



Missed Opportunities to Improve the Health of Postpartum Women: High Rates of Untreated Hypertension in Rural Tanzania

Elysia Larson¹ · Miriam Rabkin² · Godfrey M. Mbaruku³ · Redempta Mbatia⁴ · Margaret E. Kruk¹

© Springer Science+Business Media New York 2017

Abstract *Objectives* To assess the prevalence of high blood pressure amongst postpartum women in rural Tanzania, and to explore factors associated with hypertension prevalence, awareness, treatment, and control. *Methods* 1849 women in Tanzania's Pwani Region who delivered a child in the prior year participated in the study. We measured blood pressure, administered a structured questionnaire and assessed factors associated with the prevalence, awareness, treatment, and control of hypertension (HTN) using bivariable and multivariable logistic regressions. *Findings* 26.7% of women had high blood pressure and/or were taking antihypertensive medication. Women were on average 27.5 years old (range 15–54). Nearly all women (99.5%) reported contact with the health system during their pregnancy and delivery, with an average of 5.2 visits for their own care in the past year. Only 23.5% of those with HTN were aware of their diagnosis, 17.4% were taking medication, and only 10.5% had controlled blood pressure. In multivariable analysis, facility delivery, health insurance, and increased distance from a hospital were associated with increased likelihood of HTN awareness; facility delivery and hospital distance were associated with current hypertensive treatment; younger age and increased hospital

distance were associated with control of HTN. *Conclusion* The prevalence of high blood pressure in this postpartum population was high, and despite frequent recent contacts with the health system, awareness, treatment and control of HTN were low. These findings highlight an important missed opportunity to improve women's health during antenatal and postnatal care.

Keywords Health services research · Hypertension · Obstetrics and gynecology · Primary care

Significance

What is already known on this subject? The prevalence of hypertension among adults in Africa is growing, yet fewer than one-third of hypertensive individuals are aware of their status. The prevalence of hypertension, one's awareness of her hypertensive status, and treatment among postpartum women is unknown.

What does this study add? Hypertension is distressingly common among postpartum women in rural Tanzania. Despite frequent interactions with the health system, few women were aware of their diagnosis and only one in ten women had controlled blood pressure. This highlights a very important missed opportunity for the health system to integrate maternal healthcare with diagnosis, care, and treatment for non-communicable diseases, thus expanding the quality of care provided to women.

Introduction

The growing prevalence of non-communicable diseases (NCDs) in sub-Saharan Africa (SSA) has placed additional

✉ Elysia Larson
el Larson@mail.harvard.edu

¹ Department of Global Health and Population, Harvard T. H. Chan School of Public Health, 665 Huntington Ave, 11th floor, Boston, MA 02115, USA

² Mailman School of Public Health, Columbia University, New York, NY, USA

³ Ifakara Health Institute, Dar es Salaam, Tanzania

⁴ Tanzania Health Promotion Support, Dar es Salaam, Tanzania

pressure on health systems already burdened by high rates of infectious diseases and maternal and child health threats. Hypertension (HTN), for example, is among the top five risk factors for death and disability in SSA (Lim et al. 2012). A recent meta-analysis found high rates of untreated HTN across 33 African studies in 15 countries: HTN prevalence ranged from 15–70%, fewer than a third of hypertensive individuals were aware of their HTN, and fewer than 20% were on treatment (Ataklte et al. 2014).

One approach to expanding access to HTN diagnosis and treatment in SSA is to integrate HTN services into existing health programs and platforms. In countries with high rates of maternal healthcare utilization, such as Tanzania, the maternal health platform offers an important opportunity to diagnose, treat and control HTN amongst women of childbearing age. The prevalence of HTN amongst adults in Tanzania was 28.9% in 2014, (WHO 2016) suggesting that screening for high blood pressure during pregnancy will identify HTN as well as more transient conditions such as pre-eclampsia and eclampsia. Women who had hypertension, pre-eclampsia, or eclampsia during pregnancy should be followed after birth to monitor and treat HTN as needed. Because of the additional risks during pregnancy, we expect that unless treated properly, HTN in postpartum women would be higher than the general population (Vogel et al. 2014).

Although the prevalence of HTN amongst pregnant women is well studied, much less is known about post-partum women, who are at higher risk of death than the general population and often remain in frequent contact with the health system. To address this gap, we used cross-sectional data from a large cluster-randomized maternal health study in rural Pwani Region, Tanzania to assess the prevalence of HTN amongst postpartum women, as well as factors associated with women's awareness of their HTN diagnosis, report of current use of antihypertensive medication, and HTN control.

Methods

Study Setting and Participants

This analysis used cross-sectional data from a large cluster-randomized maternal and newborn health study: MNH+ (ISRCTN 17107760). The MNH+ study includes 24 government-managed primary health clinics and their catchment populations in four rural districts in Pwani Region, Tanzania. Study site selection was described previously (Kruk et al. 2014). Eligible women were identified via enumeration of all households within the government-designated catchment areas of 24 study facilities. Women were eligible if they were at least 15 years old, lived in the

catchment area, and had delivered a baby within 1 year prior to interview. The 1-year cutoff was chosen given recent evidence of increased risk of mortality during late post-partum periods and guidelines suggesting that pregnancy-related deaths include all mortality within 1 year of delivery (Hoj et al. 2003; Ronsmans and Graham 2006; Prevention CfDCa 2016). A simple random sampling strategy included stratification at the facility catchment level and random selection of 60% of women for inclusion.

Study staff interviewed women who provided written consent, or in the case of minors, those who provided assent and whose guardians provided consent. The study was approved by ethical review boards at Columbia University and Harvard University in the U.S., and the Ifakara Health Institute and the Tanzanian National Institute for Medical Research in Tanzania.

Tanzanian data collectors conducted the surveys in Swahili in February and March 2014. Survey questions from the Demographic and Health Surveys were used to ask women relevant questions about their blood pressure (Demographic and Health Surveys methodology 2011). Three sitting blood pressure (BP) measurements were taken on the same day, with 5–10 min rest between each measure. All women were provided with their results, and those who were identified as hypertensive were encouraged to visit local health facilities for further evaluation and treatment. The American Society of Hypertension/International Society of Hypertension staging guidelines were used to categorize women as having either normal BP, high normal BP, or stage 1 or 2 hypertension (Weber et al. 2014). A woman was thus coded as having high BP if her average systolic reading was greater than or equal to 140 mm Hg and/or her average diastolic reading was greater than or equal to 90 mm Hg. To assess women's awareness of their HTN we asked if they were ever told they had high BP. To assess treatment, we asked if they were currently taking BP medication. Normotensive women who were currently taking antihypertensive medications were considered to have controlled HTN.

Following a literature review, we assessed factors associated with the self-reported HTN diagnosis (awareness of one's own HTN), treatment, and control of HTN. We assessed demographic and household characteristics as well as the distance from the sub-village center where the woman lived to the nearest dispensary (primary care clinic) and hospital as potential predictors of access to care. We further explored participants' contact with the health system, as we would expect that women with more frequent contact would be more likely to receive diagnosis and treatment. To further assess the quality of women's prior interaction with the health system we asked participants if they had their BP measured during ANC, if they were offered and received an HIV test during ANC, and if they were given their test result.

We analyzed factors associated with awareness, treatment, and control of HTN using Stata 13.1 (StataCorp LP, College Station, USA). We calculated univariable statistics for the outcomes of interest and potential covariates. We conducted bivariable and multivariable analyses assessing factors associated with awareness of HTN diagnosis, use of antihypertensive medication, and control of HTN. Variables that were significant in the bivariable analyses at the $\alpha=0.25$ level were included in the multivariable analyses. We assessed correlation between covariates and did not include highly correlated variables in the multivariable model. Robust standard errors clustered at the facility catchment level were used.

Results

Data collection teams enumerated 31,544 households identifying 3452 eligible women. 2098 women were selected for inclusion in the study, of whom 1915 participated in the

survey (response rate of 91%). A majority of non-response to the survey (84.9%) was because the woman could not be located after three attempts. Of the 1915 women participating in the survey, 1849 (96.6%) had three BP readings taken.

Women were on average 27.5 years old (range 15–54). Most were married or living with a partner (82.3%), 209 (11.3%) had completed at least some secondary education, and 140 (7.6%) reported having some form of health insurance (Table 1). Nearly all women (99.5%) reported contact with the health system during their pregnancy and delivery, with 97.0% reporting at least one antenatal care visit, 81.4% reporting facility delivery, and an overall average of 5.2 visits for their own care (as opposed to care of infants or children) in the past year. When asked about receipt of specific health services, 84% of women reported having their BP measured during antenatal care. In contrast, 1782 (96.4%) women reported being offered an HIV test as part of their antenatal care. Of these, 1763

Table 1 Descriptive statistics for 1849 post-partum women, Tanzania 2014

	n (%) ^a
Maternal factors	
Age, mean (SD)	27.5 (7.0)
Muslim ^b	1490 (80.6)
Married or living with partner	1522 (82.3)
Head of household	105 (5.7)
Any secondary education	209 (11.3)
Farmer or homemaker ^c	1460 (79.3)
Listens to radio daily	981 (53.1)
Household has a bank or mobile money account	1153 (62.4)
Household owns a motorcycle	292 (15.8)
Number of deliveries, mean (SD)	3.3 (2.1)
Distance from hamlet center to nearest hospital (km), mean (SD)	36.2 (20.8)
Current smoker	4 (0.2)
Maternal interactions with the health system	
Has insurance	140 (7.6)
Number of visits to any health facility for self in past year, mean (SD)	5.2 (3.3)
Attended ANC for most recent pregnancy	1793 (97)
>3 ANC visits for most recent pregnancy	1212 (65.9)
Took antimalarial medications during pregnancy	1627 (91)
Took iron tablets or syrup during pregnancy	1787 (100)
Delivered most recent child in a health facility	1506 (82.3)
Experienced excessive bleeding in or post labor	341 (22.7)
Received a blood transfusion during delivery	27 (1.8)
Checked by healthcare provider after delivery, before discharge	651 (43.4)
Child received a postnatal check within 2 months post delivery ^d	1146 (76.5)

^aFor some rows denominators differ from 1849 due to missing data

^bCompared to 18.7% Christian and 0.7% no religion or other

^cCompared to 13.5% small sales and 7.2% other

^dDenominator includes only women who delivered at least 2 months prior to interview (n = 1297)

(98.8%) were tested and 1747 (99.1%) reported receiving their result.

On physical examination, 442 (23.9%) had high BP and an additional 52 (2.8%) were normotensive but taking BP medication. Only 23.5% of those with HTN were aware of their diagnosis, 17.4% were taking medication, and 10.5% had controlled BP (Fig. 1).

Factors Associated with Hypertension Awareness, Treatment, and Control

Awareness of Their Own Hypertension

Health facility deliveries were associated with increased odds of awareness of HTN diagnosis in the multivariable model (OR 1.95, 95% CI 1.11–3.42). Having health insurance was associated with increased odds of awareness, but was not statistically significant (OR 1.70, 95% CI 0.99–2.91) (Table 2). Increased distance from the nearest hospital was also statistically significant in this model, but only marginally increased the odds of awareness (OR 1.02, 95% CI 1.01–1.02).

Treatment

In multivariable analysis, increased distance from the nearest hospital was associated with taking antihypertensive medication (OR 1.01, 95% CI 1.00–1.02).

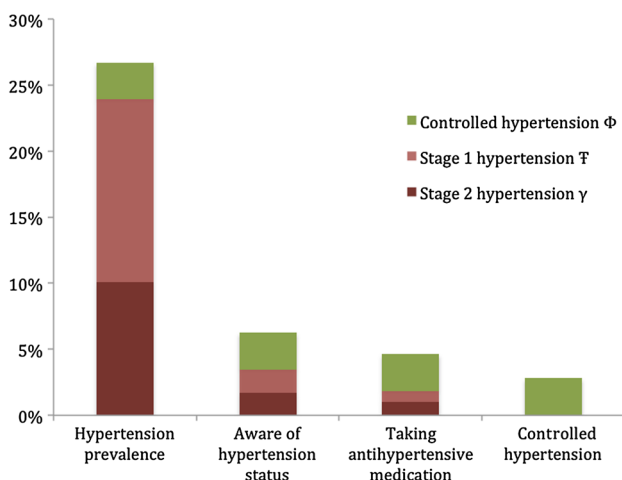


Fig. 1 Prevalence of hypertension, hypertension awareness, and hypertension control, by American Society of Hypertension and International Society of Hypertension staging classification (Classification is made based on the highest category indicated by either the systolic or diastolic reading) 1849 post-partum women, Tanzania 2014. Φ Normal BP reading with report of using antihypertensive medication. T Systolic pressure 140–159 mm HG or diastolic pressure 90–99 mm HG. γ Systolic pressure \geq 160 mm HG or diastolic pressure \geq 100 mm HG

Control

In multivariable analysis, older age was associated with decreased odds of hypertension control (OR 0.95, 95% CI 0.91–0.99) and increased distance from the hospital was associated with increased hypertension control (OR 1.02, 95% CI 1.01–1.03).

Discussion

Despite a high prevalence of HTN and frequent recent contacts with the health system, women's awareness of their HTN diagnosis was low, treatment was rare, and BP control was even rarer. This demonstrates a significant missed opportunity to improve the health of postpartum women in Tanzania. HTN is readily diagnosable and treatable by primary care providers; national treatment guidelines are available, and the appropriate medications are on Tanzania's essential medications list, are relatively inexpensive, and can be delivered in primary care environments. The failure to identify and control HTN amongst post-partum women despite their access to the health system may be the result of gaps in the preparedness of primary care clinics to address HTN; a previous study determined low levels of posted guidelines, diagnostic equipment, and health worker knowledge (Peck et al. 2014).

We found that women with higher ANC utilization, facility delivery, and health insurance were more likely to be aware of their high BP, and that women who delivered at a health facility were more likely to be taking antihypertensive medications, although this did not show strong statistical significance. It is possible that increased access to and contacts with the health system may have facilitated diagnosis and counseling, however, these effects were marginal. In addition, health system indicators, other than distance to nearest hospital, were not associated with increased likelihood of HTN control.

Interestingly, hypertensive women who lived further from the nearest hospital were marginally more likely to be aware of their diagnosis, be taking antihypertensive medication, and have their hypertension controlled. It is possible that these women were given more comprehensive care if health workers were aware that they had traveled far to receive services. However, this would likely only be in a few cases, as individuals rarely travel far for routine care. An additional hypothesis is that individuals in more rural areas have different beliefs about the causes of hypertension and thus respond differently to the care provided (Mshana et al. 2008). This finding should be further explored in future studies.

This study has several limitations. Firstly, because the study is cross-sectional the associations examined here

Table 2 Bivariable and multivariable regression of factors associated with awareness, treatment, and control among hypertensive women

Bivariable	Awareness		Treatment		Control	
	Ever received hypertension diagnosis OR [95% CI] n=494	Ever received hypertension diagnosis OR [95% CI] n=452	Currently taking antihypertensive medication OR [95% CI] n=494	Currently taking antihypertensive medication OR [95% CI] n=451	Controlled hypertension OR [95% CI] n=494	Controlled hypertension OR [95% CI] n=484
	Multivariable	Multivariable	Bivariable	Multivariable	Bivariable	Multivariable
Health characteristics						
Mid-upper arm circumference						
≤25% (small-est)	Reference	Reference	Reference	NI	Reference	NI
26–50%	1.19 [0.62–2.29]	1.04 [0.49–2.22]	1.14 [0.54–2.44]	NI	0.75 [0.32–1.76]	NI
51–75%	1.64 [0.73–3.66]	1.43 [0.62–3.30]	1.85 [0.62–5.49]	NI	0.98 [0.25–3.78]	NI
76–100% (largest)	2.29* [1.25–4.19]	1.74 [0.89–3.38]	1.73 [0.81–3.66]	NI	1.27 [0.49–3.28]	NI
Number of children	0.91* [0.84–1.00]	0.97 [0.89–1.07]	0.92** [0.85–1.00]	NI	0.77** ^a [0.66–0.90]	NI
Time since delivery (weeks)	0.99 [0.98–1.00]	NI	0.99 [0.97–1.01]	NI	1.01 [0.99–1.03]	NI
Demographic and household characteristics						
Age	1.00 [0.97–1.03]	NI	0.98 [0.96–1.01]	0.99 [0.96–1.02]	0.93** [0.90–0.97]	0.95* [0.91–0.99]
Any secondary education	1.99* [1.05–3.77]	1.44 [0.64–3.21]	1.39 [0.68–2.82]	NI	2.39* [1.10–5.20]	2.06 [0.96–4.40]
Poorest quintile	0.45 [0.24–0.84]	0.65 [0.32, 1.32]	0.56 [0.26–1.19]	0.74 [0.35, 1.56]	0.51 [0.24–1.08]	0.62 [0.30–1.30]
Health system access and experience						
Has health insurance	2.68*** [1.75–4.10]	1.70 [0.99–2.91]	1.87* [1.11–3.15]	1.49 [0.81–2.75]	1.38 [0.68–2.79]	NI
Distance from hamlet center to nearest dispensary (km)	0.97 [0.89–1.05]	NI	0.99 [0.90–1.08]	NI	0.95 [0.79–1.13]	NI
Distance from hamlet center to nearest hospital (km)	1.01** [1.00–1.02]	1.02*** [1.01–1.02]	1.01* [1.00–1.02]	1.01** [1.00–1.02]	1.01* [1.00–1.02]	1.02*** [1.01–1.03]
>3 ANC visits for most recent pregnancy	1.62* [1.06–2.46]	1.61 [0.90–2.91]	1.42 [0.87–2.32]	1.50 [0.83–2.70]	1.35 [0.70–2.63]	NI
Delivered most recent child in a health facility	2.22** [1.28–3.86]	1.95* [1.11–3.42]	2.31 [0.91–5.86]	2.41 [0.97–6.01]	1.96 [0.88–4.33]	1.96 [0.84–4.57]

Table 2 (continued)

	Awareness		Treatment		Control	
	Ever received hypertension diagnosis OR [95% CI] n=494	Ever received hypertension diagnosis OR [95% CI] n=452	Currently taking antihypertensive medication OR [95% CI] n=494	Currently taking antihypertensive medication OR [95% CI] n=451	Controlled hypertension OR [95% CI] n=494	Controlled hypertension OR [95% CI] n=484
	Bivariable		Bivariable		Bivariable	
Received a postnatal visit within 2 months of delivery	1.17 [0.69–1.97]	NI	1.29 [0.65–2.55]	NI	1.24 [0.58–2.64]	NI
Number of visits to any health facility for self in past year	1.07 [0.99–1.16]	1.04 [0.97–1.13]	1.04 [0.98–1.10]	1.02 [0.96–1.09]	1.02 [0.98–1.07]	NI

For some rows sample size differs owing to missing data

NI not included. This variable was not included in the multivariable model as it did not have a significant association with the outcome during bivariable analysis

* < 0.05

** < 0.01

*** < 0.001

^aNumber of previous children was co-linear with age and thus not included in the multivariable model

should not be interpreted as causal. Secondly, the study was limited to four districts in one region of Tanzania and may not be generalizable to other areas. However, the utilization of maternal care in Pwani Region is similar to other rural regions in the country. According to the 2010 Demographic and Health Survey 99.5% of pregnant women in Pwani had at least one antenatal care visit compared to 95.9% country-wide. Utilization of health facilities for childbirth was similar to some rural regions, but higher than many (DHS 2010). Thirdly, our data on prior diagnosis is based on self-report. If participants' recall was incomplete, it is possible that high BP was previously identified in more women than reported. Finally, there could be an overestimation of HTN prevalence, as diagnosis was based on measurements made during a single visit, while in clinical practice diagnosis would require BP measurements on several days. However, the methods employed here have been utilized widely in comparable studies (Chow et al. 2013; Jenson et al. 2011; WHO 2012; Hendriks et al. 2012).

As countries work toward achieving the goals of the "Global action plan for the prevention and control of NCDs 2013–2020", (WHO 2013) it will be necessary for the health system to adapt and leverage the existing frequent interactions with pregnant and postpartum women to detect and treat these common conditions. The ability of the system to diagnose, counsel, and treat women for HIV, another common illness among women of childbearing age, suggests that providing quality care for chronic illnesses is feasible, given sufficient resources and political support. Strengthening of the quality of primary care by including common NCDs will not only improve women's health but also potentially improve their future birth outcomes and the health of their newborns.

Acknowledgements This work was supported by the National Institutes of Health [R01 AI093182-04]. All authors received funding support from this Grant for this manuscript. The funder did not participate in the planning, execution, or analysis of the research and the authors had full control of all primary data. ISRCTN17107760.

Compliance with Ethical Standards

Conflict of interest The authors declare that they no conflict of interest.

References

- Ataklte, F., Erqou, S., Kaptoge, S., et al. (2014). Burden of undiagnosed hypertension in Sub-Saharan Africa: A systematic review and meta-analysis. *Hypertension*, 65(2), 291–298. doi:10.1161/hypertensionaha.114.04394.
- Chow, C. K., Teo, K. K., Rangarajan, S., et al. (2013). Prevalence, awareness, treatment, and control of hypertension in rural and urban communities in high-, middle-, and low-income countries. *Jama*, 310(9), 959–968. doi:10.1001/jama.2013.184182.
- Biomarker manual. (2011). *Demographic and health surveys methodology*. MEASURE DHS/ICF Macro.
- DHS Tanzania Demographic and Health Survey. (2010). Dar es Salaam: National Bureau of Statistics (NBS) [Tanzania]; ICF Macro, 2011.
- Hendriks, M. E., Wit, F. W., Roos, M. T., et al. (2012). Hypertension in sub-Saharan Africa: Cross-sectional surveys in four rural and urban communities. *PLoS ONE*, 7(3), e32638. doi:10.1371/journal.pone.0032638.
- Hoj, L., da Silva, D., Hedegaard, K., et al. (2003). Maternal mortality: Only 42 days? *BJOG: An International Journal of Obstetrics and Gynaecology*, 110(11), 995–1000.
- Jenson, A., Omar, A. L., Omar, M. A., et al. (2011). Assessment of hypertension control in a district of Mombasa, Kenya. *Global Public Health*, 6(3), 293–306. doi:10.1080/17441692.2010.510478.
- Kruk, M. E., Hermsilla, S., Larson, E., et al. (2014). Bypassing primary care clinics for childbirth: a cross-sectional study in the Pwani region, United Republic of Tanzania. *Bulletin of the World Health Organization*, 92(4), 246–253. doi:10.2471/BLT.13.126417.
- Lim, S. S., Vos, T., Flaxman, A. D., et al. (2012). A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: A systematic analysis for the Global Burden of Disease Study 2010. *Lancet*, 380(9859), 2224–2260. doi:10.1016/S0140-6736(12)61766-8.
- Mshana, G., Hampshire, K., Panter-Brick, C., et al. (2008). Urban-rural contrasts in explanatory models and treatment-seeking behaviours for stroke in Tanzania. *Journal of biosocial science*, 40(1), 35–52. doi:10.1017/S0021932007002295.
- Peck, R., Mghamba, J., Vanobberghen, F., et al. (2014). Preparedness of Tanzanian health facilities for outpatient primary care of hypertension and diabetes: A cross-sectional survey. *The Lancet Global Health*, 2(5), e285–e292. doi:10.1016/S2214-109X(14)70033-6.
- Prevention CfDca. (2016). Reproductive health: Pregnancy-related deaths. Secondary reproductive health: Pregnancy-related deaths. Retrieved from <http://www.cdc.gov/reproductivehealth/maternalinfanthealth/pregnancy-relatedmortality.htm>.
- Ronsmans, C., & Graham, W. J. (2006). Lancet Maternal Survival Series steering g. Maternal mortality: who, when, where, and why. *Lancet*, 368(9542), 1189–1200. doi:10.1016/S0140-6736(06)69380-X.
- Vogel JP, Souza JP, Mori R, et al. (2014). Maternal complications and perinatal mortality: Findings of the World Health Organization Multicountry Survey on maternal and newborn health. *BJOG: An International Journal of Obstetrics and Gynaecology* 121(Suppl 1):76–88 doi:10.1111/1471-0528.12633.
- WHO. (2012). *Tanzania steps survey-2012 fact sheet*. World Health Organization.
- WHO. (2013). *Global action plan for the prevention and control of noncommunicable diseases*. Geneva, Switzerland.
- WHO. (2016) *Global health observatory (GHO) data; Blood pressure. Secondary global health observatory (GHO) data; Blood pressure*. Retrieved from http://www.who.int/gho/ncd/risk_factors/blood_pressure_prevalence/en/.
- Weber, M. A., Schiffrin, E. L., White, W. B., et al. (2014). Clinical practice guidelines for the management of hypertension in the community: A statement by the American Society of Hypertension and the International society of hypertension. *Journal of Clinical Hypertension*, 16(1), 14–26. doi:10.1111/jch.12237.