randomly selected. A total of 401 patients were selected from all comprehensive health centers of Shahrekord.

Sample size determination

A sample size of 368 was obtained according to $n = \frac{z^2 s^2}{d^2}$ equation, and 401 participants were selected based on a 10% loss.

Z = 95% confidence level was equal to 1.96.

S = Standard deviation of medication adherence score was 4.64.

d = Accuracy (error estimate) was considered to be 0.05.

Inclusion and exclusion criteria

Inclusion criteria were set as follows: hypertension (at least in the past 6 months), having an active health record, and willingness to participate in the study. Noncompletion of the questionnaire was considered as the exclusion criterion.

Data gathering tool

The Morisky Medication Adherence Scale (MMAS) was utilized to collect data.^[24] MMAS consisted of eight items; the first seven questions were scored as yes (1 point) and no (0 point). Question 8 was designed as a four-point Likert scale from never to always. The answers of never and sometimes were scored 1, and the answers of usually and always were scored 0. Items 5 and 8 were scored in contrary to other items. To calculate the total score of the questionnaire, the scores of all items of the questionnaire were summed up, ranging from 0 to 8; scores more than 2 indicated low medication adherence, 1 = moderate medication adherence, and 0 = high medication adherence.^[25]

Koudhyar *et al.* approved the reliability and validity of the study in Iran. The validity was reported as a measure of content validity index = 0.93 and content validity ratio = 0.89, and the reliability was calculated 0.68 through Cronbach's alpha.^[25]

Procedure

To complete the questionnaire, patients with hypertension were identified through the quota sampling process and were recalled to the health center by phone according to a time schedule. They received the explanation of the research purpose before completing the questionnaire, and the questionnaires were completed after obtaining the written consent. Their systolic and diastolic blood pressure were measured first from the right hand and then the left hand after completing the questionnaires with standard considerations. A higher number was recorded as the patient's final blood pressure.

Using the standard standing hand scales, Rasa CO19000, and a tape measure, their heights and weights were measured according to standard conditions (patients stood on a flat with minimal clothing, and the scales were on a firm surface to measure their weight. To measure their heights, they were asked to take off their shoes; their back was held straight, and hands were holding still to either side of the body). Their abdominal circumference was also measured according to the standard instructions of the Ministry of Health (passing a tape measure over the navel in the middle and the prominent part of the pelvis on the sides).

Data analysis

The data were analyzed using SPSS (SPSS Inc., Chicago, Illinois, USA, Ver 20), independent *t*-test, one-way analysis of variance (ANOVA), Pearson correlation coefficient, Spearman correlation coefficient, and regression analysis. The significance level of the tests was considered to be <5%.

Ethical consideration

All subjects received written consent for participation in the study. Questionnaires were completed without name and that the confidential information was provided to the participants. This study was approved by the Vice Chancellor for Research, Isfahan University of Medical Sciences with the code of ethics IR.MUI.REC.1399.477.

Results

In the study, 401 patients with hypertension within the age range of 32–90 years were examined. Their mean age was 61.1 ± 11.3 years, and 250 (62.3%) of the participants

were female. Most participants with a frequency of 220 (54.8%) were housewives [Table 1].

In terms of comorbidities of hypertension, the highest frequency belonged to blood lipid (24.2%), and the lowest frequency was related to depression (3.5%) [Table 2].

Table 1: Mean values of different quantitative variables and frequency distribution of demographic variables

Variables	Mean±SD/n (%)
Age (year)	61.1±11.3
Duration of hypertension (years)	7.8±6.9
Height (cm)	162.3±12.9
Weight (kg)	75.9±14.8
Abdominal circumference (cm)	95.3±8.9
Number of visits to the doctor per year	4.8±3.8
Years of taking hypertension medication	7.3±5.7
Number of drugs used	1.5±0.8
Number of uses per day	1.7±0.8
Systolic blood pressure	126.7±15.7
Diastolic blood pressure	78.8±8.6
Gender	
Male	149 (37.2)
Female	250 (62.3)
Unknown	2 (0.5)
Place of residence	
City	341 (85)
Village	3 (0.7)
Unknown	57 (14.3)
Marital status	
Single	2 (1.2)
Married	343 (85.5)
Divorced	2 (0.5)
Widowed	48 (12)
Unknown	3 (0.8)
Education level	
Illiterate	109 (27.2)
Primary school	109 (27.2)
Secondary school	49 (12.2)
High school	21 (5.2)
High school diploma	52 (13)
Academic	59 (14.7)
Unknown	2 (0.5)
Job	
Unemployed	12 (3.7)
Housewife	220 (54.8)
Self-employed	54 (13.5)
Employee	28 (7)
Retired	72 (18)
Unknown	12 (3)
Type of insurance	
Rural	5 (1.2)
Health service	123 (30.7)
Social security	232 (57.9)
Armed forces	8 (2)
Other	22 (5.5)
Unknown	11 (2.7)

SD=Standard deviation

In terms of causes of drug use, the highest frequency belonged to forgetfulness (52.9%), and the lowest frequency belonged to fear of drug addiction and not preparing the medication (0.2%) [Table 3].

In terms of medication adherence level, the results indicated that most participants (63.3%) had good medication adherence.

The Spearman correlation coefficient indicated that the score of medication adherence had a direct relationship with education level ($r = 0.134, P = 0.007$) and monthly income level ($r = 0.111, P = 0.03$) [Table 4].

The one-way ANOVA indicated that the mean score of medication adherence was significantly different among people with different jobs ($P = 0.001$) so that the highest rate belonged to employees, and the lowest rate was related to self-employed individuals. Furthermore, the score of medication adherence was significantly correlated with the type of insurance ($P = 0.02$) [Table 5].

Discussion

The present study examined the medication adherence behavior of patients with hypertension and its relevant factors in patients covered by comprehensive health service centers in Shahrekord. In the study, 63.3% of the patients had good medication adherence, consistent with a study by Paczkowska in Poland on 488 patients, indicating that more than half of patients (54.7%) had comprehensive information about drug treatment and medication adherence.^[26]

A study by Chonhua *et al.* in China indicated that patients had low medication adherence.^[27] A study in Sri Lanka also found that 92% of participants had enough knowledge about the complications of hypertension.^[28] Inconsistency of the results might be due to the high support provided by hypertension patients' families in Iran as an important factor in terms of medication adherence. Based on a study by Dimatteo *et al.*, patients who were living with families had higher medication adherence than lonely individuals and those with family discord.^[29]

In the present study, forgetting to take medications was the main cause of medication withdrawal in hypertensive patients probably due to mental preoccupations and life worries or lack of proper scheduling and aging.^[30] The results of a study in Japan indicated that the problem of forgetting to take medications was less important because antihypertensive drugs were prescribed by doctors every 4 weeks, and general advices were given by doctors during prescription, and the use of drugs was monitored by a nurse. Therefore, the medical staff

played an effective role in preventing forgetfulness and regular use of drugs.^[31]

Table 2: Frequency distribution of hypertension comorbidities

Hypertension comorbidities	n (%)
Diabetes	91 (22.7)
Blood lipids	97 (24.2)
Heart failure	32 (8)
Migraine	19 (4.7)
Depression	14 (3.5)
Other	73 (18.2)

Table 3: Frequency distribution of the reasons for not taking drugs

Reasons for not taking drugs	n (%)
Forgetting	212 (52.9)
High price of drug	5 (1.2)
Feeling about drug ineffectiveness	7 (1.7)
Fear of drug addiction	1 (0.2)
Side effects	15 (3.7)
Failure to provide drugs	1 (0.2)
A combination of causes	16 (4.2)
Always consumes	144 (35.9)

Table 4: Correlation coefficients between medication adherence score with age, duration of disease, education level, and monthly income level

Variable	Medication adherence score	
	r	P
Age	-0.002	0.97
Duration of the disease	0.015	0.78
Education level	0.134	0.007
Monthly income level	0.111	0.03

Table 5: Mean scores of medication adherence by gender, marital status, job, and type of insurance

Variable	Mean±SD	P
Gender		
Male	69.8±23.3	0.42
Female	71.7±22.4	
Marital status		
Married	70.5±22.9	0.19
Other	74.7±21.4	
Job		
Unemployed	73.6±21.5	<0.001
Housewife	70.5±22.8	
Self-employed	61.1±23.2	
Employee	82.8±16.6	
Retired	74.9±22.1	
Type of insurance		
Rural	74.4±5.6	0.02
Health service	76.7±21.2	
Social security	68.5±22.8	
Armed forces	64.5±28.6	
Other	71.3±24.9	

SD=Standard deviation

The medication adherence score was directly related to education level and monthly income level. In a study by Sawicka and Szczepanska in the Netherlands, people with higher education had higher awareness and medication adherence than those with primary education.^[32] Furthermore, Akoko *et al.* examined 221 patients in Cameroon and found that people with higher education levels and awareness had better adherence.^[33]

The medication adherence was 30%–50% in low-income countries and 50%–70% in high-income countries probably due to physicians' allowance, insurance, medication cost, and proper diet in high-income countries.^[34-36]

The medication adherence score had a significant relationship with the type of insurance and having insurance. Since medication noncompliance was very widespread, having insurance and its type were also effective in the patients' medication adherence.^[37,38] Therefore, clinicians and policymakers should strengthen the medical care system to improve drug adherence. The study was consistent with a study in Korea, indicating that paying insurance benefits to patients were useful in managing hypertension and controlling the blood pressure of society.^[39]

In terms of hypertension comorbidities, the current study demonstrated that the highest frequency was related to hyperlipidemia, which is consistent with a study by the sun because the consumption of high-fat foods and insufficient consumption of fruits and vegetables were effective factors that led to high blood pressure and its inefficient management.^[40]

The cross-sectional design is an important limitation of the current study. Longitudinal designs are recommended for future studies in this regard.

Conclusion

Even though more than half of the patients with hypertension followed medication adherence, forgetting to take medications was an important reason for medication withdrawal, and more than half of the patients who did not have proper medication adherence considered it as the main cause for the lack of medication adherence. Therefore, it is recommended that health-care providers and family members of patients receive necessary trainings regarding the importance of the issue and emphasize that they provide the medication to the patient at a specific time for consumption.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Abu-El-Noor NI, Aljeesh YI, Bottcher B, Abu-El-Noor MK. Assessing barriers to and level of adherence to hypertension therapy among Palestinians living in the Gaza strip: A chance for policy innovation. *Int J Hypertens* 2020;2020:7650915.
2. Shrivastava SR, Shrivastava PS, Ramasamy J. The determinants and scope of public health interventions to tackle the global problem of hypertension. *Int J Prev Med* 2014;5:807-12.
3. Arabshahi A, Gharlipour Z. Assessment of adherence to self-care behaviors in hypertensive patients in Qom city (Iran). *Qom Univ Med Sci J* 2020;14:55-65.
4. Boutayeb A, Boutayeb S. The burden of non communicable diseases in developing countries. *Int J Equity Health* 2005;4:2.
5. Ninomiya T, Ohara T, Hirakawa Y. Midlife and late-life blood pressure and dementia in Japanese elderly. *J Hisayama Study Hypertens* 2011;58:22-8.
6. Wysocki M, Luo X, Schmeidler J, Dahlman K, Lesser GT, Grossman H, *et al.* Hypertension is associated with cognitive decline in elderly people at high risk for dementia. *Am J Geriatr Psychiatry* 2012;20:179-87.
7. Tel H, Vei H. Anger and depression among the elderly people with hypertension. *Neurol J Psychiatry Brain Res* 2013;19:109-13.
8. Heidenreich P, Trogon J, Khavjou O, Butler J, Dracup K, Ezekowitz M, *et al.* Forecasting the future of cardiovascular disease in the United States: A policy statement from the American Heart Association. *J Circulatio* 2011;123:933-4.
9. Oori MJ, Mohammadi F, Norozi K, Fallahi-Khoshknab M, Ebadi A, Gheshlagh RG. Prevalence of HTN in Iran: Meta-analysis of Published Studies in 2004-2018. *Curr Hypertens Rev* 2019;15:113-22.
10. De Geest S, Sabaté E. Adherence to long-term therapies: Evidence for action. *Eur J Cardiovasc Nurs* 2003;2:323.
11. Ashoorkhani M, Bozorgi A, Majdzadeh R, Hosseini H, Yoonessi A, Ramezankhani A, *et al.* Comparing the effectiveness of the BPMAP (blood pressure management application) and usual care in self-management of primary hypertension and adherence to treatment in patients aged 30-60 years: Study protocol for a randomized controlled trial. *Trials* 2016;17:511.
12. Rash JA, Lavoie KL, Feldman HR, Campbell TS. Adherence to antihypertensive medications: Current status and future directions. *J Cur Cardio Risk Rep* 2014;8:415-18.
13. ALLHAT Officers and Coordinators for the ALLHAT Collaborative Research Group The Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial. Major outcomes in high-risk hypertensive patients randomized to angiotensin-converting enzyme inhibitor or calcium channel blocker vs. diuretic: The antihypertensive and lipid-lowering treatment to prevent heart attack trial (ALLHAT). *JAMA* 2002;288:2981-97.
14. Turnbull F, Neal B, Algert C, Chalmers J, Chapman N, Cutler J, *et al.* Effects of different blood pressure-lowering regimens on major cardiovascular events in individuals with and without diabetes mellitus: Results of prospectively designed overviews of randomized trials. *Arch Intern Med* 2005;165:1410-9.
15. Burkhart P, Sabaté E. Adherence to long-term therapies: Evidence for action. *J Nurs Scholarsh* 2003;35:207.
16. Monane M, Bohn RL, Gurwitz JH, Glynn RJ, Levin R, Avorn J. The effects of initial drug choice and comorbidity on antihypertensive therapy compliance: Results from a population-based study in the elderly. *Am J Hypertens* 1997;10:697-704.
17. Jung O, Gechter JL, Wunder C, Paulke A, Bartel C, Geiger H, *et al.* Resistant hypertension? Assessment of adherence by toxicological

- urine analysis. *J Hypertens* 2013;31:766-74.
18. Matsumura K, Arima H, Tominaga M, Ohtsubo T, Sasaguri T, Fujii K, *et al.* Impact of antihypertensive medication adherence on blood pressure control in hypertension: The COMFORT study. *QJM* 2013;106:909-14.
 19. Lewington S, Clarke R, Qizilbash N, Peto R, Collins R; Prospective Studies Collaboration. Age-specific relevance of usual blood pressure to vascular mortality: A meta-analysis of individual data for one million adults in 61 prospective studies. *Lancet* 2002;360:1903-13.
 20. Dragomir A, Côté R, Roy L, Blais L, Lalonde L, Bérard A, *et al.* Impact of adherence to antihypertensive agents on clinical outcomes and hospitalization costs. *Med Care* 2010;48:418-25.
 21. Shin S, Song H, Oh SK, Choi KE, Kim H, Jang S. Effect of antihypertensive medication adherence on hospitalization for cardiovascular disease and mortality in hypertensive patients. *Hypertens Res* 2013;36:1000-5.
 22. Chowdhury R, Khan H, Heydon E, Shroufi A, Fahimi S, Moore C, *et al.* Adherence to cardiovascular therapy: A meta-analysis of prevalence and clinical consequences. *Eur Heart J* 2013;34:2940-8.
 23. Cutler DM, Long G, Berndt ER, Royer J, Fournier AA, Sasser A, *et al.* The value of antihypertensive drugs: A perspective on medical innovation. *Health Aff (Millwood)* 2007;26:97-110.
 24. Morisky DE, Ang A, Krousel-Wood M, Ward HJ. Predictive validity of a medication adherence measure in an outpatient setting. *J Clin Hypertens (Greenwich)* 2008;10:348-54.
 25. Koudhyar H, Shourvazi M, Dalir Z, Hosseini M. Survey of health literacy with adherence to treatment and quality among diabetes elders of community. *Maz J Univ Mel Sci* 2013;23:134-43.
 26. Paczkowska A, Hoffmann K. Impact of patient knowledge on hypertension treatment adherence and efficacy: A single-center study in Poland. *Int J Med Sci* 2021;18:852-60.
 27. Chunhua M. A cross-sectional survey of medication adherence and associated factors for rural patients with hypertension. *Appl Nurs Res* 2016;31:94-9.
 28. Kisokanth G, Ilankoon IM, Arulanandem K. Assessment of knowledge on the disease, its complications and management strategies among hypertensive patients attending medical clinics at teaching hospital, Batticaloa, Sri Lanka. *JPGIM* 2016;30:1-11.
 29. DiMatteo MR, Giordani PJ, Lepper HS, Croghan TW. Patient adherence and medical treatment outcomes: A meta-analysis. *Med Care* 2002;40:794-811.
 30. Ezeala-Adikaibe BA, Mbadiwe N, Okudo G. Factors associated with medication adherence among hypertensive patients in a tertiary health center: A cross-sectional study archives of community medicine. *J Public Health* 2017;3:24-311.
 31. Hosohata K, Inada A, Oyama S, Doi T, Niinomi I, Wakabayashi T, *et al.* Improvement of blood pressure control by adherence check in patients with apparent treatment-resistant hypertension: A case series. *Clin Med Insights Case Rep* 2020;13:1179547620904884.
 32. Sawicka K, Szczepanska J. Evaluation of the level of knowledge of patients with hypertensive disease in prevention and complications of hypertension. *J Educ Health Sport* 2016;6:296-321.
 33. Akoko BM, Fon PN, Ngu RC, Ngu KB. Knowledge of hypertension and compliance with therapy among hypertensive patients in the Bamenda health district of Cameroon: A Cross-sectional study. *Cardiol Ther* 2017;6:53-67.
 34. Al-Ramahi R. Adherence to medications and associated factors: A cross-sectional study among Palestinian hypertensive patients. *J Epidemiol Glob Health* 2015;5:125-32.
 35. Brent BM, Zhao Y, Axon RN. US trends in prevalence, awareness, treatment, and control of hypertension, 1988-2008. *JAMA* 2010;303:2043-50.
 36. Shani M, Lustman A, Vinker S. Adherence to oral antihypertensive medications, are all medications equal? *J Clin Hypertens (Greenwich)* 2019;21:243-8.
 37. Haynes RB, Montague P, Oliver T, McKibbon KA, Brouwers MC, Kanani R. Interventions for helping patients to follow prescriptions for medications. *J Cochrane Database Syst Rev.* 2005;19:CD000011.
 38. Dimatto MR. Variations in patients adherence to medical recommendations: A quantitative review of 50 years of research. *J Med Care* 2004;42:200-9.
 39. Cheong W, Yim J. The effect of a clinic based incentive program on medication adherence among patients with hypertension or diabetes mellitus in Incheon. *J Health Policy Manage* 2013;23:427-33.
 40. Sun Z, Zheng L, Detrano R, Zhang X, Xu C, Li J, *et al.* Risk of progression to hypertension in a rural Chinese women population with prehypertension and normal blood pressure. *Am J Hypertens* 2010;23:627-32.