Prevalence, awareness, treatment and control of hypertension and diabetes mellitus among the elderly: the 2004 National Health Examination Survey III, Thailand

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ABSTRACT

Introduction: This study aims to determine the prevalence of hypertension, diabetes mellitus, and both conditions combined, and to examine factors related to awareness, treatment and control among the elderly in Thailand.

Methods: Data from a multistaged National Health Examination Survey III of 19,374 individuals aged 60 years and older in Thailand was used. Information on the socioeconomic status was obtained by interview. Blood pressure was measured with a sphygmomanometer. Fasting plasma glucose was obtained. Logistic regression models were used to examine the determinants of awareness, treatment and control of blood pressure and plasma glucose.

Results: Age-adjusted prevalence of hypertension was 51.1 percent, diabetes mellitus 14.0 percent, and diabetes mellitus with hypertension 8.0 percent. Overall, the proportion of unawareness for hypertension, diabetes mellitus and both conditions combined were 56.1, 41.2 and 21.9 percent, respectively. For those undergoing treatment for the control of blood pressure (less than 140/90 mmHg) was 12.4 percent, diabetes mellitus (fasting plasma glucose less than 140 mg/dL) 26.4 percent, and control of both conditions combined was 7.4 percent. Factors associated with unawareness and inadequate controls of the illnesses were subjects from rural areas, with low income, low educational levels, currently working, and the oldest age group.

Conclusion: There was a high prevalence of hypertension and diabetes mellitus among the older people in Thailand, with high percentages of unawareness and inadequate control for those treated. Screening programmes for early detection, treatment and control of hypertension and diabetes mellitus need to be improved.

Keywords: diabetes mellitus, disease prevalence, elderly patients, geriatrics, health awareness, health screening, hypertension

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INTRODUCTION

Hypertension and diabetes mellitus are common illnesses in the elderly, as the prevalence of each condition increases with age. The proportions of population affected by both conditions are increasing in countries which become ageing societies. Since both diabetes mellitus and hypertension are important risk factors for cardiovascular diseases,[1-4] management of hypertension and diabetes mellitus is therefore essential for the reduction of cardiovascular events and mortality.[5,6] Despite the benefit of blood pressure (BP) lowering and glycaemic control, rates of detection and control of the conditions have been suboptimal.[7-9] For hypertension in older people, undiagnosed and uncontrolled hypertension are commonly reported in the oldest age group and those with low socioeconomic status.[10] However, such information is less clear for diabetes mellitus and those with both hypertension and diabetes mellitus, especially for people in the low- and middle-income countries. Thailand is a country with emerging economic growth. The elderly population aged 60 years and older has been rapidly increasing, from a total of 5.87 million (9.5% of total population) in 2000 to an estimated 8.38 million (12.6%) in 2010. This is expected to increase to 12.39 million (17.8%) in 2120.[11] In 2004, diabetes mellitus accounted for a total disability-adjusted life year (DALY) loss of 3.1% in men and 6.4% in women, and hypertension was responsible for 5.5% in each gender.[12] The burden due to these two conditions is likely to rise steadily in the future.

The previous National Health Examination Survey (NHES) I in 1991 and NHES II in 1996 revealed an

Table I. Prevalence of hypertension, diabetes mellitus and diabetes mellitus with hypertension among the elderly.

	Hypertension		Diabetes mellitus		Diabetes mellitus with hypertension	
	Male	Female	Male	Female	Male	Female
Overall age (years)	50.7 (48.1–53.4)	52.2 (49.5–54.9)	12.7 (11.6–14.0)	16.6 (15.4–17.8)	8.1 (7.4–8.9)	10.3 (9.5–11.1)
60–69	47.3 (44.6–50.0)	48.1 (45.5–50.7)	13.9 (12.6–15.4)	19.1 (17.6–20.8)	8.9 (7.8–10.0)	11.6 (10.6–12.6)
70–79	53.2 (50.2–56.1)	54.1 (51.0–57.2)	12.1 (10.5–13.8)	16.1 (14.4–17.9)	7.6 (6.6–8.8)	10.2 (8.8–11.7)
≥ 80	59.4 (54.6–64.0)	61.7 (55.4–67.6)	9.1 (6.9–11.8)	9.2 (7.0–12.1)	6.1 (4.3–8.5)	6.1 (4.3–8.5)
Administrative area						
Urban	56.7 (54.0–59.5)	57.6 (55.1–60.1)	16.9 (15.4–18.6)	20.5 (19.1–22.0)	11.3 (10.2–12.5)	13.6 (12.5–14.7)
Rural	48.7 (45.6–51.9)	50.3 (47.0–53.6)	11.3 (9.9–12.8)	15.2 (13.8–16.7)	7.1 (6.2–8.1)	9.1 (8.2–10.1)
Region						
Central	58.3 (55.0– 61.5)	56.9 (52.8–60.9)	14.0 (12.3–15.9)	17.4 (15.8–19.3)	9.8 (8.5–11.2)	11.3 (10.1–12.7)
Northeast	42.8 (37.8–48.1)	43.1 (37.7–48.8)	13.2 (10.7–16.1)	17.9 (15.5–20.5)	7.6 (6.2–9.3)	9.5 (8.0–11.2)
North	54.9 (47.9–61.7)	58.4 (51.7–64.8)	10.1 (8.7–11.7)	13.2 (11.5–15.2)	6.6 (5.6–7.9)	9.5 (8.1–11.0)
South	48.1 (43.0–53.3)	53.5 (47.6–59.3)	10.8 (7.8–14.6)	14.6 (11.2–18.8)	6.9 (4.5–10.4)	9.4 (6.8–12.8)
Bangkok	49.8 (44.4–55.3)	54.6 (49.7–59.4)	21.6 (17.1–26.9)	24.5 (21.0–28.3)	13.8 (10.8–17.5)	16.1 (13.4–19.3)
Education (years)						
No education	51.9 (47.0–56.9)	54.5 (50.8–58.1)	9.4 (7.4–11.9)	13.1 (11.3–15.1)	5.6 (4.2–7.5)	8 (6.6–9.7)
< 4	49.1 (46.4–51.8)	51.2 (48.3–54.1)	11.6 (10.3–13.0)	17.7 (16.3–19.2)	7.3 (6.5–8.1)	11 (10.1–12.1)
≥ 4	58.2 (53.8–62.5)	53.0 (47.5–58.5)	20.9 (18.5–23.6)	19.0 (15.7–22.7)	14.1 (12.0–16.5)	11.7 (9.2–14.9)
Currently employed						
Yes	45.9 (42.8–49.0)	45.8 (42.6–48.9)	10.7 (9.4–12.1)	14.3 (12.7–16.2)	6.5 (5.6–7.5)	7.8 (6.5–9.2)
No	55.0 (52.3–57.8)	54.6 (51.8–57.4)	14.5 (13.1–16.0)	17.4 (16.1–18.8)	9.5 (8.5–10.7)	11.2 (10.3–12.1)
Monthly income (Baht)						
≤ 500	51.4 (46.9–55.8)	51.0 (46.5–55.4)	11.5 (9.0–14.4)	14.4 (12.7–16.3)	7.1 (5.4–9.3)	9 (7.6–10.6)
501–5,000	48.1 (45.1–51.2)	51.2 (48.1–54.3)	10.8 (9.5–12.2)	17.3 (15.7–19.0)	6.5 (5.7–7.5)	10.4 (9.4–11.5)
≥ 5,001	55.0 (51.3–58.6)	57.5 (53.5–61.5)	18.5 (15.6–21.4)	21.6 (17.9–25.7)	12.8 (10.6–15.3)	13.5 (10.9–16.7)

Numbers in parenthesis indicate the 95% confidence interval.

increasing prevalence and level of awareness, proper medication treatment received and effective control of hypertension and diabetes mellitus among the general Thai population aged 15–59 years. The levels of awareness increased from 10.2% in 1991 to 26.6% in 1996 for hypertension, and from 42.6% to 48.7% for diabetes mellitus, respectively.[13,14] However, such information available to the older Thai people is very limited. This study used data from a recent NHES III in Thailand, 2004.[15] We aimed to determine the prevalence, treatment and control of hypertension, diabetes mellitus, and both conditions combined, among Thai people aged 60 years and older. We also examined factors that are likely to be associated with the unawareness of treatment and control of the conditions. Such information is crucial in detecting, monitoring and evaluating the quality of care for individuals with hypertension and/or diabetes mellitus.

METHODS

NHES III was conducted by the Health Systems Research Institute and Bureau of Policy and Strategy of Thai Ministry of Public Health with data collection conducted between January and May, 2004. The study was approved by the relevant ethics committee and all participants provided written informed consent. The sampling methods were detailed elsewhere.[16] Briefly, sample design was a nationally representative cross-sectional survey, using multistage, stratified, cluster sampling. A total of 19,374 people aged ≥ 60 years were included in the analysis. The estimated sample size at the national level was based on stratification of respondents by urban/rural and by gender of 13 subregional areas. The calculated sample sizes of 360 respondents were needed for a 95% confidence of detecting a gender and urban/rural-specific prevalence for each subregional area.

Demographic characteristics, history of previous medical diagnosis of high BP and/or diabetes mellitus, and corresponding medication use were obtained via interview. Three serial measurements of BP, one minute apart, were measured using a mercury sphygmomanometer by trained nurses. Participants were asked to fast for at least 12 hours overnight before the venous blood sample was obtained. High BP was defined as mean systolic BP (SBP) ≥ 140 mmHg or diastolic BP (DBP) ≥ 90 mmHg.[2] Hypertension was defined as having high BP or using BP lowering medication during the previous two weeks. Awareness was considered as having ever been told/diagnosed by a medical doctor or having received drugs for lowering/controlling the high BP. An effective control referred to SBP < 140 mmHg and DBP < 90 mmHg measured at the interview date.

Diabetes mellitus was defined as fasting plasma

Table II Percentages of unawareness, treatment and control among the elderly with hypertension and diabetes mellitus.

	Male								Female							
	Hypertension				Diabetes mellitus				Hypertension				Diabetes mellitus			
	Unaware	Aware, not treated	Treated, not controlled	Treated, controlled	Unaware	Aware, not treated	Treated, not controlled	Treated, controlled	Unaware	Aware, not treated	Treated, not controlled	Treated, controlled	Unaware	Aware, not treated	Treated, not controlled	Treated, controlled
No. of subjects	2,971	368	1,149	546	514	76	342	327	2,634	362	1,484	851	599	105	511	525
% of subjects	61.6	6.9	21.5	10	46.9	5.1	26.4	21.6	53	7.2	25.4	14.4	37.7	6.1	26.9	29.3
Age (years)																
60–69	60.6	7.8	21.7	9.9	46.4	2.1	30	21.5	52	6.9	25.8	15.3	36.3	2.6	29.9	31.2
70–79	61.8	7.3	20.1	10.9	49.8	1.4	25.1	23.7	49.8	7.2	27.9	15	38.3	1.6	28.3	31.9
≥ 80	64.6	3.5	23.4	8.5	57.8	1.3	17.1	23.7	60.8	8	20	11.1	61.7	3.8	13.5	21
p-value	ns	< 0.05	ns	ns	ns	ns	ns	ns	< 0.01	ns	< 0.01	< 0.01	< 0.01	ns	ns	ns
Municipality																
Urban	55.9	6.9	25.2	12	36.1	4.2	30.2	29.5	48.4	6.1	29	16.4	34.2	2.3	32	31.5
Rural	63.9	6.9	20	9.2	54.7	0.7	25.8	18.8	54.9	7.7	23.9	13.5	41.5	2.4	26.1	30
p-value	< 0.01	ns	0.01	< 0.01	< 0.01	< 0.01	ns	< 0.01	< 0.01	< 0.05	< 0.05	< 0.01	< 0.01	ns	< 0.05	ns
Region																
Central	61.1	7.2	22.5	9.2	45	2	27.8	25.1	49.8	6.9	29	14.3	38.6	1.8	29.8	29.8
Northeast	68.9	7	15.8	8.3	56.9	1.9	24.1	17.1	60.1	7.7	18.5	13.7	43	2.4	25.9	28.7
North	57.3	6.7	26.8	9.2	51.6	0.4	25.1	22.9	53.6	7.3	26.3	12.8	36.5	2.3	25.1	36.1
South	59.9	6.1	19.9	14.1	37	2.6	33.1	27.3	49.6	6.9	26.8	16.7	35.1	4.1	30.3	30.6
Bangkok	47.5	8.6	25.4	18.5	30.9	3.4	38.2	27.5	41.4	6.2	31.9	20.5	34.5	2.4	35.2	27.9
p-value	< 0.01	ns	< 0.01	< 0 .01	< 0.05	ns	ns	ns	< 0.01	ns	< 0.01	< 0.05	ns	ns	ns	ns
Monthly income (Baht)																
≤ 500	65.6	7.9	16.8	9.8	48.8	5.4	22.9	22.8	50.9	6.9	26.0	16.2	37.0	2.5	29.5	31.1
501–5,000	63.1	6.6	20.3	10	46.9	4.3	26.8	22	51.6	7.1	26.2	15.1	36.1	2.0	30.1	31.8
≥ 5,001	56.3	7.4	26.2	10.1	36.9	5.2	31.2	26.6	45.5	4.5	30.7	19.2	34.4	2.9	33.5	29.2
p-value	< 0.01	ns	< 0.01	ns	< 0.05	ns	< 0.05	ns	ns	ns	ns	ns	ns	ns	ns	ns
Education (years)																
None	65.9	7.2	16.6	10.3	61.2	6.6	19.7	12.5	58.5	7.4	23.7	10.4	42	7.5	23.2	27.3
< 4	63.2	7.2	21.7	8	48.4	4.7	25.6	21.3	50.8	7.4	29.1	12.7	36.7	5.8	27.9	29.5
≥ 4	52.9	6	31.5	9.6	38.5	5.8	31.4	24.4	50.9	4.5	30.2	14.3	31.7	7.2	31	30.1
p-value	< 0.01	ns	< 0.01	< 0.01	< 0.01	ns	ns	< 0.05	< 0.01	ns	ns	ns	ns	ns	ns	ns
Currently employed																
Yes	67.5	6.8	17.5	8.2	51.5	1.2	27.3	20	56.8	6.3	23.3	13.6	44.1	1.6	27	27.3
No	57.4	7	24.4	11.3	46.6	2.3	27.3	23.8	51.9	7.5	26	14.6	37.7	2.7	28.2	31.4
p-value	< 0.01	ns	< 0.01	< 0.01	< 0.05	ns	ns	< 0.05	< 0.01	ns	< 0.01	ns	< 0.01	ns	ns	< 0.05

ns: not significant

glucose (FPG) ≥ 126 mg/dL (or 7.0 mmol/L) or use of medication for treatment of diabetes mellitus during the previous two weeks. Diagnosed diabetes mellitus was defined as those meeting the criteria for diabetes mellitus and who had previously been informed by a physician that they had diabetes mellitus. In the absence of glycosylated haemoglobin (HbA1c) measurements, control of diabetes mellitus was defined as FPG < 140 mg/dL (or 7.8 mmol/L).[17] Diabetes mellitus with hypertension was defined as the same person having both diabetes mellitus and hypertension. Awareness was considered as having been told/diagnosed by a medical doctor or using medication for lowering BP or/and plasma glucose. For individuals with both diabetes mellitus and hypertension, and who were treated, the target control for FPG was set at < 140 mg/dL and BP at < 130/80 mmHg.[17,18]

The analysis was restricted to the respondents with the sample weighted against the registered 2004 population. Prevalence of hypertension and diabetes mellitus were calculated. Comparisons by gender and area of residence were age-standardised to the national population. Wald test was used to determine statistical significance. Multiple logistic regressions were used to examine the association of several sociodemographic factors with the levels of awareness, treatment and control of hypertension and diabetes mellitus. The odds-ratio and 95% confidence interval were calculated. All the statistical analyses were performed using STATA version 9.

RESULTS

A total of 19,374 individuals (9,385 men and 9,918 women) aged ≥ 60 years participated in the study. Age-specific prevalence of hypertension, diabetes mellitus, and diabetes mellitus with hypertension are shown in Table I. The age-standardised prevalence of hypertension was 51.1%. This proportion equates to 3.2 million old people. The prevalence was significantly increased with advancing age ($p < 0.05$). Prevalence of hypertension among urban residents was significantly higher than in rural residents ($p < 0.05$). The prevalence was highest in the Central region followed by North, Bangkok, South and Northeast Thailand. There was no significant difference between the Central and the North regions, as well as between Bangkok and South Thailand. However, a significant

Table III Adjusted odds-ratios (95% confidence interval) of factors associated with those unaware of having hypertension and diabetes mellitus.

	Unaware of hypertension OR (95% CI)	Unaware of diabetes mellitus OR (95% CI)	Hypertension not controlled OR (95% CI)	Diabetes mellitus not controlled OR (95% CI)
Age (years)				
60–69	1.00	1.00	1.00	1.00
70–79	0.99 (0.89–1.10)	1.08 (0.83–1.42)	0.97 (0.81–1.18)	0.88 (0.65–1.18)
≥ 80	1.44 (1.10–1.89)	2.65 (1.44–4.88)	0.94 (0.67–1.33)	0.63 (0.32–1.25)
Gender				
Male	1.49 (1.30–1.71)	1.40 (1.07–1.84)	1.16 (0.98–1.38)	1.32 (1.04–1.67)
Female	1.00	1.00	1.00	1.00
Municipality				
Urban	1.00	1.00	1.00	1.00
Rural	1.13 (0.99–1.30)	1.41 (1.11–1.78)	0.91(0.74–1.11)	1.05 (0.83–1.33)
Region				
Central	1.26 (0.96–1.66)	0.95 (0.60–1.50)	1.50 (1.06–2.12)	0.77 (0.53–1.10)
Northeast	1.77 (1.31–2.38)	1.34 (0.79–2.26)	1.12 (0.74–1.70)	0.75 (0.50–1.13)
North	1.32 (1.00–1.75)	1.02 (0.62–1.69)	1.53 (1.02–2.29)	0.61 (0.39–0.94)
South	1.08 (0.79–1.47)	0.73 (0.42–1.27)	0.97 (0.66–1.42)	0.79 (0.52–1.21)
Bangkok	1.00	1.00	1.00	1.00
Currently employed				
Yes	1.57 (1.38–1.78)	1.63 (1.21–2.19)	0.98 (0.81–1.20)	1.09 (0.84–1.41)
No	1.00	1.00	1.00	1.00
Education (years)				
None	1.38 (1.03–1.85)	1.70 (1.02–2.85)	1.15 (0.91–1.46)	1.22 (0.86–1.73)
< 4	1.13 (0.90–1.42)	1.31 (0.87–1.98)	1.05 (0.88–1.27)	1.15 (0.88–1.49)
≥ 4	1.00	1.00	1.00	1.00
Monthly income (Baht)				
≤ 500	1.27 (1.01–1.61)	1.32 (1.01–1.73)	1.10 (0.87–1.38)	1.23 (0.88–1.72)
501–5,000	1.14 (0.96–1.37)	1.26 (1.00–1.59)	1.05 (0.86–1.27)	1.29 (0.97–1.70)
≥ 5,001	1.00	1.00	1.00	1.00

higher prevalence in the North than the Northeast region was observed (46% and 55%, $p < 0.05$). The prevalence was not different between men and women in the same residential area. Hypertension was less common in people who were currently employed compared to those who were not. The prevalence of hypertension was higher among those having a monthly income > 5,000 Baht than those having a monthly income of 501–5,000 Baht (55.9% vs. 49.7%, $p < 0.05$).

The age-standardised prevalence of diabetes mellitus was 14.8%, corresponding to 0.93 million old people. In contrast to hypertension, diabetes mellitus prevalence decreased with advancing ages. The prevalence of diabetes mellitus was significantly higher in the urban than in the rural regions (19% vs. 13.4%, $p < 0.05$). Bangkok had the highest prevalence, followed by Central, North, South and Northeast Thailand. Prevalence of diabetes mellitus was lower in those having no formal education compared to those with 1–4 and > 4 years of education. The prevalence was lower in those who were currently working compared to those not working. The prevalence was significantly higher in those having income ≥ 5,001 Baht compared to those having incomes of < 500 and 501–5,000 Baht. Overall prevalence of diabetes mellitus with hypertension in men and women were 8.1% (168,429) and 10.3% (350,204), respectively. The prevalence decreased with advancing age. Urban residents had a higher prevalence than did their rural counterparts. The distribution by region was relatively similar to that of diabetes mellitus.

Percentage of awareness, treatment and control of high BP and plasma glucose in individuals with hypertension, diabetes mellitus, and diabetes mellitus with hypertension are shown in Table II. Of 10,365 individuals with hypertension, 56.1% were unaware of their condition. Of those who were aware of hypertension, 36.1% had been treated, whereas 10.6% of those treated had their BP controlled. Awareness levels were significantly higher in urban than in rural respondents ($p < 0.05$). The Northeast region had the highest proportion of unawareness. Unawareness was also more common among the oldest age group (≥ 80 years). Of 2,999 individuals with diabetes mellitus, 41.2% of them were unaware of their elevated FPG. For those who were aware, 53.1% had been treated, with 26.4% having their plasma glucose controlled (< 140 mg/dL).There were 758 individuals having both diabetes mellitus and hypertension. Overall, 54.1% were unaware of having the conditions. Of those who were aware, 43.7% had been treated. Among those treated, 6.8% were controlled for both BP (130/80 mmHg) and plasma glucose (140 mg/dL).

The results of logistic regression (Table III) showed that individuals who were more likely to be unaware of the

conditions were male, rural residents, living in peripheral regions, low education, currently working, low income and oldest age group, compared to their counterparts. For those who were on treatment, determinants associated with uncontrolled BP or uncontrolled plasma glucose are shown in Table III. Uncontrolled BP and plasma glucose were more common in men than in women. In both genders, the oldest age group was less likely to have their BP or blood sugar under control. Those living in peripheral regions were among the least controlled compared to residents in Bangkok and Central Thailand.

DISCUSSION

This study demonstrated the high prevalence of hypertension and diabetes mellitus in Thai people aged 60 years and older. Half of the older people had hypertension, one in seven had diabetes mellitus, and one in ten had both conditions. The prevalence rates of both conditions were relatively uniformly distributed. The prevalence of diabetes mellitus or/and hypertension was more common among those who were not currently employed. Unawareness of hypertension or diabetes mellitus or both conditions combined was more common in men, rural residents, low educational attainment, oldest age group and low income. Despite the overall inadequate treatment and control rates, the problem was more intense in the underserved group.

The high prevalence rates of hypertension and diabetes mellitus among older people were consistent with that of other countries.[19-21] It should be noted that the results were compared with caution, since the different cut-off points for hypertension and procedure of measuring BP could affect the comparison. The higher prevalence of hypertension, diabetes mellitus and both conditions in women than in men is consistent with other studies.[12,22,23] Some other studies in the West have reported a similar prevalence of diabetes mellitus in men and women.[24,25] High prevalence of being overweight and obesity might account for the higher prevalence in women. It was observed that the SBP increased with age, while the DBP was relatively stable resulting in a higher prevalence of systolic hypertension. The prevalence of both conditions increased in those with a higher educational level and in the higher income groups, and this is consistent with the findings from other developing countries,[23] but is in contrast to the developed countries, where the prevalence was higher in those with a lower educational level.[19,23,26] However, this pattern is likely to revert in the near future when the country enters the later stage of epidemiological transition.

The age- and gender-specific prevalence of diabetes mellitus are relatively similar to those of several cohorts in China and Japan, but lower than those of India.[27] However, the present study found that the diabetes mellitus prevalence declined after age > 70 years. The difference might partly be due to the shorter survival of people with diabetes mellitus and a low incident in the older age group. It is not clear whether insulin clearance or genetic background played a role. Further study in this area might be warranted. The proportions of awareness of the conditions were relatively low, and these are similar to those in other countries in Asia,[22,28] although they are much lower than those of some developed countries.[24,25] Similar to other studies, unawareness of hypertension tended to increase with age. Although treatment of hypertension and diabetes mellitus reduced the risk of cardiovascular disease, heart failure, complications and death, the proportions of older people not treated and controlled were high and similar to those in other countries in Asia.[18,19]

The suboptimal treatment and control were also higher than those reported in the developed countries.[23,25,26,29] The treatment and control were associated with socioeconomic status, and those with lower educational levels were the most disadvantaged group.[20,23,28] In addition, those who lived in rural areas and peripheral regions were less likely to have their BP or plasma glucose controlled. This finding might reflect the problem of accessibility and the quality of care as it was generally unsatisfactory, especially among the poor. Men were more likely to be unaware of their diabetes mellitus and hypertension than women. The periodic annual surveys of healthcare utilisation consistently indicate that women more frequently sought medical care than men.[30] There were some limitations to this study. As BP was measured at one visit, this might result in an overestimation of hypertension due to white coat hypertension and underestimation of controlled hypertension among those treated.

Given the results of this study, prevalence rates of hypertension and diabetes mellitus were very high among the Thai elderly. Acknowledging the high prevalence of the two conditions, the Ministry of Public Health has established a health programme for early detection of hypertension and diabetes mellitus. A national health strategy called Healthy Thailand 2004 has been launched with a nationwide mass screening programme for hypertension and diabetes mellitus.[31] Village health volunteers have been trained in the measurement of BP to perform the screening in their neighbourhood. An opportunistic screening programme for hypertension among individuals aged ≥ 40 years and who visit all levels of health service facilities has also been implemented. A periodic screening programme for identification of individuals with diabetes mellitus among high-risk groups

in the communities is underway, with a target of at least 60% of population aged ≥ 40 years to undergo an annual screening.[31] However, given the results of this survey, much more work still has to be done in order to meet the target. It is important to improve on the accessibility and quality of care, in particular, control of BP and plasma glucose. In addition, the screening of people with high risk and treatment must be accompanied by primary prevention strategies.

In conclusion, this study has documented a high prevalence of hypertension and diabetes mellitus among the older people with low rates of treatment and control. Despite the higher prevalence in women, the percentages of unawareness were higher in men. The overall percentages were uniformly low across regions, and those in the oldest age group, having a low income and a low education level were among the most disadvantaged groups.

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