Prevalence, awareness, treatment, and control rates of hypertension in the general population of Australia: a systematic review and meta-analysis

Xia Wang[a], J.E. Shaw[b], J. Yu[a], G. Jennings[b,c], B. Stavreski[c], D. Magliano[b], T.K. Gill[d], R. Adams[e], A. Rodgers[a], M. Woodward[a,f], M.P. Schlaich[g], R. Singleton[h,i,j,k], B. Zhou[h,i,j], and A.E. Schutte[a,k]

Background: A recent call-to-action highlighted that Australia is lagging behind high-income countries regarding hypertension control rates.

Methods: We performed a systematic literature search of reports on prevalence, awareness, treatment and control rates since 2010. We also undertook an individual participant data meta-analysis of six population-based studies in the general population from 1980 to 2018 to understand the size of the problem and trajectories over time.

Results: The aggregated data showed that after 2010, hypertension prevalence was 31%]95% confidence interval (CI) 27–34%], and awareness, treatment, and control rates among people with hypertension were 56% (41–71%), 54% (46–62%) and 34% (22–47%), respectively. Since 1980, these figures have shown slight improvement. However, we noted a low availability of quality nationwide randomized databases for Australia.

Conclusions: We require critical action to improve the prevention, detection and treatment of hypertension, and highlight the need for large-scale investment in tracking population health in order to produce vital health statistics for the nation.

Keyword: Hypertension

Abbreviations: BP, blood pressure; IPD, individual participant data; MOOSE, Meta-analysis Of Observational Studies in Epidemiology; NCD, non-communicable diseases; NHANES, the National Health and Nutrition Examination Survey; PBS, Pharmaceutial Benefits Scheme; SBP, systolic BP; SPC, single pill combination

INTRODUCTION

The Australian Burden of Disease Study Database shows that high blood pressure (BP) is a major risk factor for premature death and disability in Australians, contributing to an estimated 43% of coronary heart disease, 41% of stroke, 38% of chronic kidney disease, 32% of atrial fibrillation and flutter burden and 3.6% of dementia [1]. Based on the National Health Survey (2017–2018) and other screening studies, approximately 31–44% of adults have hypertension [2–5], and among them, more than half of those treated remain uncontrolled [5], with considerable health and economic consequences [6].

The Non-Communicable Diseases (NCD) Risk Factor Collaboration recently compared hypertension control rates across the world, and reported a control rate of 26% in Australia, which compared poorly to other high-income countries (e.g. 61% in Canada) [7,8], prompting us to publish a call-to-action to improve BP control in Australia [9]. This call-to-action piece was followed by the establishment of a National Hypertension Taskforce of Australia at the end of 2022 [10]. However, the NCD-Risk Factor Collaboration mainly included data from studies prior to 2010, which is insufficient to understand the current situation. For the Taskforce to act appropriately, it needs to fully understand the size of the problem. We, therefore systematically examined available evidence of hypertension prevalence, awareness, treatment, control rates, and use of antihypertensive medication in the general population in Australia. We also investigated how these outcomes varied by time and whether they differ by age or sex.

METHODS

Systematic review and meta-analysis of published studies

A comprehensive search strategy was developed in consultation with a university librarian and epidemiologists, and used to search two electronic databases (MEDLINE, and

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[a]The George Institute for Global Health, Faculty of Medicine and Health, University of New South Wales, NSW, [b]Baker Heart and Diabetes Institute, Melbourne, [c]Faculty of Medicine & Health, University of Sydney, Camperdown, NSW, [d]Adelaide Medical School, Faculty of Health and Medical Sciences, The University of Adelaide, Adelaide, [e]Adelaide Institute for Sleep Health, Flinders University, Bedford Park, SA, Australia, [f]George Institute for Global Health, Imperial College London, London, UK, [g]Dobney Hypertension Centre, Medical School – Royal Perth Hopsital Unit, The University of Western Australia, Perth, Australia, [h]Department of Epidemiology and Biostatistics, School of Public Health, [i]MRC Centre for Environment and Health, School of Public Health, [j]The Abdul Latif Jameel Institute for Disease and Emergency Analytics, School of Public Health, Imperial College London, London, UK and [k]School of Population Health, University of New South Wales, Sydney, Australia

Correspondence to A.E. Schutte, School of Population Health, University of New South Wales, 1466, Sydney, Australia. E-mail: a.schutte@unsw.edu.au

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Embase) for papers published between 1 January 2010 and 28 February 2023. The resultant systematic review was reported following the Meta-analysis Of Observational Studies in Epidemiology (MOOSE) guidelines [11]. For grey literature, we examined the reference lists of any relevant reviews identified. We also searched reports from population-based health surveys conducted by the Department of Health in Australia. For any data presented in reviews but not reported in the paper, authors were contacted to request original data. We only included reports which measured BP of the general population of Australia. Therefore, we will be able to report those figures from the same population. Reference screening, data extraction, and quality assessment using the Newcastle-Ottawa scale [12] were performed by X.W. and J.Y. Disagreements were resolved by a third author (A.E.S.).

Meta-analysis of individual participant data

We pooled individual participant data (IPD) from national, subnational or community population-based Australian studies from those included by the NCD-Risk Factor Collaboration. We extracted data on BP measurements, hypertensive status and on the use of antihypertensive medications in adults aged 18 years and older. Six out of 12 shared studies had such data in the general population, collected between 1980 and 2018 (Table 1, Supplemental Digital Content, http://links.lww.com/HJH/C555) [13,14].

Data synthesis of the data from the literature review and individual participant data

The data were pooled across studies using random effects models. The heterogeneity statistic was determined by I^2. We conducted a meta-regression by age/study year to explain the heterogeneity if a large heterogeneity appears (i.e., I^2 >75%). All statistical analyses were performed using R, version 4.2.2.

The main outcomes of interest were the percentages of hypertension, reporting a previous hypertension diagnosis (awareness), taking medication for hypertension (treatment), and BP being controlled (control), as well as the number of antihypertensive medications used. Hypertension was defined as having a systolic BP (SBP) of 140 mmHg or greater and/or diastolic BP (DBP) of 90 mmHg or greater or taking medication for hypertension [15]. Control was defined as taking medication for hypertension and having SBP <140 mmHg and DBP <90 mmHg among those with hypertension. The secondary outcome was the number of antihypertensive medications used based on data from the Australian National Health Survey 2017–2018, with data on hypertension status and the number of prescribed antihypertensive medications used.

RESULTS

For the literature review, of 2113 references obtained after the execution of the search strategy, 197 remained after screening titles and abstracts for relevance (Figure 1, Supplemental Digital Content, http://links.lww.com/HJH/C555). Six studies (N= 52,539) that satisfied the eligibility criteria, were included in the review (Table 2, Supplemental Digital Content, http://links.lww.com/HJH/C555). All the included studies were defined as high quality with scores ≥ 5 using Newcastle-Ottawa scale (Table 3, Supplemental Digital Content, http://links.lww.com/HJH/C555). Six further population-based health surveys were identified through a grey literature search (Table 4, Supplemental Digital Content, http://links.lww.com/HJH/C555). For the IPD, data from six (n = 49,306) studies, which had data on BP measurements and use of antihypertensive medications, were included in the analysis (Table 1, Supplemental Digital Content, http://links.lww.com/HJH/C555).

The pooled prevalence of hypertension in the general population of Australia decreased in the last four decades, which was 43% (95% CI, 29–57) before 2000, 39% (34–44%) during 2000–2010 and 31% (27–34%) after 2010 (Fig. 1). Among those participants with hypertension, the proportion of people who were aware of their condition was 47% (41–52%), 71% (65–77%) and 56% (41–71%) for the three periods, respectively. The proportions using antihypertensive medications [32% (25–40%), 43% (36–51%) and 54% (46–62%)] and BP controlled to less than 140/90 mmHg [8% (6–11%), 19% (16–22%) and 34% (22–47%)] improved over time (Figures 1–4, Supplemental Digital Content, http://links.lww.com/HJH/C555).

Our data show a higher hypertension prevalence among men than women until the 7th decade of life and this phenomenon is especially clear in the younger age groups (Table 5, Supplemental Digital Content, http://links.lww.com/HJH/C555). A higher proportion of men were unaware of their hypertensive status consistently across all the age groups. A higher proportion of women with hypertension was in the category of treated and controlled hypertension than men, consistently across all the age groups (Tables 6–8, Supplemental Digital Content, http://links.lww.com/HJH/C555, Fig. 2). There was an increasing trend in the proportion of treated and controlled hypertension over the years (P for trend <0.01).

Among people with hypertension from the Australian National Health Survey 2017, the proportion of participants using antihypertensive medication increased with age (Fig. 3). The proportions of participants with hypertension using zero, one, two, three or more types of antihypertensive medications were 44.5% (n = 1362), 35.4% (n = 1084), 14.2% (n = 435), 5.8% (n = 177) for men and 38.6% (n = 1223), 41.1% (n = 1303), 14.8% (n = 469), 5.6% (n = 176) for women, respectively. Table 9, Supplemental Digital Content, http://links.lww.com/HJH/C555 shows the number of antihypertensive medications used by BP-controlled status among participants with hypertension from the Australian National Health Survey 2017–2018. For those with uncontrolled hypertension and SBP 140–160 mmHg, the majority of the participants (65.8%, n = 2184) were not on antihypertensive medication and 22.4% (n = 744) used monotherapy. About a half of the participants (n = 401, 50.8%) with uncontrolled hypertension and SBP ≥160 mmHg were not on antihypertensive medication and 29.7% (n = 234) used monotherapy.

DISCUSSION

We reviewed available evidence regarding hypertension prevalence, awareness, treatment and control rates in the

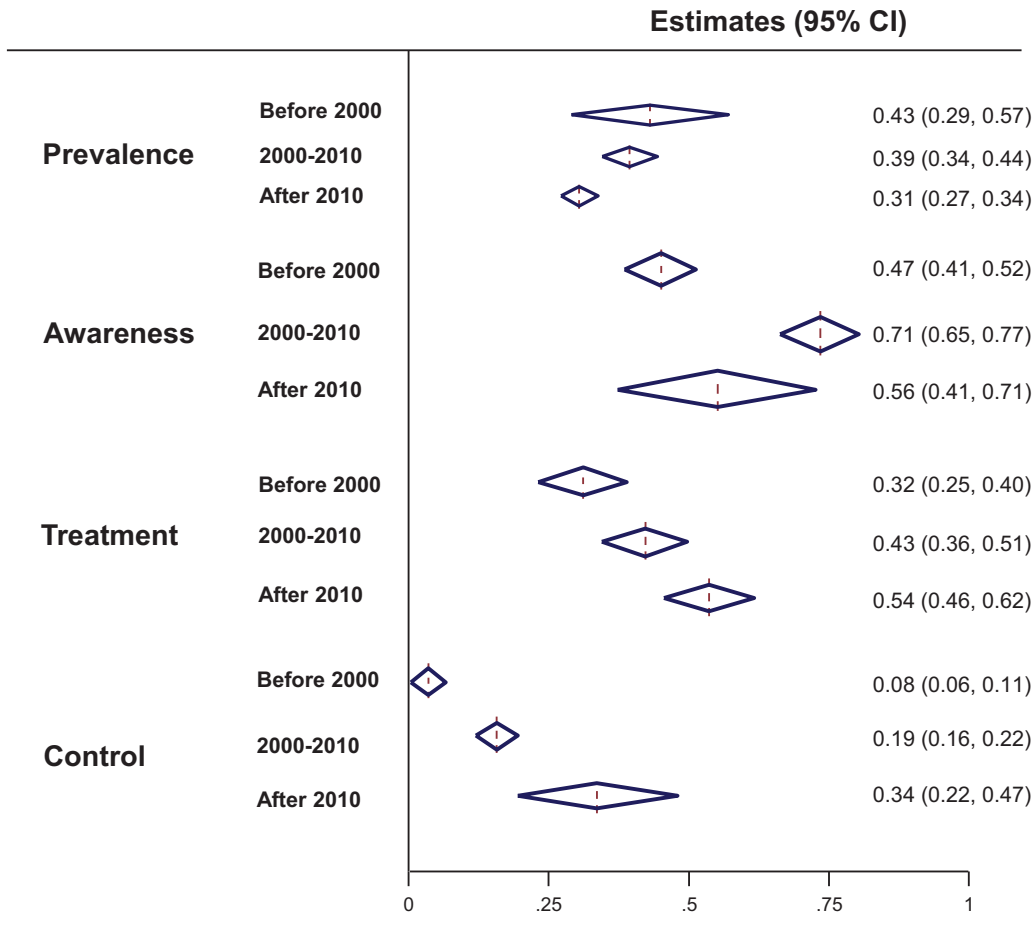

FIGURE 1 The prevalence, awareness, and control rates of hypertension in the general population in Australia.

general population in Australia and found that the pooled prevalence of hypertension in the general population of Australia after 2010 was 31%, with hypertension awareness, treatment, and control rates being 56%, 54% and 34%, respectively. There have been steady improvements in the prevalence of treatment and control rates over the past decades. Our IPD analysis based on data post 1980 allowed sex-specific approaches where we found more women being aware of their hypertensive status and being treated. Based on self-reported data from the 2017 National Health Survey, more than one in three people who self-reported hypertension did not use any medication, and about 40% were on monotherapy. Of those participants with uncontrolled hypertension, a half of them did not use any medication.

The proportion of people with BP controlled to <140/90 mmHg in Australia varies greatly in the literature, which is mainly due to the variation of different study populations and designs [5]. Some reports focus on opportunistic screening in the general population, including a convenience sample [5]. Some studies include random general population samples [14]. For example, the May Measurement Month initiative, a global opportunistic BP screening campaign initiated by the International Society of Hypertension and carried out in the general population of Australia in 2017, 2018 and 2019, found that the proportion of those treated and controlled was 24% among people with hypertension [5]. The NCD-Risk Factor Collaboration which only included data from random population samples, estimated that the BP control rate among those with hypertension in Australia was 25% (16–36%) and 27% (17–39%) in men and women, respectively [14]. The 2023 Global report on hypertension from the World Health Organization [16] indicated a control rate of 26% among people with hypertension. Data from the Australian Burden of Disease study which included BP measurements in 2017–2018, indicate a control rate of 32% [17]. Our systematic review has incorporated all those studies, including a broad representative sample and synthesized all available evidence to provide the most comprehensive data showing a BP control rate of 34%, and a steady improvement in control rates over time.

Most of the latest international guidelines [15,18–21] recommend dual single pill combination (SPC) therapy for most patients with hypertension as initial therapy. Several systematic reviews have clearly demonstrated that compared to standard monotherapy, initiating treatment with low-to-standard dose dual combination therapy is more efficacious in lowering BP without increasing withdrawals due to adverse events [22,23]. Some real-world databases have illustrated that initial combination treatment lead to a better BP control than initial monotherapy [24] and a reduced risk of cardiovascular events [24,25]. However,

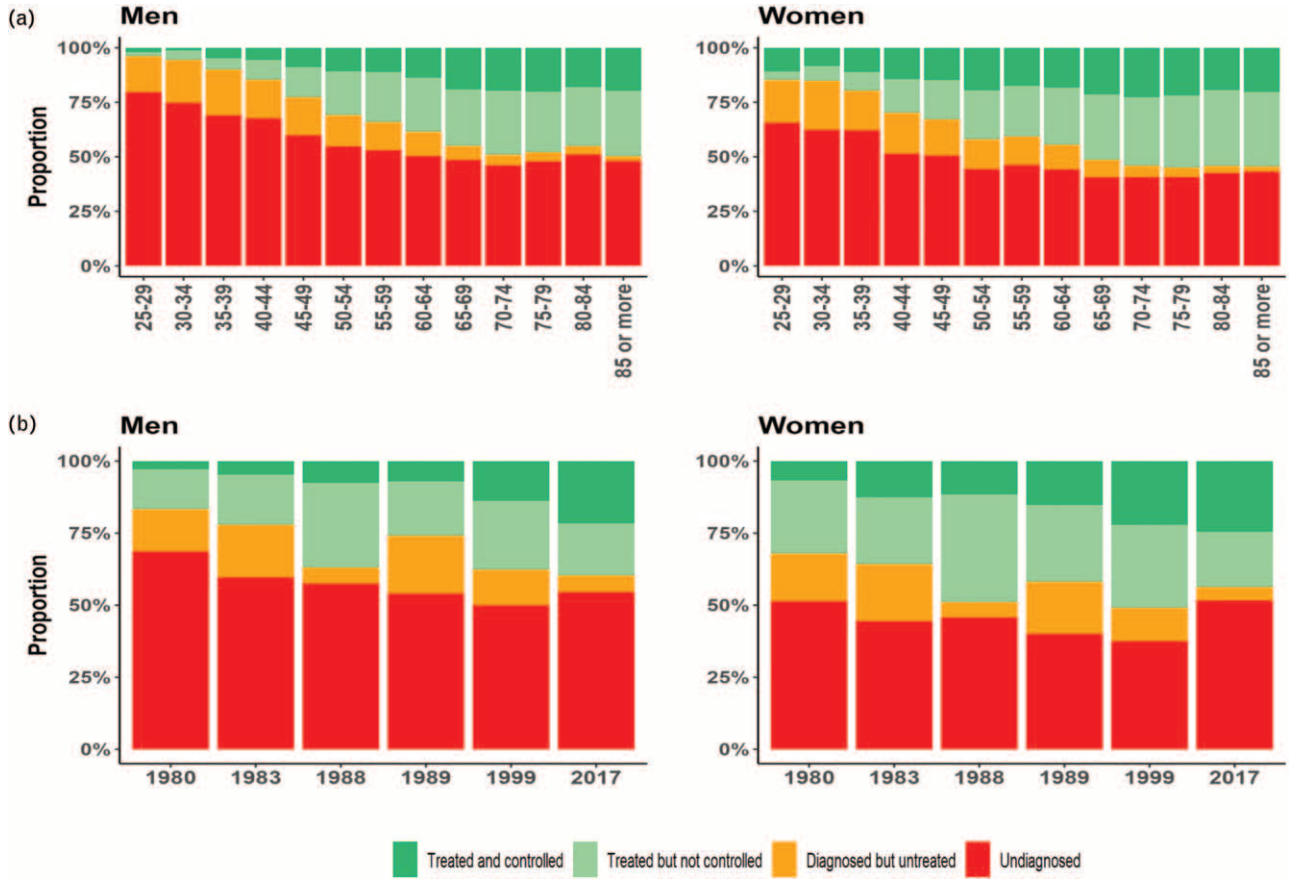

FIGURE 2 Sex-specific proportions of hypertension categories in the general Australian population from individual participant meta-analysis, by (a) age groups, and (b) study year. Treated and controlled: using antihypertensive medication and with BP <140/90 mmHg. Treated but not controlled: using antihypertensive medication and with SBP ≥140 and/or DBP ≥90 mmHg. Diagnosed but untreated: hypertension but not using antihypertensive medication. Undiagnosed: self-reported normotensive but with measured SBP ≥140 and/or DBP≥90 mmHg.

our data show that a quarter of Australian adults with uncontrolled BP are using monotherapy, which seem to align with the 2016 Australian Hypertension guidelines [26], but not with international best practice. This also fits with our earlier analysis based on prescription data from the Pharmaceutical Benefits Scheme (PBS) of Australia where script volumes for SPCs have plateaued since 2016 and remained significantly lower than scripts for monotherapy [27].

BP control in adults with hypertension in Australia is unsatisfactory as reflected by 34% in our analysis, which lagged behind Germany (58%), Canada (50%) and the USA (54%) but was comparable to the United Kingdom (37%) [28]. Compared to people with hypertension achieving BP control, those with uncontrolled BP exhibit a marked persistent elevation in the risk of heart failure, atrial fibrillation, chronic kidney disease, heart valve diseases, aortic syndromes and dementia, in addition to coronary heart disease and stroke [29], with a low rate of BP control being regarded as a major reason why hypertension remains the leading cause of death across the world [30]. The National Hypertension Taskforce of Australia therefore has a remit to improve BP control in Australia to at least 70% among people with hypertension by 2030. This manuscript serves as the first step to acknowledge the size of the problem and to guide the prioritization of key steps.

Our study has several strengths. This is the first comprehensive review of hypertension prevalence awareness, treatment and control in Australia. The shared IPD data is from high-quality and generalizable population-based studies free of the limitations of hospital-based or convenience samples. However, several limitations need to be noted. Firstly, it is noticeable that the pooled data showed high heterogeneity. Lastly, a major limitation of this analysis was the low availability of quality nationwide population-based randomized databases for Australia. We highlight here a critical need for large-scale investment in tracking population health in a similar format as e.g. the National Health and Nutrition Examination Survey (NHANES) in the United States as part of the Centres for Disease Control and Prevention, with the responsibility to produce vital health statistics for the nation.

In conclusion, our meta-analysis shows that the pooled proportion of hypertension in the general population of Australian adults after 2010 was 31%. About a half of the affected participants were unaware of their increased BP status. Of people with hypertension, only about half were using BP lowering medication and 34% had their BP controlled to <140/90 mmHg. Only 20% of hypertensive patients were treated with two or more antihypertensive drugs. Although treatment and control rates improved steadily over time, there remain major room for

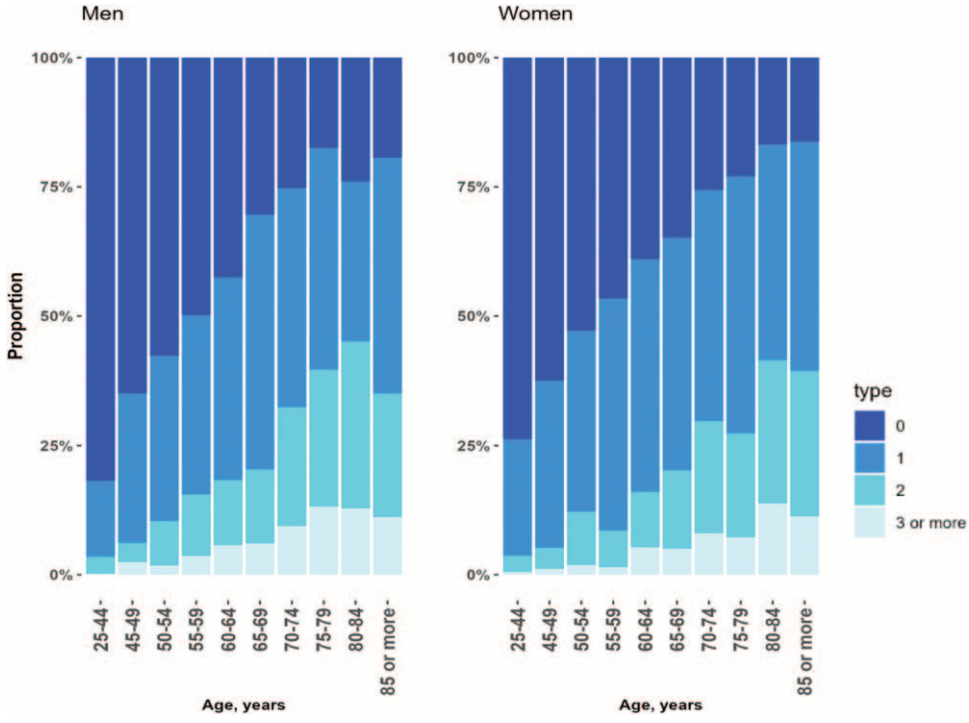

FIGURE 3 The number of antihypertensive medications used, by sex and age in those with hypertension, according to the National Health Survey 2017–2018.

improvement as have been done in other high-income countries. We highlight here a critical need for large-scale investment in tracking population health in order to produce vital health statistics for the nation.

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Conflicts of interest

There are no conflicts of interest.

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