

A Community-Based Study of Prevalence and Risk Factors Associated with Hypertension in Geriatric Population under the Field Practice Area of RHTC (Achrol), Jaipur, Rajasthan

Shailendra Kumar Sharma¹, Dharmendra Mandarwal^{2*}, Sumit Ahluwalia³, Amol R. Gite⁴

¹PG Resident, Department of Community Medicine, National Institute of Medical Sciences & Research, NIMS University Rajasthan, Jaipur, Rajasthan, India

²Professor & Head, Department of Community Medicine, National Institute of Medical Sciences & Research, NIMS University Rajasthan, Jaipur, Rajasthan, India

³Professor, Department of Community Medicine, National Institute of Medical Sciences & Research, NIMS University Rajasthan, Jaipur, Rajasthan, India

⁴Assistant Professor cum Statistician, Department of Community Medicine, National Institute of Medical Sciences & Research, NIMS University Rajasthan, Jaipur, Rajasthan, India

Received: 25-06-2026 / Revised: 23-07-2026 / Accepted: 26-08-2026

Corresponding Author: Dr. Dharmendra Mandarwal

Conflict of interest: Nil

Abstract:

Background: Hypertension is one of the most important modifiable risk factors for cardiovascular morbidity and mortality worldwide. Its burden increases with advancing age because of progressive vascular stiffening, reduced arterial compliance and cumulative exposure to behavioural and metabolic risk factors. Older adults living in rural communities may face additional barriers to screening, diagnosis, treatment and long-term blood pressure control. Community-based assessment is therefore important for identifying undiagnosed hypertension and determining locally relevant risk factors. The aim of study to estimate the prevalence of hypertension and identify associated risk factors among the geriatric population in the rural area of Jaipur, Rajasthan.

Methods: A community-based cross-sectional study was conducted among elderly individuals aged ≥ 60 years residing in the field practice area. A sample of 264 participants was obtained using systematic random sampling. Hypertension was defined as systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg, or current use of antihypertensive medication. Categorical variables were analysed using the chi-square test and continuous variables using the independent t-test; $p < 0.05$ was considered statistically significant.

Results: Among 264 participants, 93 (35.2%) were hypertensive, 63 (23.9%) had pre-hypertension and 108 (40.9%) had no hypertension. The mean age was 76.58 ± 9.25 years and mean BMI was 25.33 ± 3.37 kg/m². Hypertension increased significantly with age ($\chi^2 = 50.67$, $p < 0.0001$). Participants aged 90–99 years showed particularly high prevalence, with 20 of 21 participants being hypertensive. BMI was also significantly associated with hypertension ($\chi^2 = 62.73$, $p < 0.0001$), with hypertension observed in 23 of 25 obese participants. Alcohol consumption, smoking and tobacco chewing were also significantly associated with hypertension in the study population.

Conclusion: Hypertension represented a substantial health burden among elderly residents of the rural field practice area, with more than one-third of participants classified as hypertensive and nearly one-fourth having pre-hypertension. Advancing age, excess body weight, lower educational attainment, previous illness, family history and substance-use habits were associated with hypertension. Community-based screening, health education, promotion of physical activity and weight management, reduction of tobacco and alcohol exposure, and strengthening of primary-care follow-up are important components of hypertension prevention and management in rural geriatric populations.

Keywords: Hypertension; Geriatric Population; Rural Health; Prevalence; Risk Factors; BMI; Elderly; Rajasthan; Community-Based Study.

DOI: 10.25258/ijpqa.17.9.34

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Hypertension is a major non-communicable disease and one of the most important modifiable

determinants of cardiovascular morbidity and mortality. It is frequently asymptomatic and may

remain undetected for prolonged periods, despite causing progressive damage to target organs. The global burden of hypertension has increased substantially alongside population ageing, urbanization, and dietary changes and reduced physical activity. The World Health Organization has identified hypertension as a major public-health priority because of its contribution to cardiovascular disease, stroke, chronic kidney disease and premature death. [1,2]

The relationship between elevated blood pressure and cardiovascular risk is continuous. Higher blood pressure is associated with increasing risks of stroke, coronary heart disease, heart failure and renal disease. [3] The global burden is particularly important in low- and middle-income countries, where rapid demographic transition is occurring alongside changes in dietary and behavioural patterns. The NCD Risk Factor Collaboration reported substantial worldwide increases in the number of people living with hypertension while highlighting continuing gaps in treatment and control. [4,5]

India has experienced a marked increase in the burden of hypertension. National and regional studies have demonstrated considerable variation according to age, sex, geography, socioeconomic status and lifestyle. Anchala et al., in a systematic review and meta-analysis, reported an overall hypertension prevalence of approximately 29.8% among Indian adults, with substantial rural as well as urban burden. More recent reviews have continued to document a high and increasing prevalence of hypertension across India. [6,7]

The problem is particularly relevant in older adults. Ageing is associated with structural and functional changes in the arterial system, including arterial stiffening and declining vascular compliance. These changes contribute particularly to increases in systolic blood pressure and pulse pressure. [8] In older individuals, isolated systolic hypertension becomes increasingly common and may contribute substantially to cardiovascular risk.

The geriatric population is also characterized by a high prevalence of multimorbidity. Diabetes mellitus, coronary artery disease, cerebrovascular disease and other chronic conditions frequently coexist with hypertension. These conditions share several biological and behavioural risk factors, including obesity, physical inactivity, tobacco use, unhealthy diet and advancing age.

The rural context is especially important. Hypertension was historically regarded predominantly as an urban problem, but increasing evidence demonstrates a substantial burden in rural India. Changes in dietary patterns, reduced physical activity and increasing exposure to tobacco and alcohol have contributed to this epidemiological

transition. At the same time, rural communities may have limited access to regular screening, healthcare professionals and continuity of treatment. The hypertension care cascade is another important consideration. The presence of hypertension does not automatically result in diagnosis, treatment or adequate control. Indian studies have demonstrated substantial losses between these stages. [9-14] Lee et al. reported that among middle-aged and older Indians, only a proportion of individuals with hypertension were aware of their condition, receiving treatment or achieving adequate blood-pressure control.⁹ Boro and Banerjee similarly demonstrated important rural–urban differences in undiagnosed, untreated and undertreated hypertension among older adults. [15]

Evidence from Rajasthan is also relevant. Godara et al. documented hypertension and substantial gaps in awareness, treatment and control among adults in Barmer district. [16] Such regional findings demonstrate the importance of generating community-level data rather than relying exclusively on national estimates.

The present study was undertaken in the field practice area of RHTC, Achrol, Jaipur, and Rajasthan. The study area represents a rural population experiencing socioeconomic and lifestyle changes while continuing to face challenges related to access to healthcare and chronic disease management. The thesis specifically identified the need to assess prevalence, associated risk factors and the awareness, treatment and control of hypertension among the geriatric population. Aim of the study to estimate the prevalence of hypertension and risk factors associated with hypertension in the geriatric population under the field practice area of a tertiary care centre.

Materials and Methods

Study Design and Setting: A community-based cross-sectional study was undertaken among elderly individuals residing in the rural field practice area of a tertiary care centre/RHTC, Achrol, Jaipur, Rajasthan.

Sample Size and Sampling: Sample size was calculated using the standard prevalence-study formula, with $Z=1.96$ for a 95% confidence level, an anticipated prevalence of 22%, and absolute precision of 5%. The calculated sample size was 263.7 and was rounded to 264 participants. Systematic random sampling was used. A line listing of eligible elderly individuals was prepared, a random starting participant was selected, and subsequently every fourth eligible individual was approached.

Eligibility Criteria: Individuals aged 60 years or older, residing in the study area for at least six months and willing to participate were eligible. Individuals unable to respond because of severe illness or cognitive impairment, those in whom anthropometric measurements could not be performed, and those with secondary causes of hypertension such as pheochromocytoma, chronic kidney disease or drug-induced hypertension were excluded.

Data Collection: House-to-house visits were conducted. After explaining the purpose of the study and obtaining informed consent, participants were interviewed using a predesigned semi-structured proforma.

Information included age, sex, education, socioeconomic characteristics, occupation, lifestyle factors, physical activity, alcohol use, smoking, tobacco chewing, family history and previous illness.

Anthropometric Assessment: Height was measured using a stadiometer with the participant standing erect without footwear. Weight was measured using a calibrated digital weighing machine. BMI was calculated using the standard formula:

BMI = weight in kilograms / height in metres²

Participants were categorized as underweight, normal weight, overweight or obese according to the BMI categories used in the thesis.

Blood Pressure Measurement: Blood pressure was measured using a standard mercury sphygmomanometer. Participants were allowed to

sit comfortably and relax before measurement. The arm was supported at heart level and an appropriately sized cuff was applied. The first Korotkoff sound was considered the systolic blood pressure and disappearance of Korotkoff sounds was considered the diastolic blood pressure. Three measurements were obtained at 10-minute intervals, and the highest reading was used for analysis. Hypertension was operationally defined as systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg or current antihypertensive medication.

Statistical Analysis: Data were entered into Microsoft Excel and subsequently analysed using appropriate statistical software. Categorical variables were expressed as frequencies and percentages and continuous variables as mean $\pm$ standard deviation. Chi-square testing was used for categorical associations and the independent t-test for continuous variables. A p-value < 0.05 was considered statistically significant.

Results

A total of 264 geriatric participants were included. The mean age was 76.58 ± 9.25 years, with participants ranging from 61 to 94 years. The largest age group was 80–89 years, comprising 92 participants (34.8%). Participants aged 70–79 years accounted for 76 (28.8%), those aged 60–69 years for 75 (28.4%), and those aged 90–99 years for 21 (8.0%).

There were 136 males (51.5%) and 128 females (48.5%), indicating an approximately balanced sex distribution.

Table 1: Descriptive statistics of Anthropometric and Vital Parameters of patients

Variables	Minimum	Maximum	Median (IQR)	Mean $\pm$ SD
Age (Yrs.)	61	94	76 (68-85)	76.58 ± 9.25
BMI (Kg/m ²)	18	35	25.3 (22.78-27.63)	25.33 ± 3.37
Systolic BP (mmHg)	102	176	128 (121-139)	131.2 ± 15.3
Diastolic BP (mmHg)	63	109	80 (76-88)	82.2 ± 9.30
Pulse Rate (bpm)	55	101	76 (71-81)	75.76 ± 7.94

The mean BMI was 25.33 ± 3.37 kg/m². Of the participants, 112 (42.4%) had normal BMI, 123 (46.6%) were overweight, 25 (9.5%) were obese and 4 (1.5%) were underweight. Thus, more than half of the participants were either overweight or obese. The mean systolic blood pressure was 131.2 ± 15.3 mmHg, while the mean diastolic blood pressure was 82.2 ± 9.30 mmHg. Mean pulse rate was 75.76 ± 7.94 beats/minute.

Table 2: Prevalence of Hypertension

Category	n = 264	In %
No Hypertension	108	40.9%
Pre Hypertension	63	23.9%
Hypertension	93	35.2%

Among 264 participants, 93 (35.2%) were hypertensive, 63 (23.9%) had pre-hypertension and 108 (40.9%) had no hypertension. Thus, nearly six out of every ten participants had either hypertension or pre-hypertension.

Table 3: Association of demographic factors with hypertension by using chi-square test

Category		Hypertension	Non-Hypertension	Chi-Square Test	P Value
Age Interval	60 - 69	13	13	50.67	< 0.0001
	70 - 79	19	19		
	80 - 89	41	41		
	90 - 99	20	20		
Gender	Male	52	84	1.112	0.29158
	Female	41	87		
BMI	Underweight (< 18.5)	0	4	62.73	< 0.0001
	Normal (18.5 - 24.9)	16	96		
	Overweight (25.0 - 29.9)	54	69		
	Obese (≥ 30)	23	2		
Educational Status	No formal	34	29	14.24	0.0066
	Primary	24	59		
	Secondary	21	49		
	Higher Secondary	12	23		
	Graduate	2	11		

Age: A strong age-related gradient was observed. Among participants aged 60–69 years, 13 of 75 were hypertensive; among those aged 70–79 years, 19 of 76 were hypertensive; among those aged 80–89 years, 41 of 92 were hypertensive; and among those aged 90–99 years, 20 of 21 were hypertensive. The association between age and hypertension was statistically significant ($\chi^2=50.67$, $p<0.0001$), demonstrating a marked increase in hypertension with advancing age.

Sex: Hypertension was present in 52 of 136 males and 41 of 128 females. Although hypertension was numerically more frequent among males, the association was not statistically significant ($\chi^2=1.112$, $p=0.29158$). Thus, sex was not significantly associated with hypertension in this population.

BMI: A strong association was identified between BMI and hypertension. None of the four

underweight participants had hypertension. Among 112 participants with normal BMI, 16 were hypertensive. Among 123 overweight participants, 54 were hypertensive, while 23 of 25 obese participants were hypertensive. The association between BMI category and hypertension was highly statistically significant ($\chi^2=62.73$, $p<0.0001$).

Educational Status: Educational attainment was significantly associated with hypertension ($\chi^2=14.24$, $p=0.0066$). Hypertension was more frequently observed among participants without formal education compared with those with higher educational attainment. Among participants without formal education, 34 were hypertensive compared with 29 who were not hypertensive. The corresponding figures among graduates were 2 and 11, respectively.

Table 4: Association of different factors with hypertension by using chi-square test

Category		Hypertension	Non-Hypertension	Chi-Square Test	P - Value
History of Illness	Yes	56	43	31.61	< 0.0001
	No	37	128		
Family history of Hypertension	Yes	55	27	52.87	< 0.0001
	No	38	144		
Alcohol Habits	Yes	29	11	28.7	< 0.0001
	No	64	160		
Smoking Habits	Yes	40	25	26.16	< 0.0001
	No	53	146		
Tobacco Chewing	Yes	26	18	13.18	0.00028
	No	67	153		

Previous Illness and Family History: Of the 264 participants, 165 (62.5%) had no reported major illness.

Diabetes mellitus was reported in 41 (15.5%), stroke in 34 (12.9%) and coronary artery disease in 24 (9.1%). Previous history of illness was

significantly associated with hypertension. Among participants with a history of illness, 56 were hypertensive compared with 43 non-hypertensive; among those without previous illness, 37 were hypertensive and 128 were non-hypertensive ($\chi^2=31.61$, $p<0.0001$). Family history of

hypertension was reported by 82 participants (31.1%). Among them, 55 were hypertensive and 27 were non-hypertensive. In contrast, among participants without a family history, 38 were hypertensive and 144 were non-hypertensive.

The association was highly significant ($\chi^2=52.87$, $p<0.0001$). Substance Use: Alcohol use was

reported by 40 participants (15.2%), smoking by 65 (24.6%) and tobacco chewing by 44 (16.7%). Alcohol consumption was significantly associated with hypertension ($\chi^2=28.7$, $p<0.0001$). Smoking was also significantly associated ($\chi^2=26.16$, $p<0.0001$), as was tobacco chewing ($\chi^2=13.18$, $p=0.00028$).

Table 5: Association of Physical Activity with hypertension by using chi-square test

Physical Activity (Min./Week)	Hypertension	Non-Hypertension	Chi-Square Test	P - Value
≤ 150 Min./week	74	112	5.73	0.01667
> 150 Min./week	19	59		

Physical activity was generally low to moderate. Fifty-two participants (19.7%) reported less than 100 minutes of physical activity per week, 63 (23.9%) reported 101–125 minutes, 71 (26.9%) reported 126–150 minutes, 47 (17.8%) reported 151–175 minutes, 22 (8.3%) reported 176–200 minutes and only 9 (3.4%) reported more than 200 minutes per week.

Discussion

The present community-based study identified a substantial burden of hypertension among geriatric residents of the rural field practice area of Achrol, Jaipur. Hypertension was present in 35.2% of the study participants, while an additional 23.9% were classified as pre-hypertensive. The finding is important because the combined proportion indicates that a considerable majority of the elderly population had blood pressure above the non-hypertensive range. The prevalence observed in the present study is comparable with the substantial burden reported in other Indian community-based studies. Kapil et al. reported hypertension prevalence of 54.5% among elderly individuals living in rural high-altitude Uttarakhand, with increasing age and BMI associated with hypertension. [17] Pratim et al. reported a prevalence of 53.5% among geriatric individuals in Eastern India and identified advancing age and obesity as important factors. [18] Chinnakali et al. reported hypertension in 40.5% of elderly participants in rural Puducherry. [19] Differences between studies may reflect variations in age distribution, diagnostic criteria, geographical setting, sampling procedures and population characteristics.

The present study demonstrated a particularly strong association between advancing age and hypertension. The prevalence increased progressively across age categories and was particularly high among participants aged 90–99 years. This observation is consistent with the physiological effects of ageing on the arterial system. Vascular stiffening and reduced arterial compliance contribute to increased systolic pressure with advancing age. [8] The findings also

agree with national evidence showing that age is a major determinant of hypertension among older Indian adults. [9]

BMI emerged as another major correlate. More than half of the participants were overweight or obese, and hypertension was substantially more frequent in these groups. The association was highly significant. Kapil et al. similarly reported a significant relationship between BMI ≥ 25 kg/m² and hypertension among rural elderly individuals. [17] Bansal et al. found increasing age and higher BMI to be independent predictors of hypertension in a rural Indian community. [20] Chakma et al. also demonstrated an association between BMI and hypertension in Central India. [21]

The high prevalence of excess body weight in this rural geriatric population suggests that nutritional transition and reduced physical activity are relevant even outside urban environments. Tripathy et al. described convergence of several lifestyle risk factors between rural and urban Indian populations, including obesity and physical inactivity. [22] Although hypertension was somewhat more frequent among males than females in the present study, the difference was not statistically significant. This finding is compatible with evidence demonstrating that sex differences in hypertension vary according to age and population characteristics. [23] In older age groups, the prevalence among women may increase substantially following menopause, potentially reducing the sex differential observed in younger populations.

Educational status was significantly associated with hypertension. Participants without formal education showed a greater occurrence of hypertension than those with higher educational attainment. Education may influence health literacy, knowledge of risk factors, use of preventive services, adherence to treatment and health-seeking behaviour. Boro and Banerjee identified educational differences as an important contributor to rural–urban disparities in undiagnosed hypertension among older Indians. [15] A positive family history was strongly associated with

hypertension in the present study. More than half of participants with a family history were hypertensive, compared with a substantially smaller proportion among those without such a history. Family history may reflect genetic susceptibility but may also capture shared household dietary patterns, physical activity, socioeconomic circumstances and other environmental exposures. The finding reinforces the value of family history as an easily obtainable marker for identifying individuals requiring closer screening. Previous illness was also strongly associated with hypertension. Diabetes, stroke and coronary artery disease were among the principal reported comorbidities. This clustering is clinically important because hypertension and these conditions share several common risk factors and can mutually increase cardiovascular risk. Swami et al. observed a high burden of morbidity among elderly Indians, with hypertension being one of the most common chronic conditions. [24] Substance-use behaviours were significantly associated with hypertension. Alcohol use, smoking and tobacco chewing were all associated with increased hypertension prevalence in the present analysis. These findings are biologically plausible because tobacco exposure can adversely affect vascular function, while alcohol intake may contribute to elevated blood pressure through several mechanisms. Recent Indian evidence has similarly identified tobacco and alcohol use as relevant hypertension-associated behaviours. [25]

The physical-activity findings are also important. Most participants reported low-to-moderate weekly physical activity, while only a small proportion reported more than 200 minutes per week. In older adults, physical inactivity may contribute to excess weight, impaired cardiovascular fitness and increased cardiometabolic risk.

Community-based programmes should therefore emphasize safe and age-appropriate physical activity rather than assuming that rural residence automatically ensures adequate activity.

The present findings should also be considered in relation to the hypertension care cascade. National studies have repeatedly demonstrated that detection does not necessarily translate into treatment and control. Lee et al. reported important gaps in awareness, treatment and control among middle-aged and older Indians. [9] Mohanty et al. similarly identified substantial gaps among adults aged 45 years and older. [12] Systematic reviews have demonstrated persistently suboptimal blood-pressure control in India. [13,14]

The thesis objectives included evaluation of awareness, treatment and control; however, the available results extracted from the uploaded thesis did not provide a separate numerical table for these

three outcomes. Therefore, numerical awareness, treatment or control percentages have not been invented in this paper. This distinction is important when preparing the manuscript for publication.

The rural setting of the present study further strengthens the public-health relevance of the findings. Anchala et al. demonstrated that although hypertension prevalence was higher in urban populations, rural populations also experienced a substantial burden and substantially lower awareness, treatment and control. [6] Boro and Banerjee reported higher levels of undiagnosed and untreated hypertension in rural older adults. [15] Community-level screening can therefore provide an important bridge between undiagnosed disease and primary-care management.

Conclusion

This community-based study demonstrated a substantial burden of hypertension among geriatric individuals residing in the rural field-practice area of RHTC, Achrol, and Jaipur. Hypertension was identified in 35.2% of participants, while 23.9% had pre-hypertension, indicating a considerable population at current or future cardiovascular risk.

Advancing age showed a strong association with hypertension, with the burden increasing markedly among the oldest participants. BMI was another important correlate, with hypertension particularly frequent among overweight and obese participants. Lower educational attainment, previous illness and a positive family history were also significantly associated with hypertension. Alcohol consumption, smoking and tobacco chewing demonstrated significant associations, emphasizing the relevance of modifiable behavioural exposures.

The findings support an integrated community-based approach to geriatric hypertension. Regular blood-pressure screening, identification of high-risk individuals, promotion of healthy body weight and physical activity, tobacco and alcohol reduction, health education and continuity of primary-care follow-up should form important components of local hypertension-control programmes.

Community-based hypertension research is particularly valuable in rural elderly populations because it can identify disease before complications develop and can reveal social and behavioural factors that influence health-seeking and management. Future studies should incorporate longitudinal follow-up, detailed dietary and salt-intake assessment, medication adherence, healthcare-access indicators and standardized assessment of awareness, treatment and control.

References:

- World Health Organization. Global report on hypertension 2025: High stakes: Turning evidence into action. Geneva: WHO; 2025.
- NCD Risk Factor Collaboration (NCD-RisC). Worldwide trends in hypertension prevalence and progress in treatment and control from 1990 to 2019: a pooled analysis of 1201 population-representative studies with 104 million participants. *Lancet*. 2021;398(10304):957-980.
- Fuchs FD, Whelton PK. High blood pressure and cardiovascular disease. *Hypertension*. 2020;75(2):285-292. doi:10.1161/HYPERTENSIONAHA.119.14240.
- GBD 2019 Risk Factors Collaborators. Global burden of 87 risk factors in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet*. 2020;396(10258):1223-1249.
- Gupta R, Gaur K, Ahuja S, Anjana RM. Recent studies on hypertension prevalence and control in India 2023. *Hypertens Res*. 2024;47(6):1445-1456.
- Anchala R, Kannuri NK, Pant H, Khan H, Franco OH, Di Angelantonio E, et al. Hypertension in India: a systematic review and meta-analysis of prevalence, awareness, and control of hypertension. *J Hypertens*. 2014;32(6):1170-1177.
- International Institute for Population Sciences (IIPS), ICF. National Family Health Survey (NFHS-5), India, 2019-21. Mumbai: IIPS; 2021.
- Saladini F, Palatini P. Isolated systolic hypertension in young individuals: pathophysiological mechanisms, prognostic significance, and clinical implications. *High Blood Press Cardiovasc Prev*. 2017;24(2):133-139.
- Lee J, Wilkens J, Meijer E, Sekher TV, Bloom DE, Hu P. Hypertension awareness, treatment, and control and their association with healthcare access in the middle-aged and older Indian population: a nationwide cohort study. *PLoS Med*. 2022;19(1):e1003855.
- Deepa R, Shanthirani CS, Pradeepa R, Mohan V. Is the 'rule of halves' in hypertension still valid? Evidence from the Chennai Urban Population Study. *J Assoc Physicians India*. 2003;51:153-157.
- Maroof M, Faizi N, Thekkur P, Raj S, Goel S. Is the rule of halves in hypertension valid uniformly across India? A cross-sectional analysis of National Family Health Survey-4 data. *Indian J Public Health*. 2022;66(3):269-275.
- Mohanty SK, Pedgaonkar SP, Upadhyay AK, Kämpfen F, Shekhar P, Mishra RS, 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 Med*. 2021;18(8):e1003740.
- Koya SF, Pilakkadavath Z, Chandran P, Wilson T, Kuriakose S, Akbar SK, et al. Hypertension control rate in India: systematic review and meta-analysis of population-level non-interventional studies, 2001-2022. *Lancet Reg Health Southeast Asia*. 2022;9:100113.
- Kumar SM, Anandraj J, Sivanatham P, Essakky S, Nain J, Talukdar R, et al. Control status of hypertension in India: systematic review and meta-analysis. *J Hypertens*. 2023;41(5):687-698.
- Boro B, Banerjee S. Decomposing the rural-urban gap in the prevalence of undiagnosed, untreated and under-treated hypertension among older adults in India. *BMC Public Health*. 2022;22(1):1310.
- Godara R, Mathews E, Mini GK, Thankappan KR. Prevalence, awareness, treatment and control of hypertension among adults aged 30 years and above in Barmer district, Rajasthan, India. *Indian Heart J*. 2021;73(2):236-238.
- Kapil U, Khandelwal R, Ramakrishnan L, Khenduja P, Gupta A, Pandey RM, et al. Prevalence of hypertension, diabetes, and associated risk factors among geriatric population living in a high-altitude region of rural Uttarakhand, India. *J Family Med Prim Care*. 2018;7(6):1527-1536.
- Pratim DP, Bhaswati S, Nilanjan G, Ashique FK, Subhasis C, Arpita D, et al. Hypertension and related morbidity among geriatric population of Eastern India. *Mater Sociomed*. 2012;24(1):29-33.
- Chinnakali P, Mohan B, Upadhyay RP, Singh AK, Srivastava R, Yadav K. Hypertension in the elderly: prevalence and health seeking behavior. *N Am J Med Sci*. 2012;4(11):558-562.
- Bansal SK, Saxena V, Kandpal SD, Gray WK, Walker RW, Goel D. The prevalence of hypertension and hypertension risk factors in a rural Indian community: a prospective door-to-door study. *J Cardiovasc Dis Res*. 2012;3(2):117-123.
- Chakma T, Kavishwar A, Sharma RK, Rao PV. High prevalence of hypertension and its selected risk factors among adult tribal population in Central India. *Pathog Glob Health*. 2017;111(7):343-350.
- Tripathy JP, Thakur JS, Jeet G, Chawla S, Jain S, Prasad R. Urban rural differences in diet, physical activity and obesity in India: are we witnessing the great Indian equalisation? Results from a cross-sectional STEPS survey. *BMC Public Health*. 2016;16(1):816.
- Mohanty P, Patnaik L, Nayak G, Dutta A. Gender difference in prevalence of hypertension among Indians across various age-groups: a report from multiple nationally representative

- samples. BMC Public Health. 2022;22(1): 1524.
24. Swami HM, Bhatia V, Dutt R, Bhatia SPS. A community based study of the morbidity profile among the elderly in Chandigarh, India. Bahrain Med Bull. 2002;24(1).
25. Mohanty P, Patnaik L, Nayak G, Dutta A. Gender difference in prevalence of hypertension among Indians across various age-groups: a report from multiple nationally representative samples. BMC Public Health. 2022;22(1): 1524.