

HYPERTENSION IN PUBLIC HEALTH

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Abstract. Re-emerging epidemic of cardiovascular diseases activates each country to develop its strategies in primary prevention. Hypertension, as a leading cause, is a challenging public health problem. Awareness, treatment and control of hypertension are still inadequate. Socioeconomic factors may be the obstacles. Educating and motivating both the physicians and patients could provide some solutions. Therefore, national projects of screening, setting targets and community participation have to be launched throughout each area. With active public health prevention and lifestyle modifications, one can hope to decrease both hypertensive prevalence and its complication risks in the near future.

INTRODUCTION

There has been a continuous decrease in cardiovascular mortality in North America, Western Europe, Japan, and Australia during the past fifty years (Uemura and Pisa, 1988). Simultaneously, the control of hypertension in these regions has improved progressively, as shown by the Health Examination Surveys in the United States (Table 1) (Burt *et al*, 1995). However, it should be noted that there are still more than 70% of hypertensive subjects without control (or no treatment at all), as have been reported in many other countries (Marques-Vidal and Tuomilehto, 1997), and that there are warning signs that the rate of improvement has been consistent or even reversed in some areas.

In the United Kingdom, only 6% of hypertensive patients had their blood pressure (BP) under control (below 140/90 mmHg) (Colhoun *et al*, 1998). In addition, as the ageing population in most developed countries increasing, total numbers of strokes and coronary heart disease (CHD) events are rising.

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What should be recognized is the emerging epidemic of cardiovascular disease in the developing countries. There is evidence that death and disability from CHD and cerebrovascular disease are rising so rapidly in these parts of the world that they will rank No.1 and No.4, respectively, as diseases of global burden by the year 2020 (Murray and Lopez, 1996). As the primary role of hypertension in the pathogenesis of both CHD and stroke, it is clear that control of hypertension worldwide is being one of the most challenges facing public health officers and physicians.

CLASSIFICATION OF HYPERTENSION

The 1999 WHO/ISH definitions and classification of blood pressure levels are presented in Table 2.

The primary goal of treatment of the hypertensive patients is to reach the maximum reduction in the total risk of cardiovascular morbidity and mortality. This needs management of all the reversible risk factors of CHD, such as smoking, dyslipidemias, diabetes and the appropriate treatment of all associated clinical conditions, as well as control of the raised blood pressure.

To identify the optimal blood pressure, the outcomes among the three randomized blood

Table 1
Trends in the awareness, treatment, and control of high blood pressure in adults: United States, 1976-1994^a.

	NHANES II (1976-1980)	NHANES III (Phase I) 1988-1991	NHANES III (Phase II) 1991-1994
Awareness	51%	73%	68.4%
Treatment	31%	55%	53.6%
Control ^b	10%	29%	27.4%

NHANES = National Health and Nutritional Examination Survey.

^aData are for adults aged 18 to 74 years with SBP of 140 mmHg or greater, DBP of 90 mmHg or greater, or taking antihypertensive medication.

^bSBP below 140 mmHg and DBP below 90 mmHg.

Source: Burt *et al* (1995) and unpublished NHANES III, phase II, data provided by the Centers for Disease Control and Prevention, National Center for Health Statistics (1997).

Table 2
1999 WHO/ISH definitions and classifications of BP levels. When a patient's systolic and diastolic BPs fall into different categories, the higher category should apply.

Category	Systolic BP (mmHg)	Diastolic BP (mmHg)
Optimal BP	< 120	< 80
Normal BP	< 130	< 85
High-normal BP	130-139	85-89
Grade1 hypertension (mild)	140-159	90-99
Subgroup: Borderline	140-159	90-94
Grade2 hypertension (moderate)	160-179	100-109
Grade3 hypertension (severe)	≥ 180	≥ 110
Isolated systolic hypertension	≥ 140	< 90
Subgroup: Borderline	140-149	< 90

pressure target groups in the hypertension optimal treatment (HOT) study were compared (DBP < 90, 85, or 80 mmHg). There was no significant differences in the risk of cardiovascular diseases among target groups. Substudy in the diabetic group of the HOT trial demonstrated significantly lower risks of cardiovascular disease in those patients with the lowest blood pressure target. Similarly, the United Kingdom Prospective Diabetes Study (UKPDS) showed that intensive blood pressure control (average BP of 144/82 mmHg) provided a significant reduction in the risk of major cardiovascular events compared to con-

ventional blood pressure control (average BP of 154/87 mmHg). Therefore, it is reasonable to optimize blood pressures in young, middle-aged, or diabetic subjects (below 130/85 mmHg; Table 2) and slightly high normal blood pressure in elderly patients (below 140/90 mmHg).

EFFECTIVENESS OF HYPERTENSION MANAGEMENT AS PROVIDED IN COMMUNITY PRACTICE

Blood pressure control

A number of studies demonstrated that a

significant proportion of all hypertensive patients are untreated and a large part of treated hypertensive patients still have been poorly controlled, defined as SBP > 160 mmHg or DBP > 95 mmHg. Male gender and habitants in a developing country have been determined as factors associated with poorer blood pressure control. The observations in China and several other developing countries found that only about 10% of treated hypertensive patients achieved blood pressures below 160/95 mmHg. However, very poor rates of hypertensive control in some studies of Western populations were also shown.

Cardiovascular risk control

Although the benefits of blood pressure-lowering treatment have been established in randomized controlled trials, there are continuing higher risks of CHD, stroke and overall mortality in hypertensive patients than do normotensive subjects, some years after beginning antihypertensive drugs therapy. There are also more advanced atherosclerosis and more left ventricular hypertrophy among hypertensive patients than normotensive controls. The evidences may contribute to cardiovascular complications through modifiable and non-modifiable factors. Non-modifiable factors involve family history or a genetic predisposition to cardiovascular disease. Potentially modifiable factors should include high blood pressure level and metabolic syndrome such as decreased HDL-cholesterol, increased LDL-cholesterol, high blood sugar, and obesity.

SOCIAL AND ECONOMIC FACTORS AS OBSTACLES TO BLOOD PRESSURE CONTROL

Whereas the efficacy of antihypertensive drugs has been convincingly shown, its effectiveness still limited in the real world. Social and economic factors may be independent factors, leading to less satisfactory results of blood pressure treatment and control at the population level.

In some developed countries, there are evidences that hypertensive control is still poor, especially in some subgroups of the population, characterized by social and economic discrepancies. There is also failure to lower the incidence of malignant hypertension, particularly among the more deprived communities or social groups (Shea *et al*, 1992). A social gradient has been reported for stroke as well.

Identify social groups

Interestingly, some social indicators have been consistently related to blood pressure and therapeutic control of hypertension. Blood pressure levels have been found to be inversely associated with social class, education (Stamler *et al*, 1992), or income (Lang *et al*, 1990). In the general population, blood pressure was high among workers, employees and craftsmen (Lang *et al*, 1997).

Among the unemployed, self-reported hypertension was found to be twice as high in a random sample of the population in the United States, and even higher among uneducated persons (Brackbill *et al*, 1995).

Socioeconomic obstacles

Economic constraint is a factor which has been demonstrated in the randomized health insurance trial. The role of the health insurance status was shown to be particularly important for the use of preventive services. Besides financial obstacle, source of care appears to be vital. In a study of US patients, it was the lack of a primary source of care, and not income, that was associated with poor blood pressure control (Moy *et al*, 1995). Similarly, lack of a primary source of care was a major predictor of severe hypertension (Shea *et al*, 1992). However, even in a fully insured population that visited its physician often, blood pressure control was still poor (Stockwell *et al*, 1994). It should be noted that quality of care is also a responsible factor.

Importantly, medical decisions also take some roles in the control of hypertension. Poorer patients receive more treatment and fewer

investigations or advice (Martin *et al*, 1991). In addition, compliance is another factor, depending on social conditions. The doctor-patient relationship varies with the latter's socio-economic status and was shown to have a significant role. Lack of social support was also a determined factor predicting low compliance. Finally, perceptions of the illness imply a dominant part on treatment (Heurtin-Roberts and Reisin, 1984).

Factors involving in poor blood pressure control

According to the Third National Health and Nutrition Examination Survey (NHANES III) (Burt *et al*, 1995), only one-quarter of hypertensive patients in the United States have achieved a blood pressure of less than 140/90 mmHg.

The high failure rate comes since the Joint National Committee on the Detection, Evaluation and Treatment of High Blood Pressure (JNC VI) (Joint and National Committee, 1997) has demonstrated epidemiologic data indicating that blood pressure values of 140/90 mmHg- which previously had been considered as an acceptable target for antihypertensive therapy- might carry an exercise risk of cardiovascular events. Therefore, the newest blood pressure classification of the JNC VI defines 130-139 mmHg systolic and 85-89 mmHg diastolic to be "high normal," and makes the point of less than 120/80 mmHg as optimal. That results in high failure rate of BP control because only a small fraction of hypertensive patients ever have their blood pressure reduced to normal (<130/85 mmHg). Although we now realize that hypertension is a syndrome of metabolic and cardiovascular abnormalities (Weber, 1994), and that protection of patients from coronary episodes and other clinical events requires more intervention than simply reducing blood pressure, achieving effective blood pressure control remains public and clinical challenges.

The factors in poor blood pressure control

A variety of clinical, behavioral, economic and logistical factors may help explain why

Table 3

Factors for poor blood pressure control.

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- Financial constraints.
 - Poor compliance: communication problems, adverse drug effects.
 - Physician's failure to achieve treatment goals.
 - Concomitant conditions: Obesity.
 - Behavior patterns: high salt intake, alcoholism.
 - Poor adherence to treatment regimens.
 - Low education, poor attitude.
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Table 4

Strategies for improving blood pressure control.

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- Educating the patients: Lifestyle modification, complications of hypertension and goals of treatment.
 - Motivating the patient: Trained nonphysician personnel, frequent visits.
 - Familiarizing physicians with current treatment goals.
 - Physician performance audits.
 - Tailoring drugs to individual patients.
 - Innovative combination drug therapies – simple, and inexpensive drug use.
 - Exploring new pharmacologic approaches.
 - Improving patient attitude and adherence to therapy.
 - Counteracting common concomitant conditions such as obesity and alcoholism.
 - Establishing social organizations and networks.
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hypertension treatment has not been more effective (Table 3). Primarily, unawareness of high BP due to asymptomatic is a basic reason. Public screening in communities, schools, sports, or purchasing insurance will enable most people to know their blood pressure status.

STRATEGIES FOR IMPROVING BLOOD PRESSURE CONTROL

To attain good BP control, patient attitude, adherence and compliance should be activated. Educating patients about lifestyle modifications and risks of high BP to cardio-

vascular diseases will attract patient cooperation and less dropout rate of treatment. It is possible that physicians and paramedical personnel attention could provide a partial solution to the problem of poor compliance among hypertensive patients. Goals of treatment and rational approaches will advocate the success rate of hypertensive control.

POTENTIAL FOR PRIMARY PREVENTION OF HYPERTENSION

Without primary prevention, we have to face with hypertension and its complication, endlessly. Primary prevention provides an opportunity of decreasing of its epidemiology, effects and complications (Joint National Committee, 1997).

Therefore, an effective population-wide strategy to prevent blood pressure rise with age and to reduce overall high blood pressure levels, even by a little, could affect overall cardiovascular morbidity and mortality much more than that of treating only those with established disease.

Table 5
Lifestyle modifications for hypertension prevention and management (Joint National Committee, 1997).

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- Lose weight if overweight.
 - Limit alcohol intake to no more than 1 Oz (30 ml) ethanol (eg 24 Oz Beer, 10 Oz, Wine, or 2 Oz 100-proof whiskey) per day or 0.5 Oz. Ethanol per day for women and lighter weight people.
 - Increase aerobic physical activity (30 to 45 minutes most days of the week).
 - Reduce sodium intake to no more than 100 mmol per day (2.4 g sodium or 6 g sodium chloride).
 - Maintain adequate intake of dietary potassium (approximately 90 mmol per day).
 - Maintain adequate intake of dietary calcium and magnesium for general health.
 - Stop smoking and reduce intake of dietary saturated fat and cholesterol for overall cardiovascular health.
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Such a population-wide approach has been promulgated. The Dietary Approaches to Stop Hypertension (DASH) (Appel *et al*, 1997) clinical study demonstrated that combination diet, rich in fruits, vegetables, and low-fat dairy foods with reduced saturated fat, significantly lowers blood pressure. Also, lifestyle modifications have been shown to prevent or delay the expected rise in blood pressure in susceptible people (Table 5).

PUBLIC HEALTH CHALLENGES OF HYPERTENSION

Hypertensive prevention and treatment are major public health challenges of the world (Joint National Committee, 1997). These are:

- Prevent the rise of blood pressure with age.
- Decrease the existing prevalence of hypertension.
- Increase hypertension awareness and detection.
- Improve control of hypertension.
- Reduce cardiovascular risks.
- Increase recognition of the importance of controlled isolated systolic hypertension.
- Improve recognition of the importance of high-normal blood pressure.
- Reduce ethnic, socioeconomic, and regional variations in hypertension.
- Improve opportunities for treatment.
- Enhance community programs.

Community and individual participation in primary prevention

Active participation in primary prevention in every level of community and every media should be intervened and integrated into the public health program. Lifestyle modifications should be taught and practiced in schools, offices, bureaus and houses. Both private and public sectors should be educated about behavioral medicine. Therefore, they can protect themselves, their families and societies. To be responsible to these processes, social organization should be set up and maintain.

FUTURE RESEARCH

Blood pressure and cardiovascular disease in each country.

Due to emerging of hypertension and cardiovascular risks in Asia, Africa, and Latin America, epidemiological studies as well as randomized controlled trials including the effects of blood-pressure-lowering treatment in these population should be conducted. These will lead to the strategies adopted for prevention and treatment of cardiovascular diseases in these areas. It is the responsibility of each country and region to define the strategies to control high blood pressure in each population.

Image of hypertension problems in each country

The rule of halves (only half of all hypertensive patients are aware that they have hypertension, only half of those aware are actually on treatment, and only half of those on treatment have their blood pressure well controlled) still can be applied in many countries around the world, and even the most affluent countries have only doubled the proportion of well-controlled hypertensive patents to approximately one-quarter. Therefore, the data about awareness, treatment, and control of hypertension in each country will image the public health status and guide to individual national strategies, including the improvement of hypertension management in that society. (Table 1).

Intervention programs to improve controlling hypertension

To encourage or stimulate physicians to improve their effectiveness in the management of hypertension, interventions (among the physicians and patients) such as information, awareness and goal of treatment should be launched throughout the country. The outcome may be compared in the form of national statistics data of awareness, treatment, and control of hypertension in the country, before and after the interventions.

National hypertension networks

Formalization a national web to study, run and follow-up hypertension problems should be the responsibility of each country. This will be the center of all statistics, information, education, communication and researches. Mass public education campaign, national hypertension seminar, hypertension newsletters, physician information, community participation and a lot of pilot researches should be flooded throughout the whole country by this national organization. The results of incidence, prevalence, morbidity and mortality of hypertension, stroke and coronary heart disease, will be followed every 5 to 10 years. And it is hope that the decrease trends will worth our resources.

Social and economic burden of hypertension and complications

Social and economic impact of hypertension and its complications on morbidity and mortality should be demonstrated by each country in the figure of cost and monetary loss, compared year to year.

Lifestyle modification campaign

Lifestyle modification campaign should be organized in small communities and actively participated by people. Outcomes may be measured in terms of pre- and post- intervention morbidity and mortality.

Cost-effectiveness of various antihypertensive drugs

By comparing various antihypertensive drug classes, outcome in term of cost-effectiveness may guide physicians to choose appropriate drugs for their subgroup patients and their countries with acceptable and less adverse effects.

CONCLUSIONS

As a re-emerging public health problem, cardiovascular disease is a leading cause of

death, especially in the developed countries. Effects of hypertension on the risks of cardiovascular diseases have been demonstrated in various studies. Although efficacy of antihypertensive drugs has been improved, the national management to control its epidemic and complications has not been satisfied. Socio-economic obstacles have been illucidated and primary prevention, like lifestyle modifications and community participation should be activated. With future researches in public health, national guidelines and management could eventually brighten our hope of successful control in hypertension and cardiovascular risks.

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