



ORIGINAL ARTICLE

Prevalence, awareness, treatment and control of hypertension in Taiwan: results of Nutrition and Health Survey in Taiwan (NAHSIT) 1993–1996

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The objective of this paper is to describe hypertension status in Taiwan using data from the Nutrition and Health Survey in Taiwan (NAHSIT) 1993–1996, which adopted a clustered stratified multistage sampling scheme. A total of 4838 males and 4876 females aged 4 years and above were interviewed and examined corresponding to a response rate of 74%. Almost all of them (97.5%) had blood pressures measured. The results show that the mean blood pressure of adult males was higher than that of adult females below 45 years of age. After that, the pattern was reversed. When defined by JNC IV criteria (SBP/DBP \geq 160/95 mm Hg or taking anti-hypertensive drugs), the prevalence was 13% in adult males (\geq 19 years) and 12% in adult females. When defined by JNC VI criteria (SBP/DBP \geq 140/90 mm Hg or

taking antihypertensive drugs), the prevalence was 26% in adult males and 19% in adult females. The prevalence in the mountainous area, was the highest among the seven survey strata. Under the JNC IV definition, 43% males and 53% females with hypertension knew their disease status, 31% of males and 45% of females took medicine for it, and 15% of males and 22% of females had their blood pressure under control. Percentages of awareness, treatment, and control were much lower with the JNC V definition, which was introduced toward the end of survey period. People in metropolitan areas had the highest rates of awareness, treatment, control, and compliance to medication.

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Introduction

Stroke, heart diseases, diabetes mellitus and hypertension were the third, the fourth, the fifth, and the ninth major underlying causes of death in Taiwan, respectively.¹ Hypertension was strongly associated with all of these chronic diseases.² In the past 10–20 years, the economy has grown rapidly in Taiwan. The changing dietary patterns and lifestyles accompanying economic growth may have exerted great impact on the prevalence and incidence of atherosclerotic diseases. The purpose of this paper was to provide current statistics on the prevalence, awareness and control of hypertension in Taiwan as a whole and in various age-sex groups and regions.

Materials and methods

Data of this study were from the Nutrition and Health Survey in Taiwan (NAHSIT 1993–1996) collected between 1993 and 1996. Taiwan is an island off the southeast coast of China that has an area of 35 563 km² (13 869 square miles). The NAHSIT carried out from 1993 to 1996 was the third survey to examine the changes of nutrition and health status of the people in Taiwan, which was generated from a multi-stage, unequal probability survey sample of people aged 4 years and older in Taiwan. Data were collected on the nutrition status, lifestyles, nutrition-related knowledge/attitude/practice, and nutrition-related disease status.

The survey divided 359 townships of Taiwan into seven strata according to the dietary characteristics of the residents, urbanisation index, and geographical locations. These seven strata were Hakka people areas, mountainous areas, East Coast area, Peng-Hu

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Table 1 Means and standard errors of blood pressures and prevalence in Taiwan by sex and age groups. All values are weighted to reflect their representation in the population

Sex	Age groups (years)	n	SBP (mm Hg)		DBP (mm Hg)		JNC IV % (CI) ^a	Standardised ^b JNC IV	JNC V or VI % (CI) ^a	Standardised ^b JNC V or VI
			Mean	s.e.	Mean	s.e.				
Males	4-6	464	96.3	0.8	57.3	1.1	-	-	-	-
	7-12	987	105.3	0.6	65.4	1.1	-	-	-	-
	13-18	953	117.9*	1.2	70.0*	1.4	-	-	-	-
	19-44	988	121.3*	0.7	78.0*	1.1	6 (2, 10)	-	19 (13, 25)*	-
	45-64	961	130.9*	1.2	84.4*	0.9	26 (22, 30)	-	40 (36, 44)*	-
	65+	485	138.1*	1.5	79.1	0.7	27 (23, 31)*	27 (21, 33)	48 (42, 54)	48 (40, 56)
	≥19	2434	124.9	0.6	79.4	1.0	13 (11, 15)	16 (14, 18)	26 (22, 30)*	30 (26, 34)
	≥45	1446	133.3	0.8	82.7	0.7	27 (25, 29)	26 (24, 28)	43 (39, 47)*	42 (40, 44)
Females	4-6	466	94.0	0.5	56.7	0.9	-	-	-	-
	7-12	989	104.7	0.7	64.1	0.9	-	-	-	-
	13-18	961	109.6	0.9	68.7	1.4	-	-	-	-
	19-44	1013	110.4	0.8	71.5	0.9	3 (1, 5)	-	8 (4, 12)	-
	45-64	961	128.3	0.7	81.2	0.6	20 (16, 24)	-	33 (31, 35)	-
	65+	486	145.6	2.0	79.5	1.2	47 (37, 57)	47 (37, 57)	60 (52, 68)	59 (51, 67)
	≥19	2460	118.2	0.7	74.5	0.8	12 (10, 14)	15 (13, 17)	19 (17, 21)	23 (21, 25)
	≥45	1447	133.9	1.0	80.6	0.7	29 (25, 33)	28 (24, 32)	42 (38, 46)	41 (37, 45)

^a95% confidence interval, ^bStandardised to US 1980 population.
*Significantly different from females ($P \leq 0.05$).

islands, metropolitan cities, provincial cities and urbanisation class I townships, and urbanisation class II townships.

People in Taiwan are predominantly descendants of the so-called Han people, an inclusive name for various ethnic groups that have lived in the central plains of China since 2000 BC. The Hakkas are counted as Han, but are markedly distinguished from other people in Taiwan by their dialect, dietary pattern, and their strong tendency for intra-group marriage. The Hakka areas are located primarily in the northwest of Taiwan. Hakka residents migrated to Taiwan a few hundred years ago from a few counties of Guangdong province. They have been known for consuming more preserved vegetables and using a lot of lard in cooking. The other distinct group of people in Taiwan are the aborigines who are genetically related to the Malayo-Polynesians. Most of them live in the mountainous areas that occupy three-fifths of Taiwan and that have low population density. The East Coast area is a region isolated from the affluent western part of the Taiwan island. The area is influenced by the large number of aborigines living there. Peng-Hu islands are the major offshore islands in Taiwan strait under Taiwan's jurisdiction. The rest of the cities and townships were classified into three strata by their degree of urbanisation. They were metropolitan cities, provincial cities and urbanisation class I townships, and urbanisation class II townships.

After the strata were defined, three townships (or city districts) were selected from each stratum with selection probability proportional to population size (PPS). Three villages (or Li's, the smallest administrative unit) were selected within each of the 21 townships (or city districts). A pseudo-Latin square

design was used to allocate survey time for township in order to balance the effects of season and year. One of the three villages was surveyed in each season and in each year, the season being determined as February to May, June to September, October to January. A designated number of individuals (8 or 16 depending on the age groups), were recruited door to door from two randomly selected geographical clusters within each village for each of the 14 age-sex groups (age groups of 4-6, 7-12, 13-15, 16-18, 19-44, 45-64, and 65+, for men and women). The survey team consisted of five interviewers who stayed in a village for 3 weeks to interview the selected individuals. A physical examination team consisting of eight well-trained medical examiners and two public health nurses performed the physical check-up on the third and fourth weekend. Details about the design and the operational techniques of the survey have been described elsewhere.³ Altogether, 9961 individuals were interviewed, which corresponded to a response rate of 74%. About 97.5% of those who responded to questionnaires had their blood pressures measured.

Variables used in this paper included blood pressures taken by well-trained interviewers at home and those derived from questionnaires: gender, age, strata, self-reported medical history on hypertension and use of antihypertensive medicines. The blood pressure measurers were trained according to the Coronary Artery Risk Development in Young Adults (CARDIA) protocol.⁴ The trainer has been certified in the CARDIA center in Northwestern University Medical School (Chicago, IL, USA). Blood pressures were measured after the subject had rested for at least 5 min, using a standard sphygmomanometer and cuffs of appropriate sizes. The subject's arm was

placed at the same height as the heart. Two measurements were recorded. If the difference between the two measurements was greater than 10 mm Hg, the third measurement was made and the average of the closer two was used to represent the mean blood pressure.

Two definitions of hypertension were used in this paper. One was the definition of JNC IV,^{5,6} which defined hypertension as having either systolic blood pressure (SBP) ≥ 160 mm Hg or diastolic blood pressure (DBP) ≥ 95 mm Hg, or using antihypertensive drugs. The other one was the definition of JNC V⁷ and JNC VI,⁸ which defined hypertension as either having SBP ≥ 140 mm Hg or DBP ≥ 90 mm Hg, or using antihypertensive medication.

Sampling weights were calculated for each subject, using post-stratification methods, to reflect the representation of the subject in the population. SAS version 6.12⁹ and SUDAAN version 7.5¹⁰ were used to estimate the weighted averages, standard errors and percentiles of blood pressure, prevalence, awareness, and control of hypertension for males and females in various age groups and regions (strata).

Results

Table 1 shows the average blood pressure of the population by gender and age groups. Those who were taking antihypertensive drugs were not excluded in the calculation. The mean SBP values of both males and females were similar before age 12 and both increased as the age increased. The SBP of males increased from 96.3 mm Hg of those aged between 4 and 6 years to 138.1 mm Hg of those older than 65 years. The SBP of females increased from 94.0 mm Hg of those aged between 4 and 6 years to 145.6 mm Hg of those older than 65 years. The SBP of people aged between 13–18 years and those aged 19–44 years were similar, then increased sharply after 45 years old. Females had lower SBP than males between age 13 and 65 years, but they were higher after the age of 65 years. The largest discrepancy of SBP between males and females appeared at the ages between 13 and 44 years.

Table 1 also shows the average DBP of the population by gender and age groups. The DBP values for both males and females were similar before 12 years old and both increased with age, then decreased after the age of 65 years. The DBPs of females were always lower than those of males in almost all the adult age groups, except the oldest age group (≥ 65 years). The largest differences occurred at age 19–44 years.

The prevalence of hypertension according to the JNC IV and V (or VI) definition by gender and age groups is listed in Table 1. Since the definition of hypertension for children has not been clearly defined in Taiwan, only the prevalence of adults was presented in Table 1. The prevalence in adult males (≥ 19 years) was 13%, and that of adult

females was 12%. The prevalence of middle-to-old age groups (≥ 45 years) was 27% and 29% for men and women respectively. The prevalence increased as age increased in both males and females. The prevalence of people aged between 19 and 44 years was 6% for males and 3% for females. Then, it increased to 47% for females older than 65 years. This was the only age group where the prevalence of hypertension in females exceeded that of males by a large difference (20%). When standardised to the 1980 US population, the prevalence defined by JNC IV was 16% for adult males (≥ 19 years) and 15% for females.

When defined by JNC VI, the prevalence in adult males (≥ 19 years) was 26% and 19% in adult females. The prevalence in middle-to-old age males and females (≥ 45 years) was 43% and 42%, respectively. The age trend was very apparent. For males, the proportion of hypertension increased from 19% in adults aged between 19 and 44 years, to 40% in the middle-age group (45–64 years), then to 48% in the elderly (≥ 65 years). For females, it increased from 8% in women aged between 19 and 44 years, to 33% in the middle-age group (45–64 years), then to more than 60% in the elderly (≥ 65 years). The prevalence in males was higher than females in almost all the age groups, except the oldest age group (≥ 65 years). After being standardised to the 1980 US population, the prevalence defined by JNC VI was 30% and 23% for adult males and females, respectively.

Table 2 presents the average BP and the prevalence of hypertension of adults (≥ 19 years) by sex and geographic locations. The mean SBP of males and females in Peng-Hu islands were significantly higher than those in Hakka areas, whereas adults in mountainous areas had higher DBP than Hakka areas. If the JNC-VI definition was used, the prevalence in the mountainous areas was 47% and 31% for adult males and females respectively. The highest prevalence occurred in the mountainous areas for both adult males and females.

Table 3 shows the awareness, medication and control of hypertension by age and gender groups. Using the JNC IV definition, 40% of the adult males (≥ 19 years) and 58% of adult females were aware of their disease status. More mid- or old-aged (≥ 45 years) females than males knew their disease status. The awareness was low in younger age groups (19–44 years). Only 15% of males and 25% of females in this age group knew they had hypertension. The awareness increased in the middle age group (45–64 years); 47% of males and 66% of females among those who had hypertension knew their disease status. When they reached the age beyond 65 years, 69% of males and 66% of females with hypertension knew their disease status. The proportion of awareness was 55% and 66% in middle-to-old age (≥ 45 years) males and females respectively. Around 28% of the hypertensive adult males (≥ 19 years) and 45% of hypertensive adult females were on medi-

Table 2 The mean and standard error of blood pressures of adults (≥ 19 years) in Taiwan, by sex and geographical locations.

Sex	Geographical locations	n	SBP (mm Hg)		DBP (mm Hg)		Prevalence ^a % (CI) ^c	Prevalence ^b C (CI) ^c
			Mean	s.e.	Mean	s.e.		
Males	Hakka area	354	123.5	2.3	78.8	1.9	14 (8, 20)	24 (16, 32)
	Mountainous area	359	130.0	2.8	85.7*	0.9	27 (23, 31)*	47 (39, 55)*
	East coast	357	124.1	1.0	77.6	1.9	12 (8, 16)	23 (17, 29)
	Peng-Hu islands	339	129.4*	1.4	81.0	0.8	14 (12, 16)	34 (28, 40)
	Metropolitan cities	339	125.6	1.3	78.2	1.4	14 (10, 18)	27 (18, 35)
	Provincial cities & Class I townships	333	125.2	1.1	79.0	2.2	13 (7, 19)	26 (16, 36)
	Class II townships	353	124.1	0.8	80.4	0.7	10 (6, 14)	26 (22, 30)
Females	Hakka area	362	117.1	1.3	74.4	1.1	12 (10, 14)	18 (16, 20)
	Mountainous area	361	123.8	1.4	81.3*	0.7	18 (12, 24)	31 (27, 35)*
	East coast	349	120.5	1.6	75.0	0.9	13 (11, 15)	19 (17, 21)
	Peng-Hu islands	352	124.9*	1.8	77.5	0.6	16 (14, 18)	27 (23, 31)
	Metropolitan cities	344	115.9	1.2	73.2	0.6	12 (10, 14)	16 (12, 20)
	Provincial cities & Class I townships	337	119.3	0.6	75.0	1.7	12 (10, 14)	19 (17, 21)
	Class II townships	355	117.9	1.8	74.5	1.3	11 (7, 15)	21 (15, 27)

^aJNC IV definition; ^bJNC VI definition; ^c95% confidence interval; *Significantly ($P < 0.05$) different from people in Hakka areas.

Table 3 The awareness, medication and control of hypertension in Taiwan by sex and age groups

Sex	Age groups (years)	JNC IV definition				JNC VI definition			
		Awareness ^a % (CI) ^c	Medication ^a % (CI) ^c	Control ^a % (CI) ^c	Control after med ^b % (CI) ^c	Awareness ^a % (CI) ^c	Medication ^a % (CI) ^c	Control ^a % (CI) ^c	Control after med ^b % (CI) ^c
Males	19–44	15 (5, 25)	3 (0, 7)	0 (–)	12 (0, 36)	7 (3, 11)	1 (–)	0 (–)	10 (0, 28)
	45–64	47 (41, 53)*	36 (28, 44)*	14 (4, 24)*	38 (16, 50)	35 (27, 43)*	23 (17, 29)*	3 (0, 7)*	13 (0, 27)
	65 +	69 (57, 81)	56 (40, 74)	36 (24, 48)	64 (54, 74)	45 (37, 53)	32 (24, 40)	8 (2, 14)	26 (10, 42)
	≥ 19	40 (32, 48)*	28 (18, 38)*	14 (6, 22)	49 (37, 61)	22 (18, 26)*	13 (9, 17)*	2 (0, 4)*	18 (10, 26)
	≥ 45	55 (51, 59)*	43 (35, 51)*	21 (13, 29)	50 (38, 62)	39 (35, 43)*	26 (22, 30)*	5 (3, 7)	18 (10, 26)
Females	19–44	25 (9, 41)	8 (0, 22)	0 (–)	4 (0, 12)	13 (3, 23)	3 (0, 9)	0 (–)	2 (0, 6)
	45–64	66 (56, 76)	54 (44, 64)	30 (24, 36)	56 (40, 72)	46 (40, 52)	33 (29, 37)	8 (6, 10)	24 (16, 32)
	65 +	65 (57, 73)	52 (42, 62)	22 (16, 28)	43 (23, 63)*	52 (48, 56)	40 (32, 48)	6 (4, 8)	15 (7, 23)
	≥ 19	58 (52, 64)	45 (39, 51)	21 (15, 27)	48 (36, 60)	39 (35, 43)	28 (24, 32)	5 (3, 7)	18 (12, 24)
	≥ 45	66 (60, 72)	53 (47, 59)	26 (20, 32)	49 (35, 63)	49 (43, 57)	36 (32, 40)	7 (5, 9)	19 (13, 25)

^aThe proportions of awareness, treatment and control are the proportions of the hypertensive. ^bThe proportions of control after medication are proportions of those on medication. ^c95% confidence interval. *Significantly different from females at the 5% level.

ation. The proportion of those taking medication increased to 56% in males and 52% in females when they reached 65 years or older.

The control of hypertension was far from ideal. Among the adults (≥ 19 years) with hypertension, only 14% of males and 21% of females had it under control. The younger the age group, the lower the proportion keeping hypertension under control. Less than 1% of people aged between 19 and 44 years had their hypertension under control. Among middle-age (45–64 years) people, 14% of males and 30% of females had their hypertension under control. The results showed that males over 65 years old had the highest proportion of awareness and control of hypertension among all the sex/age groups (Table 3).

When the JNC VI definition was used (Table 3),

the awareness of adult males (≥ 19 years) was 22% and that for adult females was 39%. Only 13% of adult males and 28% of adult females were on medication. The proportion of people with hypertension who had it under control dropped to less than 2% in adult males and 5% in adult females. More elderly (≥ 65 years) knew their disease status (45% of males and 52% of females) than other age groups. However, their control of it was not ideal. Only 8% of elderly males and 6% of elderly females had their blood pressure under control.

Table 4 presents the awareness, medication and control of hypertension in adults by sex and geographic locations. Adult males and females in the metropolitan cities had the highest awareness of the disease under both definitions. Similarly, more people in the metropolitan cities were on medi-

Table 4 The awareness, medication and control of hypertension of adults (≥ 19 years) in Taiwan by sex and geographical locations

Sex	Locations	JNC IV definition (%)				JNC VI definition (%)			
		Awareness ^a % (CI) ^c	Medication ^a % (CI) ^c	Control ^a % (CI) ^c	Control after med ^a % (CI) ^c	Awareness ^a % (CI) ^c	Medication ^a % (CI) ^c	Control ^a % (CI) ^c	Control after ^b med % (CI) ^c
Males	Hakka	39 (23, 55)*	25 (15, 35)*	19 (9, 29)	74 (56, 92)	26 (18, 34)	15 (11, 19)	7 (1, 13)	48 (18, 78)
	Mountainous area	34 (30, 38)*	20 (7, 34)*	12 (2, 22)	60 (48, 72)	26 (22, 30)*	11 (3, 19)*	4 (0, 8)	38 (22, 54)*
	East coast	30 (20, 40)*	23 (13, 33)*	10 (6, 14)*	44 (24, 64)	21 (15, 27)*	12 (8, 16)*	3 (0, 7)	29 (5, 43)
	Peng-Hu islands	43 (33, 53)*	26 (16, 36)*	8 (2, 14)*	32 (16, 48)*	25 (19, 31)*	11 (7, 15)*	0 (-)*	0 (-)*
	Metropolitan cities	62 (52, 72)	44 (34, 54)	24 (14, 24)	56 (44, 68)	35 (31, 39)	23 (17, 29)	4 (2, 6)	19 (11, 27)
	Provincial cities & Class I townships	35 (19, 51)*	25 (7, 43)	11 (0, 27)	46 (16, 76)	23 (17, 29)*	12 (4, 20)	2 (0, 6)	19 (1, 37)
Class II townships	35 (27, 43)*	25 (15, 35)*	11 (9, 13)*	43 (31, 55)	16 (12, 20)*	10 (8, 12)*	1 (0, 3)	12 (2, 22)	
Females	Hakka	58 (48, 76)	44 (22, 66)	31 (13, 49)	70 (58, 82)	42 (18, 66)	29 (9, 49)	11 (3, 19)	38 (20, 56)
	Mountainous area	67 (63, 71)	48 (40, 56)*	21 (13, 29)*	44 (26, 62)	51 (39, 63)	28 (18, 38)*	7 (1, 13)	23 (9, 37)
	East coast	62 (48, 76)	41 (25, 57)*	19 (7, 31)*	46 (30, 62)	47 (41, 53)	28 (18, 38)*	7 (3, 11)	26 (16, 36)
	Peng-Hu islands	55 (43, 67)*	47 (33, 61)*	20 (12, 28)*	44 (30, 58)	39 (31, 47)	27 (19, 35)*	6 (2, 10)	21 (9, 33)
	Metropolitan cities	73 (67, 79)	66 (56, 76)	36 (28, 44)	54 (44, 64)	53 (43, 63)	47 (35, 59)	9 (5, 13)	19 (9, 29)
	Provincial cities & Class I townships	57 (43, 71)	39 (29, 49)*	16 (8, 24)*	40 (20, 60)	38 (30, 46)	25 (19, 31)*	5 (3, 7)*	19 (11, 27)
Class II townships	52 (48, 56)*	40 (28, 52)*	20 (14, 34)	50 (15, 85)	34 (30, 38)	22 (18, 26)*	3 (1, 5)*	16 (4, 28)	

^aThe proportions of awareness, medication and control are the proportions of the hypertensive. ^bThe proportions of control after medication are proportions of those on medication. ^c95% confidence interval. *Significantly different from metropolitan cities at the 5% level.

cation and had their blood pressures under control than in other areas.

Discussion

This paper presents the hypertension status of people in Taiwan in 1993–1996. Starting from 1995, the Department of Health in Taiwan has adopted the JNC-V or VI⁷ definition for hypertension detection and treatment.⁸ About 26% of the adult males (≥ 19 years) and 19% of adult females have hypertension defined by JNC V (VI) criteria. The prevalence in the middle-to-old (≥ 45 years) age population could be as high as 43% in males and 42% in females. Almost half of the elderly (≥ 65 years) males (48%) and 60% of the elderly females were hypertensive. Hence, hypertension is a very common chronic disease in Taiwan.

When compared with earlier results^{11–17} from different areas in Taiwan, the results of this survey were higher than past results, using the JNC IV definition. This implies that the prevalence of hypertension has increased (Figure 1). It has been speculated that the increase of hypertension is primarily related to the increase of obesity,¹⁸ since mean BMI has increased steadily in recent decades.¹⁹ Previous studies showed that the average blood pressures of people in Taiwan were lower than those of people in Europe or in the United States.^{17,19} Recently, hypertension prevention in the United States and many western European countries has been very effective. As a result, the prevalence of hypertension has started to decline.⁷ The prevalence of hypertension (using the JNC VI definition) in this

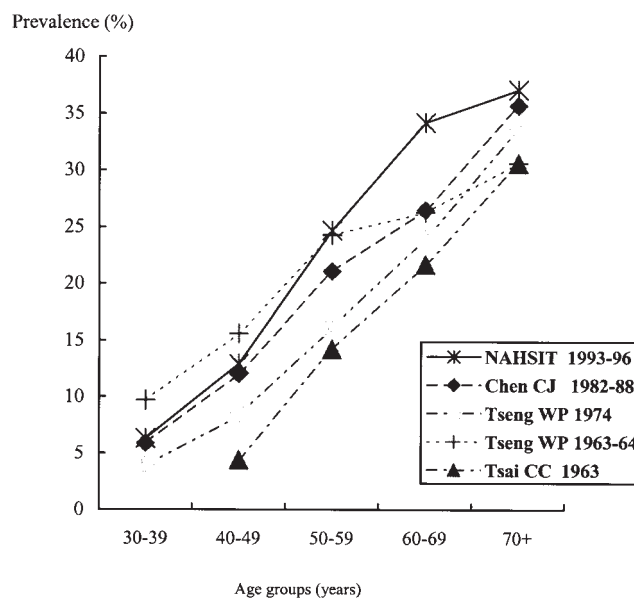


Figure 1 Comparison of prevalence of hypertension of different studies in Taiwan by age groups. The definition of hypertension is either with SBP/DBP $\geq 160/95$ mm Hg or taking antihypertensive drugs.

study for adults was 30% for males and 23% for females, after being standardised to the 1980s US population. The prevalence was higher than those of the NHANES II (1976–1980) and NHANES III (1991–1994) studies.¹⁹

Before mid-1995, the JNC IV definition was widely used. The status of hypertension awareness was far from ideal under this definition. Only 40%

of adult males and 58% of adult females knew their disease status. Among the hypertensive, only 14% males and 21% females had their blood pressures under control. Males were worse than females in terms of awareness and on medication for hypertension. In comparison with data from NHANES, the status of hypertension awareness and control in Taiwan was much poorer. NHANES reported that 44% of males and 80% of females in the US knew that they had hypertension and that 25% of males and 45% of females controlled their blood pressure well.

If the JNC VI definition (SBP/DBP \geq 140/90 mm Hg) is used, the situation is worse. Less than a quarter of the hypertensive adult males and 39% of the females knew that they had hypertension. Very few of them took antihypertensive drugs: 13% of hypertensive males and 28% of the hypertensive females. The status of hypertension control was very poor: 2% of hypertensive males and 5% of hypertensive females had their hypertension under control. This was in part due to the fact that Taiwan was at the transition stage of switching from JNC IV to JNC VI. Nevertheless, education on hypertension control needs to be stressed more in Taiwan.

The highest prevalence occurred in the mountainous areas and Peng-Hu islands. Metropolitan cities had the highest proportion of hypertension awareness, using antihypertensive drugs, and hypertension under control among the seven geographical locations. Whether this phenomenon was related to the accessibility of medical resources and information or due to a higher social economic status in metropolitan cities, requires further investigation.

In conclusion, hypertension prevalence is increasing in Taiwan. We have observed differences in rates of hypertension prevalence, awareness, treatment, control and compliance within the Taiwan region. The pattern of high prevalence rates in mountainous areas and Peng-Hu islands is consistent with that of obesity and alcohol intakes (data not shown). Metropolitan areas had the highest rates of awareness, treatment, control, and compliance to medication, pointing to the importance of public health education.

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