Hypertension in the Elderly : A Community Study

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Abstract

Hypertension in the elderly features differently from its younger counterpart in terms of diagnosis, associated condition, atypical manifestation, management and complication. Epidemiological study in this increasing age group in the community is, therefore, needed. 334 elderly subjects living in various parts of Bangkok were randomly recruited by appointment at 7 geriatric day centers situated in local health offices of Bangkok Metropolitan Authority. Each subject received blood tests before being interviewed and measured by digital sphygmomanometer. Blood pressure and heart rate changes were recorded during lying, sitting and standing. The prevalence of hypertension was 36.5 per cent, 33.2 per cent were already aware of its existence while 3.3 per cent were newly detected by the survey. Isolated systolic hypertension, a unique subtype found in the elderly, was 4.5 per cent of all or 37.5 per cent among the hypertensive group. The associated medical conditions among the case group were diabetes mellitus 22.9 per cent, hyperlipidemia 13.9 per cent, hyperuricemia 33.3 per cent and heart disease 18.0 per cent. As far as postural hypotension is concerned, 14.8 per cent of case group whereas 11.3 per cent of the control group were affected. On the other hand, the symptom of postural dizziness was found to be 31.1 per cent and 55.2 per cent in the case and control group respectively. Following the statistical logistic regression analysis, the independent associated factors in the hypertension group were: history of hyperlipidemia, increased serum uric acid and poor heart rate response after standing. These findings, as parts of the multiple pathology and potential complications prevalent among this group, should be of concern by any physician looking after the elderly.

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Rising of blood pressure with increasing age in almost linear fashion up to the age of about 80 years was well demonstrated by several cross-sectional and longitudinal studies[1]. Hypertension is not only the most frequent of the chronic health problems that the elderly experience but also a leading risk factor of stroke and coronary events in the elderly[2-6]. On the other hand, following the physiologic aging changes, this condition also features differently from the younger population in terms of diagnosis, management and outcome. The pseudohypertension, wide variability of blood pressure recorded in any occasion, the difference of blood pressure recorded at different arms, the subtype isolated systolic hypertension are among good examples of diagnostic difficulty[7,8]. Likewise, postural hypotension, muliple associated medical conditions and biochemical abnormalities certainly complicate the safe management in view of preventing adverse drug reaction[9]. As the Thai elderly are among the group predicted by World Health Organization to experience the highest increment, a specific epidemiological study regarding hypertension in the Thai elderly is needed.

POPULATION AND METHOD

The study design was a cross-sectional study. The sample population aged 60 or more from various parts of Bangkok were recruited by public announcement. Seven geriatric day centers organized by local health offices under Bangkok Metropolitan Authority were selected as the venues for data collection. Only the elderly who could perform postural change from lying to standing by themselves were included giving rise to 335 participants. All of them already starved overnight for at least 8 hours had blood tests done for blood glucose, blood urea nitrogen, creatinine, uric acid, albumin, globulin, electrolytes and complete blood count. After having a quick breakfast, the participants were interviewed for relevant medical history lasting 10-15 minutes, then blood pressure and heart rate in sitting position were recorded. Consequently the elderly were asked to lie still for 10 minutes before the blood pressure in lying position recorded by a digital sphygmomanometer with two persistent consecutive readings was obtained. Then, the elderly were asked to stand up quickly and unaided, this standing blood pressure revealed by two persistent consecutive readings usually at 1-2 minutes was recorded. Finally, all the subjects were examined clinically to exclude the secondary causes of postural hypotension e.g. skin crease hyperpigmentation in Addison's disease, cardiac murmur in mitral valve prolapse and aortic stenosis.

The medical history of hypertension and criteria for hypertension i.e. systolic pressure more than 160 mmHg and / or diastolic pressure more than 95 mmHg in resting position was employed to categorize the subjects into hypertensive group and control group[10]. Isolated systolic hypertension was defined as systolic pressure 160 mmHg or more and diastolic pressure less than 90 mmHg[11]. Those whose standing systolic pressure dropped 20 mmHg or more or standing diastolic pressure decreased 10 mmHg or more compared to the corresponding lying blood pressure were designated as postural hypotension case[12]. The subjects whose fasting blood glucose exceeded 140 mg/dl were labeled diabetes mellitus and history of hyperlipidemia was taken to identify the cases of the hyperlipidemia. Hyperuricemia meant serum uric acid exceeding 7 mg/dl.

The Chi-square test was used to determine differences in various nominal data while Student's unpaired *t*-test was employed when comparing various quantitative variables between the hypertensive and control group. Two-tailed Fisher's exact test was also employed in cases of minimum expected frequency less than 5. Finally, the parameters independently associated with hypertensive group were analyzed by logistic regression analysis.

RESULTS

The mean age of the sample population was 68.26 $\pm$ 5.7 years old and ranged from 60 to 96 years old with male to female ratio of 105: 229 or 1 : 2.2. Most of the subjects (35.6%) were in the age group of 65-69 years followed by the age group of 60-64 years (27.5%) and 70-74 years (23.4%). The average number of persons living in the same household was 4.9 $\pm$ 2.5. Regarding the health risk behaviour, 75.8 per cent were non-smokers, 17.4 per cent were ex-smokers while only 6.8 per cent or 4.3 per cent in the hypertensive group still engaged in smoking. Likewise, 69.7 per cent never drank, 23.5 per cent had already quit drinking and only 6.8 per cent were still regular drinkers.

The prevalence of hypertension was 36.5 per cent or 122 out of 334 subjects. 11 subjects, 3.3 per cent of total sample population, were not aware of the condition. Although most subjects were in the age group of 65-69 years, the percentages of hypertension were 40.7, 36.9, 36.9, 35.9 per cent and 29.4 per cent in age group of 75-79, 60-64, 65-69, 70-74 and 80 years or more respectively. When using the blood pressure recorded on the day of data collection, the prevalence of isolated systolic hypertension was 4.5 per cent of total sample population or 37.5 per cent of hypertensive cases (15 out of 40 cases).

Of those hypertensive cases 33.3, 22.9, 18.0 per cent and 13.9 per cent also suffered from associated chronic medical diseases i.e. hyperuricemia, diabetes mellitus, heart disease and hyperlipidemia respectively. Nevertheless, only hyperuricemia, history of hyperlipidemia and history of heart disease were found more in the hypertensive group than in the control group with statistical significance (P= 0.0154, <0.001 and 0.024). As far as falls, a common complication of hypertensive treatment in the elderly, is concerned, the prevalence of postural hypotension and dizziness among the hypertensive group were 14.8 per cent and 31.1 per cent sequentially. However, the prevalence of falls in this particular group was 9.8 per cent while in the control group was 11.8 per cent. Regarding the management of hypertension, 25 out of 122 cases (20.5%) were put on non-pharmacological treatment.

Table 1 demonstrates the comparison of various blood pressures and heart rates between the hypertensive and control groups in lying position while Table 2. similarly shows the comparison in standing position. Although nearly most of the hypertensive group were put on treatment, they still experienced all time higher blood pressure than the control group either in lying or standing positions with P value <0.0001. Meanwhile, the heart rate in neither lying position nor standing position was significantly different between the hypertensive group and control group (P>0.05). The mean difference of systolic pressure, diastolic pressure, and heart rates when changing the posture from lying to standing position in the hypertensive group were 4.01 ± 12.8, 5.62 ± 9.1 mmHg and 8.18 ± 9.6 beat/minute. Similarly, the mean difference of systolic pressure, diastolic pressure, and heart rate when changing the posture from lying to standing position in the control group were 2.85 ± 11.3, 5.34 ± 8.8 mmHg and 10.92 ± 7.5 beat/minute. Furthermore, when these mean differences of systolic pressure, diastolic pressure and heart rate were compared between the hypertensive group

Table 1. Comparison of various blood pressure and heart rate in lying position.

	Hypertensive group	Control group	P value
Systolic pressure	142.36 ± 18.2	126.64 ± 16.9	<0.0001
Diastolic pressure	84.02 ± 13.3	77.51 ± 10.3	<0.0001
Pulse pressure	58.32 ± 14.6	49.14 ± 13.6	<0.0001
Mean pressure	103.48 ± 13.4	93.89 ± 11.2	<0.0001
Heart rate	70.67 ± 11.3	71.43 ± 11.1	0.55

Table 2. Comparison of various blood pressure and heart rate in standing position.

	Hypertensive group	Control group	P value
Systolic pressure	145.75 ± 20.2	129.41 ± 17.9	<0.0001
Diastolic pressure	89.71 ± 15.0	82.85 ± 11.4	<0.0001
Pulse pressure	56.04 ± 18.1	46.56 ± 14.5	<0.0001
Mean pressure	108.39 ± 14.6	98.37 ± 12.1	<0.0001
Heart rate	79.06 ± 14.1	82.06 ± 13.3	0.053

and control group, both systolic and diastolic pressure differences were not statistically different with P value of 0.39 and 0.78 respectively. Interestingly, only the heart rate difference in the hypertensive group was significantly lower with P value < 0.01.

Regarding the biochemical blood tests, the mean hemoglobin, blood urea nitrogen, creatinine, glucose, albumin and globulin in the hypertensive group were 12.85 ± 1.5 g/dl, 14.18 ± 5.8 mg/dl, 1.15 ± 0.4 mg/dl, 105.7 ± 33.6 mg/dl, 4.84 ± 0.5 g/dl and 3.34 ± 0.6 g/dl respectively. When comparing all these results with those of the control group, there were no significant differences between the two groups (P > 0.05). The mean ± SD of uric acid in the hypertensive group *vs* control group were 6.36 ± 1.5 *vs* 5.41 ± 1.4 mg/dl and those of the hypertensive group were more statistically significantly than the control group with the P value 0.0001. Despite nearly 80 per cent of the hypertensive group being put on antihypertensive agents, the electrolyte in the hypertensive group i.e. 144.05 ± 2.6 mEq/L for serum sodium, 4.19 ± 0.6 mEq/L for serum potassium, 104.77 ± 2.89 mEq/L for serum chloride and 23.65 ± 1.9 mEq/L for serum bicarbonate were not significantly different from the control group (P> 0.05).

After logistic regression analysis, shown in Table 3, the three independent factors associated with the hypertensive group were history of hyperlipidemia, increased serum uric acid and poor heart rate response after standing with the overall percent correctness of 70.59 per cent.

DISCUSSION

The prevalence of hypertension in the elderly ranges from 40-65 per cent, our study revealed the figure of 36.5 per cent[13]. This lower prevalence in the Thai elderly certainly reflected the different racial origin, prolonged effects of a particular life-style or exposure to environmental factors from the western culture[14]. The percentage of hypertension peaked in those aged 75-79 years then reached nadir at the age of 80 years or more which may be partly due to fewer subjects in the age 80 years or more in our study or the selective effect of survival, the young elderly with hypertension may be eliminated by earlier death and the ones without hypertension have survived to be the older elderly. Likewise, the prevalence of isolated systolic hypertension in the United States ranges from 6-10 per cent, our result was just 4.5 per cent[13]. In contrast to classic hypertension, isolated systolic hypertension was believed to be the result of age-related structural changes in the vascular system leading to loss of distensibility and elasticity of aorta and large vessels[15]. The prevalence of this condition is hence inevitably more common in the older elderly and this explained the lower prevalence in our study.

Although the number of smokers in the hypertensive group was only 4.3 per cent, the MRC study did show that active treatment of hypertension prevented strokes and all cardiovascular events only in non-smokers[6]. Anti-smoking campaign should therefore be vigorously emphasized in the hypertensive cases.

Despite the treatment of hypercholesterolemia reduced relative risk of initial coronary heart disease death or myocardial infarction, it seems that the predictability of coronary heart disease by serum cholesterol appears to decline with advancing age based on limited data in the elderly[16]. However, patients with established coronary heart disease aged 60-69 years in the Scandinavian Simvastatin Survival Study achieved similar heart disease prevention as in younger subjects[17]. In the light of hyperlipidemia and heart disease being more prevalent in the hypertensive group in our study, this should, therefore, raise the concern of

Table 3. Logistic regression analysis revealing the independent factors associated with hypertension in the elderly.

	B	S.E.	Sig	Exp (B)
heart rate response after standing	- 0.0639	0.0261	0.0146	0.9381
serum uric acid	0.4987	0.1234	0.0001	1.6466
history of hyperlipidemia	7.9559	15.5003	0.6078	2852.241
constant	- 3.1142	0.7593	0.0000	

screening hyperlipidemia as well as relevant heart disease in the elderly with hypertension. So far, only benefit of cholesterol reduction in reducing recurrent coronary heart disease in those aged 60-69 years was demonstrated(18).

Following the result of European Working Party on high blood pressure in the elderly, serum uric acid was determined by male gender and associated renal impairment rather than the effect of diuretics(19). On the contrary, the SHEP study revealed the higher uric acid level in the diuretic group(5). Being independent associated factor found in hypertensive group in our study, increased serum uric acid should be screened both before and during treatment especially in the male elderly with renal impairment. In such cases diuretics should be best avoided owing to the possibility of worsening renal impairment from uric acid nephropathy and/or gouty arthritis.

Diabetes mellitus, found 22.9 per cent in the hypertensive group, is associated with atherosclerosis in the cerebral arteries which appears to be independent of the presence of hypertension(20). As hypertension is the prime risk factor of stroke, any elderly with both conditions should particularly benefit from stroke prevention strategy.

The study revealed 20.5 per cent of the hypertensive group were put on non-pharmacological treatment. This figure should be raised as salt sensitivity is significantly more common in older than in younger hypertensive cases and adverse drug reaction could be avoided(21). However, the physicians should bear in mind the widespread use of seasoning powder and sauce riching in salt and monosodium glutamate in Thai food. Sequentially, blood pressure was still higher significantly in the hypertensive group than in the control group even though nearly most of them were treated.

Postural hypotension, an important cause of syncope, difficulty in walking and falls in the elderly, were found 14.8 per cent in the hypertensive group and 11.3 per cent in the control group. This figure tends to agree with that found by Rutan et al with the number of 16.2 per cent(9). Hypertension reduces baroreceptor sensitivity leading to impaired blood pressure homeostasis let alone the side effect of antihypertensive agent. Hypertension is therefore the most important predisposing factor for postural hypotension(22). In addition, poor heart rate response after postural change found as an independent associated factor in the hypertensive group was strong evidence confirming the lower response to adrenergic stimulation caused by baroreceptor abnormality. The heart rates of both hypertensive and control groups were not significantly different ($P > 0.05$) in either lying or standing positions indicated the absence of beta-adrenergic blockings effect from usage of beta-blockers in the hypertensive group. The liability to postural hypotension in the elderly is certainly the main consideration before any decision making in starting pharmacological treatment, choosing type of antihypertensive agents and setting the goal of treatment in any individual.

SUMMARY

The prevalence of hypertension in the Thai elderly in Bangkok was 36.7 per cent, only 3.3 per cent were newly detected and 4.5 per cent of the sample population or 37.5 per cent of the hypertensive cases were isolated systolic hypertension. The factors found more frequently in the hypertensive group were history of hyperlipidemia and heart diseases, hyperuricemia while serum uric acid were higher in the hypertensive group statistically significantly. However, the three independent associated factors in the hypertensive group revealed by logistic regression analysis were history of hyperlipidemia, hyperuricemia and poor heart rate response. Poor heart rate response after postural change indicated the baroreceptor abnormality in the hypertensive elderly with the liability to postural hypotension and falls. Non-pharmacological treatment of hypertension in the elderly should be more emphasized.

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การศึกษาภาวะความดันโลหิตในผู้สูงอายุในชุมชน

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ความดันโลหิตสูงในผู้สูงอายุ มีลักษณะทางคลินิก การวินิจฉัย การดูแลรักษาตลอดจนภาวะแทรกซ้อน ที่ต่างจากผู้ป่วยที่อายุน้อยกว่า การศึกษาทางระบาดวิทยานี้ศึกษาผู้สูงอายุ 335 ราย จากชุมนุมผู้สูงอายุ 7 แห่งในเขตกรุงเทพมหานคร พบว่าความชุกของภาวะความดันโลหิตสูงเท่ากับ 36.5% โดย 3.3% เป็นผู้ที่ไม่เคยทราบมาก่อน ความชุกของภาวะความดันโลหิตซิสโตลิคสูงเพียงอย่างเดียวเท่ากับ 4.5% หรือ 37.5% ของผู้ที่มีความดันโลหิตสูงทั้งหมด โรคร่วมที่พบบ่อย ได้แก่ เบาหวาน 22.9% ภาวะไขมันในโลหิตสูง 13.9% ภาวะกรดยูริคในโลหิตสูง 33.3% และโรคหัวใจ 18.0% โดยมีภาวะความดันโลหิตต่ำหลังการเปลี่ยนท่าทางจากท่านอนเป็นท่ายืน 14.8% ของผู้มีความดันโลหิตสูง และ 11.3% ของผู้มีความดันโลหิตปกติ อาการเวียนศีรษะหลังจากลุกขึ้นยืนพบถึง 31.1% ของผู้มีความดันโลหิตสูง และ 55.2% ของผู้มีความดันโลหิตปกติ ด้วยวิธีวิเคราะห์ทางสถิติแบบวิคราะห์ถดถอยพบว่า ปัจจัยอิสระที่พบในภาวะความดันโลหิตสูงในผู้สูงอายุ ได้แก่ ประวัติภาวะไขมันในเลือดสูง, ระดับกรดยูริคในเลือดที่สูงขึ้น และการตอบสนองของชีพจรหลังการเปลี่ยนท่าเป็นท่ายืนที่เสื่อมลง

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