

---

## **Effect of comprehensive intervention on hypertension control among employees in the Chinese stated-owned enterprise: a cluster-randomized controlled trial**

Yang Shen<sup>a</sup>, PhD; Zengwu Wang<sup>b</sup>, MD, PhD; Xin Wang<sup>b</sup>, MD; Zuo Chen<sup>b</sup>, PhD; Linfeng Zhang<sup>b</sup>, PhD; Manlu Zhu<sup>b</sup>, BS; Chun Chang<sup>a</sup>, MD, PhD, and Runlin Gao<sup>c</sup>, MD

### **Author affiliations:**

<sup>a</sup> Department of Social Medicine and Health Education, School of Public Health, Peking University, Beijing 100191, China

<sup>b</sup> Division of Prevention and Community Health, National Center for Cardiovascular Disease, Fuwai Hospital, Peking Union Medical College & Chinese Academy of Medical Sciences, Beijing 100037, China

<sup>c</sup> Department of Cardiology, Fuwai Hospital, Peking Union Medical College & Chinese Academy of Medical Sciences, Beijing 100037, China

### **Introduction**

From the international perspective, workplace-based intervention could be a potent approach to assist patients with uncontrolled hypertension (HTN) to reach BP goals. It is well known that appropriate BP control in the hypertensive patients by lifestyle and pharmaceutical interventions can reduce CVD events effectively, while the substantial proportion remains uncontrolled. However, few studies have been specifically designed to address the HTN control among Chinese working population. Most of previous studies have been limited by small sample sizes and did not report the effectiveness of intervention on specific subgroups. Additionally, these studies did not link BP control with individual and workplace factors simultaneously.

As recommended by American Heart Association (AHA), workplace wellness programs are an important strategy to prevent major risk factors for CVD. Therefore, we will conducted a standardized management of hypertensive employees' program, aiming to assess the prevalence, awareness, treatment, and control of hypertension among the Chinese working population, and to develop a multicomponent intervention strategy that combined workplace health promotion and standardized management of hypertensive employees to improve BP control, based on the baseline survey. Herein, we hypothesize that this intervention program could improve BP control in workplaces across China, and a cluster-controlled trial will be conducted to test this hypothesis.

---

## **Study design**

The study is a two-phase design. First, a cross-sectional survey designed to evaluate the prevalence and management of hypertension among Chinese working population. Then, a cluster-randomized controlled trial conducted to test the effect of a multicomponent intervention strategy on improving hypertension control in the Chinese state-owned enterprise (SOE).

Briefly speaking, we conducted a multi-center workplace-based, cluster-randomized controlled trial for 24 months, in 30 SOE across China. We defined the inclusion and exclusion criteria to include the eligible patients in our study. Inclusion Criteria: 1) subject has a clinical diagnosis of HTN; 2) subject is aged 18 to 60 years; 3) subject is under a fixed term employment contract; 4) subject has provided signed consent form; 5) subject agrees to participate in the study for the full 2 years duration. Exclusion criteria: 1) subject has secondary hypertension; 2) subject has acute myocardial infarction or stroke less than 3 months; 3) women who self-reports being pregnant or within 3 months postpartum; 4) subject with life expectancy of less than 2 years; 5) subject with psychiatric illness, hearing difficulty, or physical incapacitation; 6) subject is a healthcare provider.

## **Intervention Strategy**

The intervention will last for 2 years, and include two components: (1) workplace wellness program for primary prevention of CVD, the development of comprehensive health promotion within workplace to increase individual employees' awareness of risk factors and produce sustained behavior change, and (2) a standardized protocol of HTN management, the implementation of guideline-based HTN management by patients' clinical teams to improve HTN control.

## **Effectiveness assessments**

There will be two examinations for both groups, at baseline and 24 months (after 2 years intervention). Indicators including BP, BMI and lifestyle factors will be assessed. The primary outcome was control rate of hypertension, and intervention effect (IE) was estimated as '2-year rate (mean)' minus the number showed at the baseline.

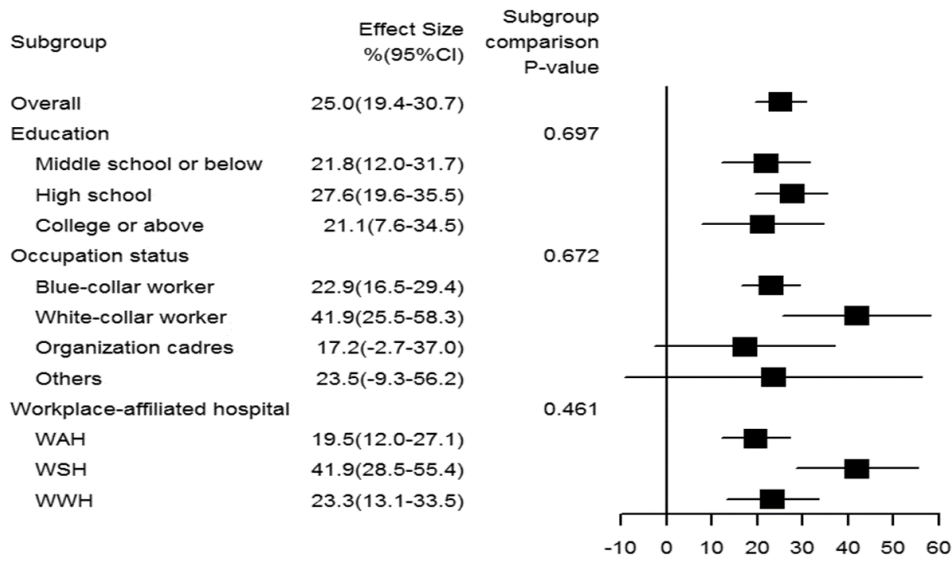
---

## **Results**

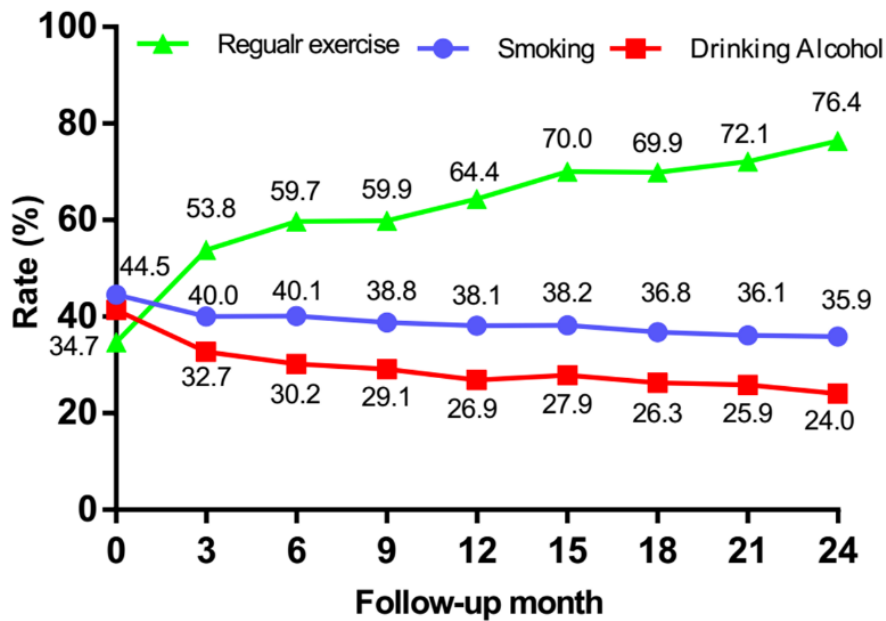
Overall, 2 622 patients completed the 2-year follow-up, of which 2 055 were in the intervention group and 567 in the control group, respectively. After 2 years of intervention, the IE on the level of SBP and DBP for intervention versus control group was -7.5 and -3.9mmHg, respectively ( $P<0.05$ ); the IE for BMI, regular exercise and alcohol consumption, was -0.4kg/m<sup>2</sup>, 36.4% and -14.0%, respectively ( $P<0.05$ ), but -6.1% for smoking ( $P>0.05$ ); the IE for control rate was 25.0%, and further subgroup analysis showed that our intervention was particularly effective for those with high education level (27.6%), white-collar employees (41.9%), and those from SOE whose affiliated hospital had separated away (41.9%).

## **Conclusion**

The study suggests that a comprehensive intervention strategy, consisting of workplace wellness program and guideline-based HTN management, is more effective in improving BP control than is usual care within the hypertensive employees in the SOE.



**Figure 1.** Primary Outcome in the Pre-defined Subgroups of Interest. Adjusted for workplaces (random effect), and age, sex, BMI, education, occupation status, workplace-affiliated hospital, antihypertensive meds (fixed effect).



**Figure 2.** Selected Measures During Follow-up for Intervention Patients

---

## References

1. National Center for Cardiovascular Disease, China. Report on cardiovascular diseases in china (2016). Beijing: Encyclopedia of China Publishing House; 2017.
2. Wang Z, Chen Z, Zhang L, Wang X, Hao G, Zhang Z, et al. Status of hypertension in China: Results from the China hypertension survey, 2012-2015 [published online February 15, 2018]. *Circulation*.doi: 10.1161/CIRCULATIONAHA.117.032380.
3. Thomopoulos C, Parati G, Zanchetti A. Effects of blood pressure lowering on outcome incidence in hypertension. 1. Overview, meta-analyses, and meta-regression analyses of randomized trials. *J Hypertens*. 2014;32:2285-95.
4. Shen Y, Wang X, Wang Z, Zhang L, Chen Z, Zhu M, et al. Prevalence, awareness, treatment, and control of hypertension among chinese working population: Results of a workplace-based study. *J Am Soc Hypertens*. 2018;12:311-322.
5. Watson AJ, Singh K, Myint UK, Grant RW, Jethwani K, Murachver E, et al. Evaluating a web-based self-management program for employees with hypertension and prehypertension: A randomized clinical trial. *Am Heart J*. 2012;164:625-631
6. Eng JY, Moy FM, Bulgiba A. Impact of a workplace health promotion program on employees' blood pressure in a public university. *PLoS One*. 2016;11:e0148307
7. Lowensteyn I, Berberian V, Belisle P, DaCosta D, Joseph L, Grover SA. The measurable benefits of a workplace wellness program in Canada: Results after one year. *J Occup Environ Med*. 2017
8. Liu L, Li M, Song S, Shi A, Cheng S, Dang X, et al. Effects of long-term psychological intervention on blood pressure and health-related quality of life in patients with hypertension among the Chinese working population. *Hypertens Res*. 2017;40:999-1007
9. Carnethon M, Whitsel LP, Franklin BA, Kris-Etherton P, Milani R, Pratt CA, et al. Worksite wellness programs for cardiovascular disease prevention: A policy statement from the American Heart Association. *Circulation*. 2009;120:1725-1741
10. Writing group of 2010 Chinese guidelines for the management of hypertension. 2010 Chinese guidelines for the management of hypertension. *Chin J Hypertens*. 2015;23:24-43
11. Zhou BF. Effect of body mass index on all-cause mortality and incidence of cardiovascular diseases--report for meta-analysis of prospective studies open optimal cut-off points of body mass index in chinese adults. *Biomed Environ Sci*. 2002;15:245-252
12. Wang Z, Zhang L, Chen Z, Wang X, Shao L, Guo M, et al. Survey on prevalence of hypertension in China: Background, aim, method and design. *Int J Cardiol*. 2014;174:721-723
13. Xu T, Wang Y, Li W, Chen WW, Zhu M, Hu B, et al. Survey of prevalence, awareness, treatment, and control of hypertension among Chinese governmental and institutional employees in Beijing. *Clin Cardiol*. 2010;33:E66-72
14. He FJ, Wu Y, Feng XX, Ma J, Ma Y, Wang H, et al. School based education programme to reduce salt intake in children and their families (school-edusalt): Cluster randomised controlled trial. *BMJ*. 2015;350:h7