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Prevalence, detection and drug treatment of hypertension in a rural Australian population: the Greater Green Triangle Risk Factor Study 2004–2006

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Key words
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Abstract

Background: Hypertension is an important risk factor for cardiovascular disease; however, limited findings are available on its detection and management in rural Australia.

Aim: To assess the prevalence, awareness and treatment of hypertension in a rural South-East Australian population.

Methods: Three cross-sectional surveys in Limestone Coast, Corangamite Shire and Wimmera regions during 2004–2006 using a random population sample (n = 3320, participation rate 49%) aged 25–74 years. Blood pressure was measured by trained nurses. Information on history of hypertension and medication was obtained by questionnaires. Hypertension was defined as systolic blood pressure $\geq$140 mmHg and/or diastolic blood pressure $\geq$90 mmHg and/or on antihypertensive drug treatment.

Results: Overall, one-third of participants had hypertension; of these, two-thirds, 54% (95% confidence interval (CI) 47–60) of men and 71% (95% CI 65–77) of women, were aware of their condition. Half of the participants with hypertension were treated and nearly half of these were controlled. Both treatment and control were more common in women (60%, 95% CI 54–67 and 55%, 95% CI 47–64) compared with men (42%, 95% CI 36–49 and 35%, 95% CI 26–44). Monotherapy was used by 55% (95% CI 48–61) of treated hypertensives. Angiotensin-converting enzyme inhibitors were the most frequently used class of antihypertensive drugs in men, whereas angiotensin-converting enzyme inhibitors, angiotensin receptor antagonists and diuretics were all widely used among women.

Conclusion: This study emphasizes suboptimal detection and treatment of hypertension, especially in men, in rural Australia.

Introduction

Hypertension is an important risk factor for heart disease, stroke, peripheral vascular disease and renal failure, accounting for 7.3% of the total disease burden in Australia.[1] Control of blood pressure (BP) is crucial in preventing these adverse outcomes. As hypertension is

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often asymptomatic, many persons with hypertension are unaware of their condition. Detection and control of BP is therefore an important public health challenge.

During the last 20 years, treatment of hypertension has improved as new antihypertensive drugs have been introduced and national and international evidence-based guidelines for detection and management of hypertension have been published.[2–4] Limited findings available from Australia indicate that the prevalence of hypertension has decreased during the last decades.[5,6] In the most recent population surveys, AusDiab in 1999–2000, 28.6% of population had high BP; however, only half the participants with hypertension were treated and 40% of these controlled.[5] Although mortality from cardiovascular disease (CVD) is higher in rural regions, there are no published findings specifically including BP in rural regions.[1]

This is the first report on the prevalence, detection and drug treatment of hypertension in rural Australia.

Methods

Three cross-sectional population surveys of chronic disease risk factors and related health behaviour were carried out in the Greater Green Triangle region.[7] The first survey was conducted in August 2004 to October 2004 in Limestone Coast (LC), in the south-east of South Australia, the second in February 2005 to March 2005 in Corangamite Shire (CO), south-west Victoria and the third in May 2006 to October 2006 in the Wimmera region (WI) in western Victoria. These regions are predominantly rural farming areas.

Each survey utilized a stratified random sample of the population aged 25–74 years drawn from the electoral roll. Stratification was by sex and 10 year age groups with the exception of the combined 25 to 44-year age group considered as one stratum. The original samples were 1120 persons in LC, 1000 persons in CO and 1500 in WI. After excluding participants who were deceased or had left the region, a total of 552 persons in LC (participation rate 51%), 415 persons in CO (42%) and 596 persons in WI (53%) participated in the study. The WI sample included an additional 127 subjects (participation rate 44%) from the age group of 75–84 years.

The survey methodology closely followed the WHO MONICA protocol[8] and recommendations from the more recent European Health Risk Monitoring project.[9] Surveys comprised a self-administered questionnaire, physical measurements and laboratory tests.

The questionnaire, which included questions on health behaviour, symptoms and diseases, medical history, socioeconomic background and psychosocial factors, together with the invitation to attend the health check, was sent by mail to all selected participants. Health checks, including anthropometric measurements and venous blood sampling, were carried out in local health centres or other survey sites by specially trained nurses.

BP was measured in a sitting position using a mercury sphygmomanometer. BP measurements were taken from the right arm of the subject after 5 min of rest. First-phase Korotkoff sounds were recorded as the systolic blood pressure (SBP) and fifth phase as diastolic blood pressure (DBP). Two measurements were taken 1 min apart. If they differed by more than 10 mmHg SBP or 6 mmHg DBP, a third measurement was made. The mean value of the two closest measurements was used in the analysis. Those having SBP of 140 mmHg or more and/or DBP of 90 mmHg or more and/or reporting use of antihypertensive treatment were regarded as having hypertension.[4] Participants who had been diagnosed with hypertension were considered to be aware of their hypertension. Hypertension was considered controlled in those on drug treatment if their measurements were SBP $\leq$140 mmHg and DBP $\leq$90 mmHg. Participants were asked to provide names of antihypertensive medications they were taking. For analysis, these were classified according to pharmacological class (angiotensin-converting enzyme inhibitors (ACEI), angiotensin II receptor antagonists (ARA), beta-blockers, diuretics, calcium channel blockers and others). Thirty-four participants who reported taking medication for hypertension did not provide details. Participants were asked when they last had their BP measured. Response categories (during the last 6 months, between 6 months and 1 year, between 1 and 5 years, more than 5 years ago, never and I do not know) were combined in the analyses as 'within 12 months', '1–5 years ago' and 'other'.

Ethics approvals were received from Flinders University Clinical Research Ethics Committee (research application number 207/034). Informed consent was received from participants.

Statistical analyses

Statistical analyses were undertaken using SPSS version 14.0 (SPSS Inc., Chicago, IL, USA). In addition to age- and sex-specific prevalence figures, overall prevalence figures are presented. Overall prevalence rates were age standardized according to local populations and the 2001 Australian population aged 25–74 years as appropriate. Each prevalence is accompanied by a 95% confidence interval (CI).[10]

Results

Of the total 1690 participants, information on BP measurement, medication and awareness was available for 1506 participants.

The overall mean SBP and DBP levels were 127 mmHg (95% CI 126–128) and 76 mmHg (95% CI 76–77), respectively (Tables 1 and 2). Compared with men, women, especially in the youngest age group (25–44 years), had lower BP levels. BP levels, especially SBP, increased with age and were higher in LC compared with the other two regions.

Overall, one-third of participants had hypertension (Table 3). The prevalence was slightly higher in men than in women, with no differences between regions. The prevalence of hypertension was 20% (95% CI 13–27) and 8% (95% CI 4–13) in 25–44-year-old men and women, respectively, and increased to 72% (95% CI 66–78) in men and 74% (95% CI 68–80) in women in the 65- to 74-year age group. In WI in the 75- to 84-year age group, 79% (95% CI 68–90) of men and 78% (95% CI 66–90) of women had predominantly systolic hypertension.

Overall, two-thirds of participants with hypertension were aware of their condition (Table 3). Over two-thirds of women but only half of men were aware of their hypertension. No differences were found between regions. The awareness increased with age from 12% (95% CI 1–23) in the youngest age group (25–44 years) to 64% (95% CI 56–73) in the 45- to 54-year age group and reached 78% (95% CI 69–87) in the oldest age group (75–84 years) in WI.

Half of the participants with hypertension were treated (Table 3). Treatment was more common in women than men and there were no regional differences. Only 9% (95% CI 0–18) of the youngest participants (25–44 years) were treated compared with 49% (95% CI 40–58) of 45- to 54-year age group. In the age group of 75–84 years in WI, 69% (95% CI 55–82) of men and 81% (95% CI 68–94) of women were treated.

One-quarter of participants with hypertension were controlled, fewer men than women (Table 3). Fewer younger (25–44 years) participants were controlled (6%, 95% CI 0–14). BP control was worse in LC compared with CO and WI.

Among hypertensives who were treated, nearly half were controlled, including a considerably higher proportion of women than men (Table 3). In LC, less than one-third were controlled compared with more than half in CO and WI.

Overall, 77% (95% CI 74–80) of women had a measurement within the last 12 months compared with 70% (95% CI 66–73) of men. The proportion of participants who had had BP measured within the last 12 months increased with age (Table 4). In LC, measurement within the last 12 months was less frequent 68% (95% CI 64–72) than in CO 77% (95% CI 73–81) and WI 76% (95% CI 72–80).

Among hypertensive subjects on treatment, 99% had a BP measurement within the last 12 months, with no

Table 1 Mean systolic blood pressure (mmHg) with 95% CI by sex, age and surveys region: The Greater Green Triangle Risk Factor Study, 2004–2006

Age groups (years)	Limestone Coast (*n* = 472)			Corangamite Shire (*n* = 404)			Wimmera region (*n* = 630)			All (*n* = 1506)		
	Mean	Lower CI	Upper CI	Mean	Lower CI	Upper CI	Mean	Lower CI	Upper CI	Mean	Lower CI	Upper CI
Men												
All 25–74 (*n* = 667)	131.7	129.3	134.2	126.9	124.6	129.3	129.8	127.7	131.8	129.4	128.1	130.7
25–44 (*n* = 116)	122.7	118.7	126.7	122.1	117.5	126.7	123.8	119.3	128.4	122.9	120.5	125.4
45–54 (*n* = 174)	133.5	129.4	137.6	122.7	118.2	127.1	128.5	125.3	131.6	128.7	126.5	130.9
55–64 (*n* = 182)	137.2	131.7	142.6	131.7	126.6	136.9	133.4	129.5	137.3	134.3	131.5	137.0
65–74 (*n* = 195)	151.3	146.7	156.0	139.9	135.4	144.5	142.2	137.8	146.5	144.7	142.0	147.3
75–84 (*n* = 57)	NA	NA	NA	NA	NA	NA	149.1	143.6	154.6	149.1	143.6	154.6
Women												
All 25–74 (*n* = 736)	127.5	125.1	129.9	125.2	122.8	127.5	122.6	120.2	124.9	124.9	123.5	126.3
25–44 (*n* = 131)	117.8	113.9	121.6	114.8	111.2	118.3	116.0	110.9	121.2	116.2	113.8	118.6
45–54 (*n* = 209)	125.5	121.2	129.7	126.9	122.4	131.5	119.5	115.6	123.4	123.7	121.2	126.1
55–64 (*n* = 211)	136.5	132.8	140.3	130.7	126.4	135.0	129.2	124.9	133.4	132.2	129.8	134.5
65–74 (*n* = 185)	148.9	144.3	153.5	140.1	135.0	145.2	141.7	137.2	146.2	143.4	140.7	146.1
75–84 (*n* = 46)	NA	NA	NA	NA	NA	NA	147.9	139.1	156.7	147.9	139.1	156.7
All												
All 25–74 (*n* = 1403)	129.6	127.7	131.3	126.0	124.3	127.7	126.0	124.4	127.6	127.1	126.1	128.0
25–44 (*n* = 247)	120.3	117.5	123.0	118.0	115.1	120.9	119.6	116.1	123.1	119.3	117.6	121.1
45–54 (*n* = 383)	129.0	125.9	132.0	125.2	122.0	128.4	123.9	121.4	126.5	125.9	124.3	127.6
55–64 (*n* = 393)	136.8	133.6	140.0	131.1	127.9	134.4	131.2	128.4	134.1	133.1	131.3	134.9
65–74 (*n* = 380)	150.2	147.0	153.5	140.0	136.7	143.4	141.9	138.8	145.0	144.1	142.2	145.9
75–84 (*n* = 103)	NA	NA	NA	NA	NA	NA	148.6	143.7	153.5	148.6	143.7	153.5

CI, confidence interval; NA, not available.

Table 2 Mean diastolic blood pressure (mmHg) with 95% CI by sex, age and surveys region: the Greater Green Triangle Risk Factor Study, 2004–2006

Age groups (years)	Limestone Coast (*n* = 472)			Corangamite Shire (*n* = 404)			Wimmera region (*n* = 630)			All (*n* = 1506)		
	Mean	Lower CI	Upper CI	Mean	Lower CI	Upper CI	Mean	Lower CI	Upper CI	Mean	Lower CI	Upper CI
Men												
All 25–74 (*n* = 667)	81.8	80.4	83.2	75.9	74.3	77.6	79.3	78.1	80.4	79.3	78.5	80.1
25–44 (*n* = 116)	78.7	75.7	81.7	74.5	70.8	78.2	79.8	76.4	83.2	77.8	75.9	79.7
45–54 (*n* = 174)	85.5	82.7	88.2	76.8	72.3	81.3	81.6	79.5	83.6	81.7	80.0	83.4
55–64 (*n* = 182)	83.9	80.7	87.2	76.8	74.0	79.5	79.8	78.1	81.4	80.4	78.9	81.9
65–74 (*n* = 195)	80.3	78.1	82.4	77.0	74.1	80.0	76.5	74.2	78.9	78.0	76.6	79.4
75–84 (*n* = 57)	NA	NA	NA	NA	NA	NA	74.6	72.4	76.7	74.6	72.4	76.7
Women												
All 25–74 (*n* = 736)	75.3	73.9	76.6	72.4	70.9	73.9	72.3	71.1	73.4	73.3	72.5	74.1
25–44 (*n* = 131)	71.8	68.7	74.9	69.3	66.9	71.8	70.8	67.9	73.8	70.7	69.0	72.3
45–54 (*n* = 209)	76.4	74.1	78.7	74.7	71.6	77.7	73.6	71.4	75.8	74.8	73.4	76.3
55–64 (*n* = 211)	79.8	77.4	82.3	74.1	71.1	77.1	74.1	71.8	76.5	76.1	74.6	77.6
65–74 (*n* = 185)	77.1	74.6	79.5	73.6	69.3	77.9	74.3	72.2	76.4	74.9	73.2	76.6
75–84 (*n* = 46)	NA	NA	NA	NA	NA	NA	73.6	69.8	77.3	73.6	69.8	77.3
All												
All 25–74 (*n* = 1403)	78.5	77.5	79.5	74.0	72.9	75.1	75.6	74.8	76.5	76.2	75.6	76.7
25–44 (*n* = 247)	75.4	73.1	77.6	71.6	69.4	73.7	74.9	72.5	77.3	74.0	72.7	75.3
45–54 (*n* = 383)	80.4	78.5	82.3	75.5	72.9	78.1	77.5	75.9	79.2	78.0	76.8	79.1
55–64 (*n* = 393)	81.7	79.7	83.7	75.3	73.2	77.3	76.9	75.3	78.4	78.1	77.0	79.2
65–74 (*n* = 380)	78.8	77.2	80.4	75.4	72.9	77.9	75.3	73.8	76.9	76.5	75.4	77.6
75–84 (*n* = 103)	NA	NA	NA	NA	NA	NA	74.1	72.1	76.1	74.1	72.1	76.1

CI, confidence interval; NA, not available.

variation between age groups, sex or region (Table 4). Among hypertensives not on medication, only 69% had a BP measurement within the last 12 months, the likelihood increasing with age. Slightly more women (77%, 95% CI 69–86) than men (64%, 95% CI 56–72) had a measurement within the last 12 months.

Overall, monotherapy was used by 55% (95% CI 48–61) of treated hypertensives. The prevalence of use of monotherapy was similar in men and women and also in the three regions. The proportion of treated participants who were on monotherapy reduced from 62% (95% CI 49–74) at 45–54 years to 43% (95% CI 36–51) at 65–74 years. Control of BP was poor for those taking drug monotherapy, with 49% (95% CI 41–58) controlled, and also for those on more than one drug therapy, with 42% (95% CI 32–52) controlled.

ACEI were the most frequently used antihypertensive drug class in men, whereas in women, ACEI, ARA and diuretics were widely used (Table 5). Fewer LC men were taking beta-blockers than in CO or WI. Only 22% of LC women were taking ARA compared with approximately half in CO and WI.

Discussion

The findings of this study indicate that one-third of this rural population has hypertension. Only half of the participants with hypertension were treated and less than half of these were controlled, indicating suboptimal detection and treatment of hypertension, especially in men and younger participants.

Limited findings available, mainly from urban population, on prevalence of hypertension in Australia indicate that the prevalence of hypertension among men decreased from 47 to 31% between 1980 and 1995.[11] Among women, the prevalence decreased from 32 to 23% between 1980 and 1989 and was 25% in 1995. In the latest population survey, AusDiab 1999–2000,[5] the prevalence of hypertension was 32% in men and 27% in women, which is slightly lower than those in the present study.[5] These results suggest that either there is no further improvement or the situation is poorer in rural areas compared with urban and metropolitan centres. These Australian trend findings have to be interpreted with caution as there are differences between studies in BP measurement protocols and survey samples, for example, only the more recent studies have included subjects aged 65 years and over, the age group in which hypertension is more common.

There is evidence of higher rates of CVD mortality in rural areas compared with urban areas.[12] Comparisons between rural and metropolitan risk factor findings are necessary to see whether these differences may be contributing to the mortality differences.

Important determinants of BP include overweight and obesity, physical inactivity, high sodium intake, increased alcohol intake and increasing age.[3,13] There are limited Australian findings available to allow us to analyse whether the level of these risk factors may have changed over time. However, in our rural survey population, the prevalence of overweight and obesity was even higher[14] than in previous Australian surveys.[11] It is therefore likely that increasing overweight and obesity over time is an

Table 3 Prevalence, awareness, treatment and control of hypertension for those aged 25–74 years by sex and survey region: The Greater Green Triangle Risk Factor Study, 2004–2006

	Prevalence of hypertension (%)			Percentage of those with hypertension who are aware of their condition			Percentage of those with hypertension on drug treatment			Percentage of those with hypertension controlled			Percentage of those on drug treatment with hypertension controlled		
	Men (n = 230)	Women (n = 242)	All (n = 472)	Men (n = 321)	Women (n = 324)	All (n = 645)	Men (n = 321)	Women (n = 324)	All (n = 645)	Men (n = 321)	Women (n = 324)	All (n = 645)	Men (n = 165)	Women (n = 207)	All (n = 372)
LC	38.0	33.6	35.8	55.6	67.3	61.2	47.6	54.4	50.9	8.2	24.1	15.8	17.1	44.3	31.0
	(31.7–44.4)	(27.5–39.7)	(31.4–40.2)	(45.1–66.2)	(56.9–77.7)	(53.7–68.7)	(37.0–58.2)	(43.4–65.5)	(43.2–58.5)	(2.4–13.9)	(14.6–33.6)	(10.2–21.4)	(5.5–28.7)	(29.4–59.3)	(21.0–40.9)
CO	34.0	34.0	34.0	49.6	76.1	64.0	40.4	61.2	51.7	20.9	39.4	31.0	51.7	64.5	59.9
	(27.2–40.8)	(27.7–40.2)	(29.4–38.6)	(37.3–61.9)	(66.5–85.8)	(56.0–72.0)	(28.3–52.5)	(50.1–72.2)	(43.3–60.0)	(10.9–30.9)	(28.4–50.5)	(23.2–38.7)	(32.3–71.7)	(50.6–78.3)	(48.5–71.3)
WI	41.8	29.7	35.5	55.5	72.5	62.9	41.2	67.4	52.6	17.7	38.7	26.8	42.9	57.4	51.0
	(35.7–47.9)	(24.3–35.2)	(31.4–39.6)	(46.0–65.1)	(62.8–82.3)	(56.0–69.9)	(31.8–50.6)	(57.1–77.6)	(45.4–59.8)	(10.4–25.0)	(28.0–49.3)	(20.4–33.2)	(28.1–57.7)	(44.2–70.5)	(41.0–60.9)
All	36.9	31.8	34.3	53.6	71.1	62.1	42.4	60.4	51.1	14.9	33.4	23.8	35.1	55.4	46.6
	(33.2–40.6)	(28.4–35.2)	(31.8–36.8)	(47.4–59.9)	(65.3–77.0)	(57.7–66.4)	(36.3–48.6)	(54.1–66.7)	(46.6–55.6)	(10.4–19.3)	(27.3–39.5)	(20.0–27.7)	(25.9–44.2)	(47.1–63.6)	(40.4–52.9)

CO, Corangamite Shire; LC, Limestone Coast; WI, Wimmera region.

important contributor to the failure to observe a sustained reduction in the prevalence of hypertension.[15]

A substantial problem of underdetection and undertreatment of hypertension has always been identified. In Australia, in 1999–2000, just under half of those with hypertension were taking antihypertensive drugs. Of those who were not taking antihypertensive drugs, 54% had a high absolute risk of CVD, and based on current guidelines, this group would benefit from antihypertensive medication.[5] In our study, we did not estimate absolute CVD risk in those with hypertension who were not on treatment. For those already on treatment, we were unable to calculate a pretreatment risk. Although this paper focuses on hypertension as a single risk factor, clearly there needs to be greater emphasis on the assessment of absolute cardiovascular risk when making the decision to initiate antihypertensive drug treatment.[4] Younger men make up a particularly challenging group. Because age is an important determinant of risk, many will have lower absolute CVD risk levels and might not need antihypertensive drug treatment. Many of those who do need treatment are not being detected because they do not access health care.

The 'rule of halves' for hypertension states that 'half the people with high blood pressure are not known ("rule 1"), half of those known are not treated ("rule 2") and half of those treated are not controlled ("rule 3")'.[16] In this study, 'rule 1' remained true only for men with half aware of their hypertension compared with two-thirds of women. Our result that awareness is greater in women than in men is in line with observations from several other countries.[17–19] Reviewing results from Finland,[17] the US[20] and UK[19] also indicates that a higher proportion of women has been treated and the hypertension controlled over time.

Although the prevalence of hypertension, awareness and treatment was similar across three survey regions, the control of hypertension, especially for men, was less in LC, which translates to higher mean BP. The variability in medication usage between regions may reflect lack of systematic application of guidelines and clinical evidence in the treatment of hypertension. Further, BP measurement within the last 12 months was less frequent in LC, indicating differences in monitoring.

National Heart Foundation of Australia Guidelines state that combination therapy is often necessary as less than 50% of patients will achieve optimal BP response with monotherapy, as we also found.[4] In our study, combination therapy was used in just under half the subjects, suggesting that there is still room for improvement. Even with multidrug therapy, many were still not controlled. We do not know what their pretreatment BP was or whether they were particularly resistant to treatment. This makes it difficult to compare the two groups

Table 4 Time from the last measurement of blood pressure: The Greater Green Triangle Risk Factor Study, 2004–2006

Age group (years)	Time from the last measurement	Hypertensive, medicated (*n* = 294)	Hypertensive, not medicated (*n* = 432)	Normotensive (*n* = 780)	All (*n* = 1506)
All, 25–74	<12 months	98.7 (97.2–100.0)	69.3 (63.3–75.2)	68.1 (65.1–71.2)	73.7 (71.4–76.0)
	1–5 years	1.3 (0.0–2.8)	25.9 (20.2–31.5)	24.4 (21.6–27.2)	20.6 (18.5–22.7)
	Other	0.0 (0.0–0.0)	4.9 (2.1–7.6)	7.5 (5.8–9.2)	5.7 (4.5–6.9)
25–44	<12 months	100.0 (100.0–100.0)	58.1 (40.7–75.4)	61.0 (54.5–67.6)	61.1 (55.1–67.2)
	1–5 years	0.0 (0.0–0.0)	35.5 (18.6–52.3)	29.1 (23.0–35.2)	29.6 (23.9–35.2)
	Other	0.0 (0.0–0.0)	6.5 (0.0–15.1)	9.9 (5.9–13.9)	9.3 (5.7–12.9)
45–54	<12 months	98.3 (95.1–100.0)	65.1 (53.3–76.9)	71.9 (66.5–77.4)	74.9 (70.6–79.3)
	1–5 years	1.7 (0.0–4.9)	27.0 (16.0–37.9)	25.4 (20.1–30.7)	21.9 (17.8–26.1)
	Other	0.0 (0.0–0.0)	7.9 (1.3–14.6)	2.7 (0.7–4.7)	3.1 (1.4–4.9)
55–64	<12 months	99.2 (97.7–100.0)	73.8 (64.1–83.4)	81.3 (75.7–87.0)	85.8 (82.3–89.2)
	1–5 years	0.8 (0.0–2.3)	22.5 (13.3–31.7)	13.7 (8.7–18.7)	11.2 (8.1–14.3)
	Other	0.0 (0.0–0.0)	3.8 (0.0–7.9)	4.9 (1.8–8.1)	3.1 (1.4–4.8)
65–74	<12 months	98.3 (96.4–100.0)	84.8 (77.8–91.9)	89.3 (83.4–95.3)	92.4 (89.7–95.0)
	1–5 years	1.7 (0.0–3.6)	14.1 (7.3–21.0)	8.7 (3.3–14.2)	6.8 (4.3–9.4)
	Other	0.0 (0.0–0.0)	1.0 (0.0–3.0)	1.9 (0.0–4.6)	0.8 (0.0–1.7)
75–84	<12 months	100.0 (100.0–100.0)	90.5 (77.9–100.0)	100.0 (100.0–100.0)	98.1 (95.4–100.0)
	1–5 years	0.0 (0.0–0.0)	9.5 (0.0–22.1)	0.0 (0.0–0.0)	1.9 (0.0–4.6)
	Other	0.0 (0.0–0.0)	0.0 (0.0–0.0)	0.0 (0.0–0.0)	0.0 (0.0–0.0)

reliably. The most striking observation about drug therapy was the extent to which the newer classes of drugs (ARA and ACEI) appear to have become the most commonly used therapy, either as single-agent products or as fixed-combination products with diuretics. This may be the result of not only the comorbidities such as diabetes and CVD but also pharmaceutical company marketing strategies.

Table 5 Use of antihypertensive medication for those aged 25–74 years by sex and region: The Greater Green Triangle Risk Factor Study, 2004–2006

		Limestone Coast	Corangamite Shire	Wimmera region	All
Diuretics		*n* = 38*	*n* = 28	*n* = 47	*n* = 113
	Men	19.6 (6.7–32.5)	16.5 (1.3–31.7)	26.3 (13.2–39.5)	22.2 (13.9–30.4)
	Women	42.2 (26.7–57.6)	34.5 (20.4–48.5)	39.3 (25.8–52.7)	38.9 (30.6–47.3)
	All	31.3 (20.9–41.7)	28.3 (17.5–39.1)	33.3 (23.8–42.9)	31.8 (25.7–37.8)
Beta-blockers		*n* = 26	*n* = 21	*n* = 28	*n* = 75
	Men	12.2 (1.5–22.8)	35.2 (15.6–54.8)	22.0 (9.7–34.4)	21.1 (13.0–29.2)
	Women	29.6 (15.4–43.9)	14.4 (4.0–24.7)	16.1 (5.9–26.2)	20.1 (13.2–27.0)
	All	21.2 (12.0–30.5)	21.5 (11.6–31.4)	18.8 (10.9–26.7)	20.5 (15.3–25.8)
ACEI		*n* = 55	*n* = 36	*n* = 66	*n* = 157
	Men	54.9 (38.8–71.1)	40.8 (20.6–61.0)	61.4 (46.9–75.9)	54.6 (44.8–64.5)
	Women	41.3 (25.9–56.7)	36.4 (22.2–50.7)	38.1 (24.7–51.5)	38.5 (30.2–46.9)
	All	47.9 (36.6–59.1)	37.9 (26.3–49.6)	48.9 (38.7–59.0)	45.4 (39.0–51.9)
ANG II receptor antagonists		*n* = 26	*n* = 43	*n* = 46	*n* = 115
	Men	28.6 (13.9–43.3)	33.1 (13.8–52.5)	18.2 (6.7–29.7)	25.9 (17.2–34.6)
	Women	21.7 (8.8–34.6)	50.3 (35.5–65.1)	44.0 (30.3–57.7)	38.5 (30.2–46.9)
	All	25.0 (15.3–34.8)	44.4 (32.5–56.4)	32.1 (22.6–41.6)	33.1 (27.0–39.2)
Calcium channel blockers		*n* = 30	*n* = 23	*n* = 33	*n* = 86
	Men	24.0 (10.1–37.8)	15.1 (0.4–29.8)	30.9 (17.1–44.7)	23.6 (15.1–32.0)
	Women	22.1 (9.1–35.0)	28.1 (14.8–41.4)	13.9 (4.3–23.4)	21.4 (14.3–28.4)
	All	23.0 (13.5–32.4)	23.6 (13.4–33.9)	21.7 (13.4–30.1)	22.3 (16.9–27.7)
Other		*n* = 3	*n* = 0	*n* = 1	*n* = 4
	Men	0.9 (0.0–4.1)	0.0 (0.0–0.0)	0.0 (0.0–0.0)	0.5 (0.0–1.9)
	Women	2.7 (0.0–7.9)	0.0 (0.0–0.0)	1.0 (0.0–3.7)	1.3 (0.0–3.3)
	All	1.9 (0.0–4.9)	0.0 (0.0–0.0)	0.5 (0.0–2.0)	1.0 (0.0–2.2)

*Number of participants using selected medication. ANG, angiotensin.

Although there are comprehensive Australian guidelines, there is still a substantial gap between evidence and practice.[4,21] Much work still needs to be done to overcome barriers for implementation at patient, professional, organizational, social, economic and political levels.[22] To improve the detection and management of hypertension in the community, there is a specific need for system improvements within general practice to manage hypertension and other CVD risk factors better. These systems are sometimes called chronic disease management programmes, the elements of which include a database of all patients with hypertension, a periodic recall system to check risk factors against the guidelines and commencement of appropriate treatment including lifestyle changes.[23,24] These systems can incorporate the broader contributions of other health professionals including practice nurses and pharmacists. Improvements have already occurred in the management of cardiovascular risk factors through the Australian National Primary Care Collaboratives.[25] In parallel with these systems, there is a need for population-based approaches to encourage people to have their BP measured and to reduce their sodium intake.

Study limitations and strengths

As the overall participation rate in the surveys (49%) and the number of participants in some subgroup analyses were small, some caution is needed when interpreting the results. A comparison of the socioeconomic background – including primary occupation, rate of unemployment and total gross income of the survey participants – with population statistics available[10] did indicate that the participants closely represented the true populations of the areas surveyed.[7,10] The strengths of the study are the provision of findings on rural areas and elderly Australians.

Conclusions

Overall, one-third of participants had hypertension; of these, two-thirds, 54% (95% CI 47–60) of men and 71% (95% CI 65–77) of women, were aware of their condition. Half of the participants with hypertension were treated and nearly half of these were controlled. Both treatment and control were more common in women (60%, 95% CI 54–67 and 55%, 95% CI 47–64 respectively) compared with men (42%, 95% CI 36–49 and 35%, 95% CI 26–44 respectively). Monotherapy was used by 55% (95% CI 48–61) of treated hypertensives. ACEI were the most frequently used class of antihypertensive drugs in men, whereas ACEI, angiotensin receptor antagonists and diuretics were all widely used among women.

This study emphasizes issues of suboptimal detection and treatment of hypertension in rural Australia, which will have serious future consequences in terms of cardiovascular outcomes if left unaddressed. There is a need for robust comparable results from regular risk factor prevalence surveys of the population in the future to measure the effect of our prevention and treatment strategies and to achieve ongoing success, as seen in the reduction in cigarette smoking.

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