GENDER DIFFERENTIALS in HYPERTENSION CASCADE in INDIA: EVIDENCE from NATIONAL FAMILY HEALTH SURVEY-5 (2019-21)

Abstract

While there is evidence on gender difference in prevalence of hypertension in India, evidence is limited on gender differences in hypertension awareness, treatment and control (ATC). There is no evidence on hypertension ATC at local levels, such as districts in India. Using data from National Family health Survey-5 (2019-21), we examined gender differences in hypertension ATC at district level in India and the role of healthcare utilization on the ATC rates. While prevalence of hypertension is higher among men than women, hypertension ATC rates are significantly higher among women. Gender difference in ATC rates are much higher in the reproductive age (15-49) while it declines among adults age 50 years or more. While four or more antenatal care (ANC) visits was associated with lower difference in awareness in spatial regressions, four or more ANC visits was associated with larger gender difference in treatment. Hypertension ATC rates, though higher among women than men, were quite low among even among women. Promoting four or more ANC visits could be a cost-effective intervention that India may pursue to increase hypertension ATC among women. Screening husbands of pregnant women with measured hypertension during ANC visits could help improve hypertension ATC among men.

Introduction

Hypertension is one of the world's leading risk factors for death and disability. Hypertension is an important public health problem that leads to stroke, heart attack, heart failure, kidney damage and many other health problems (Forouzanfar et al 2017, GBD 2019). The prevalence of hypertension is on the rise; estimates show that the number of adults living with hypertension doubled from 650 million in 1990 to 1.3 billion in 2019 (NCD Risk Factor Collaborator 2019). It has been estimated that high systolic blood pressure is the single most important risk factor for early death worldwide, leading to an estimated 10.8 million avoidable deaths every year, and a burden of 235 million years of life lost or lived with a disability (disability-adjusted life years, DALYs) annually (GBD 2019).

Despite decades of public health education, hypertension awareness, treatment and control (ATC) remain problematic, with only 54% of the adult aged 30-79 years are aware of hypertension, 42% are on treatment and 21% have had their hypertension controlled. Moreover, hypertension ATC varies by gender and place of residence.

Few studies have examined gender differences in hypertension awareness, treatment and control. Globally, the percentage of women with hypertension who are currently being treated is estimated to be 47%, compared with only 38% of men. The same pattern holds for the likelihood of being aware and

the likelihood of having controlled hypertension. Studies from India also reported that female have had higher awareness, treatment and control of hypertension than male (Mohanty et al 2021, Jinkook Li 2022, Jonas Prenissl 2019). However, none of the studies from India have examined whether gender differences in ATC vary by broad age-groups. For example, do observed gender differentials in hypertension ATC during reproductive period (15-49) persist among older adults aged 60 or more. Moreover, none of the Indian studies have examined gender differentials in ATC at more local levels, such as districts. Having evidence on gender differentials in hypertension ATC at national level may not help in policy formulation in a large and diverse country like India. Furthermore, none of the previous studies have evaluated the role of antenatal visits by women of reproductive age in increasing or narrowing gender differentials in hypertension ATC in India.

Having noted the limited evidence on hypertension ATC in India, we used nationally representative data from National Family Health Survey (NFHS) 2019-21 to examine gender difference in hypertension ATC, stratified by broad age-groups.

Data and Methods

We used cross-sectional, population-based secondary data from National Family Health Survey (NFHS-5) conducted during 2019-21. The survey was conducted across 707 districts spread across 28 states and 8 union territories of India. A total of 2,843,917 individuals from 636,699 households were covered. Of the 2,843,917 individuals, 2,078,315 were aged 15 years or more. Information on hypertension were collected for all individuals aged 15 years or more in the surveyed households.

Outcome variables

Hypertension was measured for all women and men aged 15 years or more using a standardized OMRON™ digital BP monitor. Blood pressure measurements for each respondent were taken three times with an interval of five minutes between readings.

We classified participants as having hypertension if they had systolic BP >=140 mm Hg or diastolic BP>=90 mm Hg; or they reported ever having been told they had high BP on two or more occasions by doctor or health professionals, and they reported currently taking prescribed medication to control BP. We classified participants with hypertension as “aware” if they reported having been diagnosed with hypertension; “treated” if they reported currently taking prescribed medication to control BP; and “controlled” if they had systolic BP <140 mm Hg and diastolic BP <90 mm Hg using the survey measurement of BP.

Methods

To estimate hypertension prevalence, we used all individuals aged 15 years or older in the households. We used a subsample of these individuals who were identified as having hypertension to estimate hypertension ATC. We estimated sex stratified prevalence of hypertension, and hypertension ATC rates nationally, and by selected socioeconomic and demographic characteristics such as; age group (15-29 years, 30-49 years, 50-59 years, 60-69 years, 70+ years), education (no education, primary, secondary, and higher), marital status (unmarried, currently married, divorce/separated/widow/deserted), caste (scheduled caste, scheduled tribes, other backward classes, others), religion (Hindu, Muslim, Christian, others), wealth index (poorest, poor, middle, rich, richest) and place of residence (rural, urban).

As women are more likely to visit healthcare due to routine gynaecological services and birth control particularly in the reproductive age group (15-49 years), there is a possibility that female male differences in hypertension ATC may decline after the completion of the reproductive age. Therefore, we compared female-male difference in hypertension ATC at district level by two broad age groups - 15-49 years and 15 years or older - to understand the role of healthcare services in explaining gender difference in hypertension ATC.

We applied sampling weights and took account of survey design in all the estimations. All the analyses were done using Stata 18.0.

Results

About 35% of the participants are in the age group 15-29 years; 21.4% belonged to 30-49 years and about 16.4% were 60 years or older. Majority of the participants were female (53.9%). Educational attainment was low: one-fourth had no formal schooling while only 14.0% had higher education. Majority of the participants were currently married (69.8%), belonged to the other backward classes (46.5%), were Hindu (82.6%) and resided in rural area (68.3%).

Women had lower prevalence of hypertension (25.2%; 95% CI: 24.8-25.6) than men (25.7%; 95% CI: 25.3-26.2) (**Figure 1**). While 47.1% (95% CI: 46.8-47.7) of women were aware about their hypertension status, only 33.1% (95% CI: 32.6-33.4) of men were aware. Likewise, treatment was also higher among women (29.6%; 95% CI: 29.2-30.0) than men (22.1%; 95% CI: 21.8-22.5). Hypertension control was also higher among women than men. Fifteen percent of women (95% CI: 14.5-15.1) had controlled hypertension compared with 7.9% men (95% CI: 7.7-8.3). Gender differences in hypertension ATC was statistically significant.

Hypertension ATC for men and women by broad age-groups are shown in **Figure 2**. Gender difference in hypertension ATC was highest among younger age group while it monotonically declined with age. For example, about half (48.7%; 95% CI: 47.7-49.8) of the women age 15-29 were aware about their hypertension status compared with only 19.5% (95% CI: 18.7-20.3) of the men. The gender gap in awareness between women and men declined with increasing age; gender gap was least among adults age 70 years or older. A similar trend was observed in case of treatment. Interestingly, gender gap in controlled hypertension was observed in favour of females till the age of 59, while after 60+ controlled hypertension was higher among men than women.

Female-male difference in hypertension ATC for age group 15-49 years and 50+ years at district level are shown in **Figure 3**. Negative estimates indicate that districts have higher ATC among men than women while positive values indicate higher ATC among women. Female-male differences in hypertension awareness among age 15-49 ranged from -5.2% in Longleng district of Nagaland to 46.1% in Villupuram districts of Tamil Nadu. While among age group 50+, it ranged from -14.4% in East Garo Hills district of Meghalaya to 29.8% in Faridabad district of Haryana. In the age group 15-49, hypertension awareness was higher among women than men in 696 districts out of the total 707 districts.

Similarly, female-male difference in treatment among age 15-49 ranged between -13.5% in Sahibganj district of Jharkhand to 29.1% in North district of Goa. While among age group 50+, it ranged from 15.6% in Nagoan district of Assam to 28.5% in Ribhoi district of Meghalaya. The number of districts with higher treatment among women than men declined from 643 districts among age group 15-49 to 602 districts among age group 50+. Female-male difference in controlled hypertension among age group 15-49 ranged from -5.8% Hugli district of West Bengal to 39.1% in Villupuram district of Tamil Nadu. Among age group 50+, controlled hypertension ranged from -8.6% in Nalanda district of Bihar to 14.4% in Sonipat district of Haryana. The number of districts with higher controlled hypertension for women than men declined from 682 districts for 15-49 age-group to 434 districts for 50+ age group.

Results of spatial OLS and spatial error model to examine the role of ANC visits on hypertension ATC are presented in **Table 1**. Higher coverage of four or more ANC at district level was negatively associated with female-male difference in awareness among age-group 15-49, while the association was positive but not significant in the age group 50+. Higher coverage of four or more ANC was positively associated with female-male difference in treatment among both 15-49 and 50+ age groups. Four or more ANC was also negatively associated with female-male difference in controlled hypertension among both the age groups. Interestingly higher insurance converge was positively associated with female-male difference in hypertension treatment in both the age groups.

Conclusion

Finding shows that while prevalence of hypertension is higher among men than women, hypertension ATC rates were significantly higher among women than men. Gender difference in ATC rates were much higher during reproductive age (15-49) while it declines after age 50. While four or more ANC visits was significantly associated with larger difference in treatment between women and men, it was associated with lower female-male difference in awareness. Hypertension ATC rates, though higher among women than men, were quite low among even among women. Promoting four or more ANC visits could be a cost-effective intervention that India may pursue to increase hypertension ATC among women. Screening husbands of pregnant women with measured hypertension during ANC visits could help improve hypertension ATC among men.

References

Forouzanfar MH, Liu P, Roth GA, Ng M, Sibryukov S, Marczak L, et al. Global burden of hypertension and systolic blood pressure of at least 110 to 115 mmHg, 1990- 2015. JAMA. 2017 Jan 10;317(2):165-182. doi: 10.1001/jama.2016.19043

GBD 2019 Risk Factors Collaborators. Global burden of 87 risk factors in 204 coun- tries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. Lancet. 2020 Oct 17;396(10258):1223-1249. doi: 10.1016/ S0140-6736(20)30752-2.

Lee, Jinkook, et al. "Hypertension awareness, treatment, and control and their association with healthcare access in the middle-aged and older Indian population: A nationwide cohort study." PLoS Medicine 19.1 (2022): e1003855.

Mohanty, Sanjay K., et al. "Awareness, treatment, and control of hypertension in adults aged 45 years and over and their spouses in India: A nationally representative cross-sectional study." *PLoS Medicine* 18.8 (2021): e1003740.

Prenissl, Jonas, et al. "Hypertension screening, awareness, treatment, and control in India: a nationally representative cross-sectional study among individuals aged 15 to 49 years." *PLoS medicine* 16.5 (2019): e1002801.

Figure 1. Gender differentials in hypertension prevalence, awareness, treatment and control among adults aged 15 years or older, India, NFHS-5 (2019-21)

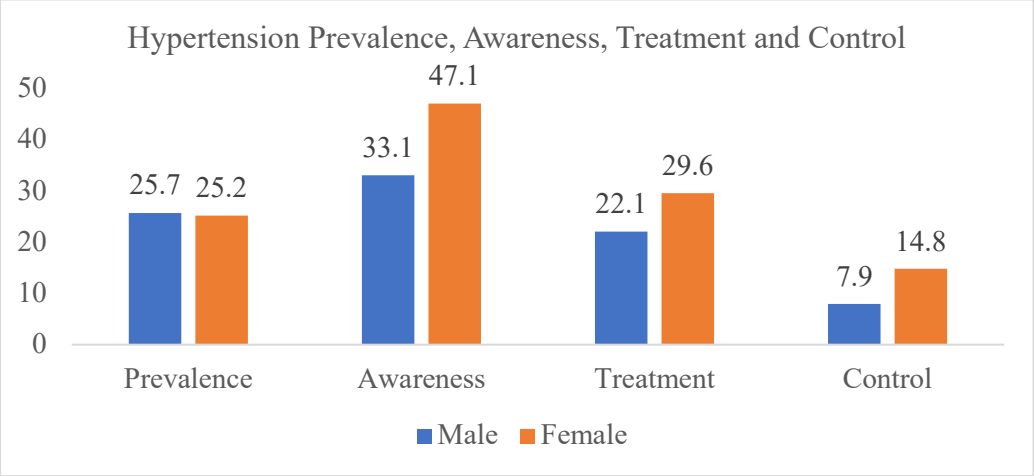

Figure 2. Gender differentials in awareness, treatment and control of hypertension by age groups, India, NFHS (2019-21)

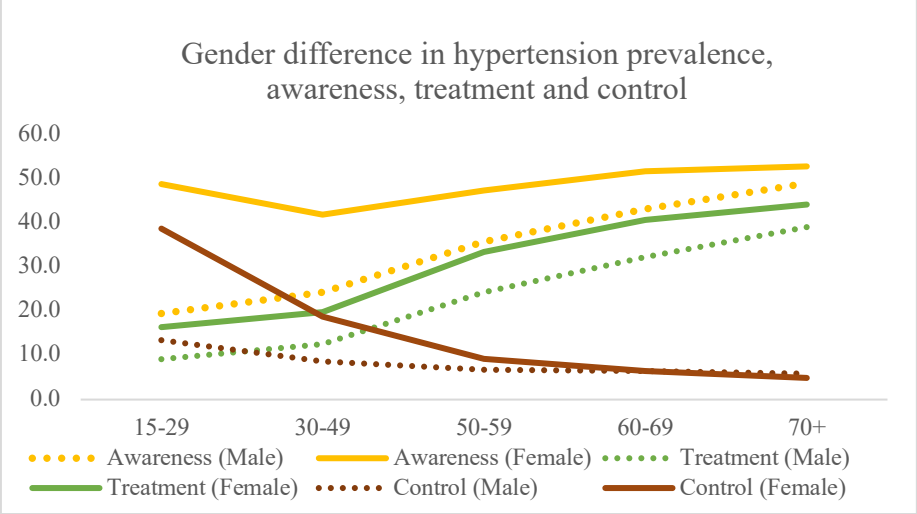

Figure 3. Gender differentials in awareness, treatment and control of hypertension among age groups 15-49 years and 50+, India, NFHS (2019-21)

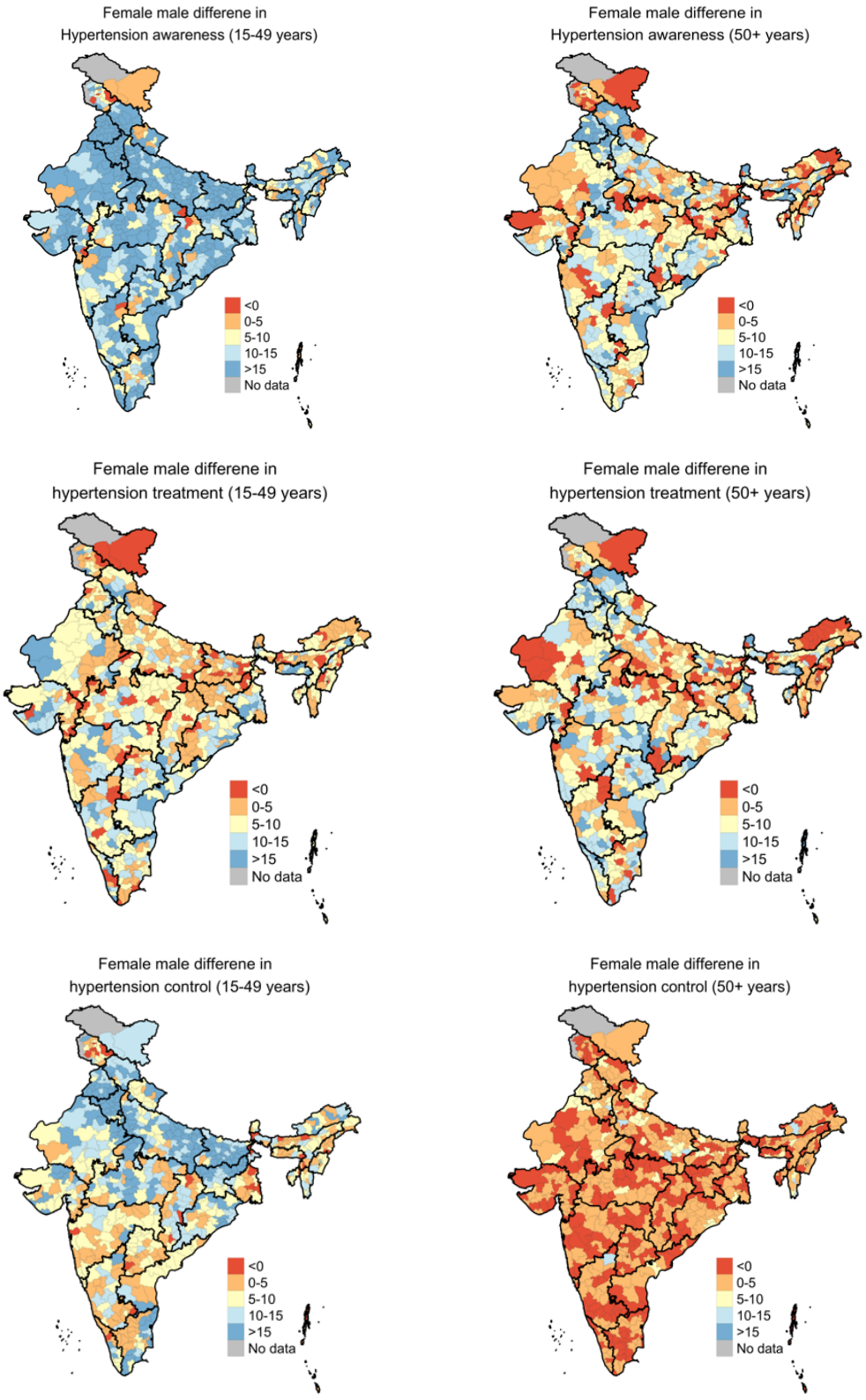

Table 2. Socioeconomic determinants of female male difference in awareness treatment and control of hypertension among 15-49 years and 50+ in India, NFHS-5 (2019-21)

	Hypertension awareness (15-49)		**Hypertension awareness (50+)**	
	OLS	**SER**	**OLS**	**SER**
Four or more ANC	-0.088(0.019)*	-0.065(0.023)*	0.017(0.014)	0.018(0.017)
Urban	-0.014(0.021)	-0.002(0.023)	0.003(0.016)	-0.01(0.017)
Muslim	-0.107(0.020)*	-0.09(0.026)*	-0.045(0.016)*	-0.039(0.019)*
Secondary and higher education	0.008(0.034)	-0.018(0.041)	-0.078(0.026)*	-0.081(0.032)*
Poor	-0.087(0.020)*	-0.069(0.026)*	-0.094(0.015)*	-0.087(0.019)*
SC/ST	-0.075(0.016)*	-0.06(0.019)*	-0.017(0.013)	-0.017(0.015)
Insurance	-0.031(0.015)*	-0.005(0.018)	-0.003(0.011)	0.001(0.014)
LAMDA		0.441(0.043)*		0.400(0.044)*
	Hypertension treatment (15-49)		**Hypertension treatment (50+)**	
	OLS	**SER**	**OLS**	**SER**
Four or more ANC	0.040(0.012)*	0.041(0.014)*	0.04(0.013)*	0.04(0.014)*
Urban	0.015(0.013)	0.017(0.014)	-0.007(0.014)	-0.007(0.015)
Muslim	-0.021(0.013)	-0.023(0.015)	-0.028(0.014)*	-0.03(0.016)
Secondary and higher education	-0.012(0.021)	-0.028(0.025)	-0.054(0.023)*	-0.06(0.026)*
Poor	-0.025(0.012)*	-0.021(0.015)	-0.08(0.013)*	-0.075(0.015)*
SC/ST	-0.024(0.010)*	-0.031(0.012)*	-0.011(0.011)	-0.012(0.012)
Insurance	0.02(0.009)*	0.021(0.011)*	0.005(0.010)	0.006(0.011)
LAMDA		0.261(0.049)*		0.23(0.050)*
	Hypertension control (15-49)		**Hypertension control (50+)**	
	OLS	**SER**	**OLS**	**SER**
Four or more ANC	-0.129(0.017)*	-0.112(0.020)*	-0.022(0.007)*	-0.019(0.008)*
Urban	-0.012(0.019)	-0.014(0.020)	-0.005(0.008)	-0.006(0.008)
Muslim	-0.102(0.018)*	-0.072(0.023)*	-0.015(0.007)*	-0.012(0.009)
Secondary and higher education	0.016(0.030)	0.03(0.037)	0.004(0.012)	0.007(0.014)
Poor	-0.044(0.017)*	-0.044(0.023)	-0.025(0.007)*	-0.021(0.009)*
SC/ST	-0.066(0.015)*	-0.033(0.017)	0.01(0.006)	0.01(0.007)
Insurance	-0.038(0.013)*	-0.014(0.016)	-0.01(0.005)	-0.009(0.006)
LAMDA		0.469(0.041)*		0.259(0.049)*