

Review Article

Prevalence of Hypertension in Indian Tribal Adult population: A Scoping Review

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A B S T R A C T

Background: There is an increasing trend in prevalence of hypertension worldwide. Studies have shown that tribal populations in India are also experiencing this transition.

Objective: To know the prevalence of hypertension in tribal population of India.

Method: A literature search PubMed, Google scholar databases from January 1980-December 2019 using the MeSH (Medical Subject Heading) - prevalence, hypertension, tribal, adult population, India, cross-sectional studies was conducted. Out of the total 96 published studies which reported the prevalence of hypertension in Indian tribal population, 21 were included in the review.

Data Extraction: All the data were extracted by the investigators using a standardized protocol and data collection form.

Result: Total twenty-one studies with sample size varying from 154 to 47,401 were included in the review. The reported prevalence of hypertension in tribal populations varied from 10% to 55.5% in different regions and states of India. The prevalence of hypertension in males was higher than females. Increasing age, body mass index, smoking, diabetes and extra salt intake were common risk factors.

Conclusion: The prevalence of hypertension in Indian tribal population is as high as other urban and rural populations and needs preventive measures to control the problem.

Keywords: Hypertension, Prevalence, Tribal Population, India

Introduction

Hypertension (HTN) is a major public health problem and a leading Non-Communicable Disease (NCD) in India. It is estimated to be attributable to nearly 10 percent of all NCDs. The prevalence of hypertension in adults increased over the

past 25 years from 5% to 20-40% in urban populations and 12-17% in rural populations.¹ Globally, HTN affects about 1 billion people and it is estimated that by 2025, up to 1.58 billion adults worldwide will suffer from complications of HTN.² The high prevalence of HTN makes it a significant

factor for mortality and morbidity.³ The prevalence of HTN varies widely across the countries. Various studies conducted in India in the last two decades showed that hypertension is increasing both in urban⁴ and among rural communities.^{5,6,7} Apart from these studies, small studies have also been conducted on the prevalence of HTN in tribal population. Within Indian context, tribal population, restricted to remote hilly terrains, are associated with poverty, illiteracy, malnutrition.⁸ Thus, they are assumed to be untouched by hypertension, which is lifestyle driven disease. However, recent studies have produced evidence for increasing trend of hypertension among tribal population.⁹

According to census 2011, the Scheduled Tribe (ST) population of India is, 104.3 million, which constitutes 8.6% of the total population¹⁰ and about 90% of tribal lives in rural areas and only 10% live in urban areas. In broader terms they inhabit two distinct geographical areas i.e Central India and North Eastern India where more than half of the tribal population are present in Central India; i.e. Madhya Pradesh (14.7%), Chhattisgarh (7.5%), Jharkhand (8.3%), Andhra Pradesh (5.7%), Maharashtra (10.1%), Orissa (9.2%), Gujarat (8.6%) and Rajasthan (8.9%).¹¹ Tribal populations are less accessible for routine scientific studies because of their scattered habitats, inaccessible terrain, and nomadic nature of living. Therefore, it is important to systematically quantify the available data from various cross-sectional studies conducted in India. We conducted a systematic review to estimate the prevalence of hypertension among adults of various tribal groups in India for the period 1980 to 2019, and to evaluate the changing trends in HTN prevalence by region and gender.

Methodology

A study protocol was prepared and predefined the data sources, search strategy, study eligibility criteria, quality assessment and data extraction of the studies. HTN is defined as systolic Blood Pressure (BP) of at least 140 mmHg and or diastolic BP of at least 90 mmHg. The guidelines under PRISMA Statement for Preferred Reporting Items for Systematic Reviews and Meta Analyses were followed during undertaking this systematic review.^{12,13}

Literature Search Strategy

We performed a systematic review from Google Scholar and PubMed using advanced search with key words 1. Hypertension 2. Prevalence 3. Tribal 4. India. The following MeSH terms was also used: (a) search 1: BP or high-BP; (b) search 2: Indian tribal and adult population and (c) search 3: search 1 and search 2. We included studies conducted among adult Indians with HTN and published in the English

language during January 2008 to December 2019. We also carried out extensive hand searches and contacted authors for further information. Cross references of all selected articles were scanned for additional studies. We screened table of contents of journals which were likely to publish such studies. To obtain disaggregate data, at least two email requests were sent to the corresponding author. If more than one article was published from a study, the article that provided the most updated data was selected.

Study Selection

The literature was searched using the pre-specified strategy. We eliminated duplicates using the Reference Manager Software version 12 (Thomson Reuters, New York). The type of studies in our review includes cross-sectional studies. We excluded the articles which do not have access to full length article. Reviews, case series, individual case reports, editorials, short communications and commentaries are excluded because they did not have original data or outcome data to provide meaningful conclusions. We also excluded some abstracts, which were not related to the study. We did not include studies on Indians staying outside India because in this set of population the exposure to the environmental and risk factors will be different as compared with those Indians (most of them were Indo-American studies) living in India.

Quality Assessment and Data Extraction

Using appropriately modified critical appraisal checklists, each article was assessed for quality assessment. We extracted data from full-length articles wherever available. We included abstracts only when they had sufficient data. Study characteristics (first author, place of study, year of publication and study population) participant characteristics (age group and tribe name, and prevalence of HTN were extracted onto pre-coded spreadsheets. Data were extracted at the lowest possible disaggregate level (referred to as major tribal population here).

Statistical Analysis

Estimates of prevalence indicated as proportions. Trends for prevalence of hypertension were recorded for sex, age, gender, and region, and arranged the studies since 2008 onwards.

Result

Search Result

Of the total 96 articles, 86 articles were considered for review and 10 duplicates articles were removed. Among these studies, only 21 articles¹⁴⁻³⁴ were considered for data extraction (Figure 1).

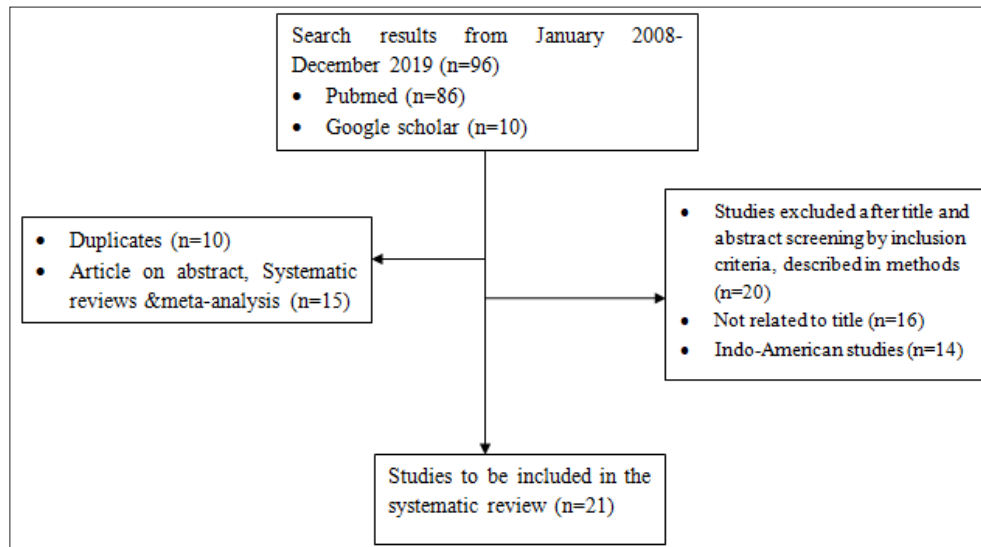


Figure I. Flow chart providing the number of studies identified, excluded for various reasons and included in scoping review

Table I. Prevalence of hypertension observed in cross sectional studies in different parts of country

S. No.	First Author	Year	Age (yrs)	Area/ Region	Population (n)			Tribes	HTN Prevalence (%)
					Total	Male	Female		
1.	Tiwari RR ¹⁴	2008	20 & above	Gujrat	154	91	63	Naika Rathwa	Total-16.9% Male-16.5% Female-17.5%
2.	Manimunda SK ¹⁵	2011	20 & above	Car Nicobar Islands	975	NA	NA	NA	Total-50.5%
3.	Meshram II ¹⁶	2012	20 & above	Kerala	4193	1891	2302	NA	Total -40% Male-45% Female-36%
4.	Hathur B ¹⁷	2013	20-60	Mysore, Karnataka	1290	571	719	Jenu Kuruba	Total -21.7% Male-28.25% Female-16.5%
5.	Meshram II ¹⁸	2014	20 & above	Maharashtra	4348	NA	NA	NA	Total- 23%
6.	Misra PJ ²⁰	2014	20 & above	Assam	332	179	153	NA	Total-26%
7.	Laximaiah A ²¹	2015	20 & above	9 states: A.P., Gujrat, Karnataka, M.P., Maharashtra, Kerala, Odisha, W.B., Tamil Nadu	47401	21141	26260	NA	Total-26.7% Male-27.1 Female-27.4
8.	Kumar RK ¹⁹	2016	18-60	Madhya Pradesh	300	127	173	NA	Total -22% Male-32.3% Female-14.4%

9.	Kandpal V ²²	2016	20-60	Uttarakhand	288	104	184	Rang Bhotia	Total-43.4% Male-57.7% Female-35.3%
10.	Raina SK ²³	2016	20-94	Uttarakhand	401	270	131	NA	Total-10.7% Male-12.9% Female-6.0%
11.	Negi PC ²⁴	2016	20-70	Kinnaur, H.P.	3582	1632	1950	NA	Total-19.7% Male-22.4 Female-17.5
12.	Ksthriya GK ²⁵	2016	20-60	West Bengal, Odisha, Gujrat	2156	1066	1090	1.West Bengal Tribes (Santhal, Oraons, Koras) 2.Odisha Tribes (Santhals, Bhumijis, Bathudis) 3. Gujrat Tribes (Dhodias, Kuknas, Chaudhris)	Total- 10% In Tribes (%) 1.Santhal (W.B)- 11.8% 2.Oraons-16.5% 3.Koras-10.6% 4.Santhal (Odisha)-9.6% 5.Bhumis-14.7% 6.Bhathudis-12.1% 7.Dhodis-12.9% 8.Kuknas-11.3% 9.Chaudhris-11.3%
13.	Chakma T ²⁶	2017	20 & above	Madhya Pradesh	3090	1442	1648	NA	Total-19% Male-28.2% Female-23.6%
14.	Deo MG ²⁷	2017	18 & above	Maharashtra	410	191	219	Katkari	16.8%
15.	Sanjeev P ²⁸	2018	25-64	Thiruvananthapuram, Kerela	298	149	149	Kani	48.3%
16.	TushiA ²⁹	2018	25-64	Mokokchung, Nagaland	472	236	236	NA	43.2%
17.	Deo MG ³⁰	2018	18-60	Western & Northern Maharashtra	1864	904	960	Bhils (BH) Karkaris (KA) Kokana (KO) Tkakars (TH)	Total- 11.7% In tribes: BH-11.9% KA-16.0% KO-13.7% TH-8.7%
18.	Kshatriya GK ³¹	2019	20-60	NA	2156	1066	1090	NA	Total -11.7% Male-9.3% Female-14.2%

19.	Madhu B ³²	2019	30 & above	Chamrajnagar, S.India	415	NA	NA	NA	32.2%
20.	Sathiyannarayana S ³³	2019	18 & above	Vellore, TamilNadu	952	383	569	NA	16.7%
21.	KshtriyaGK ³⁴	2019	20-60	NA	1431	705	726	NA	12.6%

NA-Information Not Available.

Prevalence and Incidence of HTN in Tribal Population of India

Total 21 prevalence studies were included in the review. These studies were published between January 2008 and December 2019. All the studies were cross sectional and showed sample size ranged from 154 to 47401 [Table 1]. Information regarding sex and tribes were Not Available (NA) in few studies. Table 1, summarizes the major study characteristics of tribal population including age, sex, place of study and major tribes. Most of the studies were based on the random sampling. Except for one study that included a slightly older age group (≥ 30 years), all other studies included a uniform age group (mostly the adults of above 18 years). Overall prevalence of hypertension in adults using BP criteria $\geq 140/90$ mmHg among tribal population ranged from 10% to 50.5%.

The highest prevalence rate (50.5%) of hypertension was found in tribes of Car Nicobar islands whereas, lowest (10%) was found in tribal populations of West Bengal, Orissa and Gujrat. In the present review the prevalence rate was higher in men than the women. Hathur et al. found overall prevalence of hypertension as 21.7% in *Jenu Kuruba* tribe, which found the prevalence of hypertension was higher (28.2%) among men than among women (16.5%). Similar evidences were found by the study of Kumar et al. who found that 32.3% men and 14.4% of women are hypertensive. However, some studies have also reported higher prevalence of hypertension in females than the males.

Among males, the lowest rate (9.2%) of prevalence of hypertension was found in the *Santhal, Oraons, Koras, Bhumis, Bhathudis, Dhodis, Kuknas and Chaudharis* tribes residing in states of West Bengal, Odisha and Gujrat, however, the highest rate of prevalence (57.7%) was found among the Rang Bhotia tribes of Uttarakhand. Likewise, in females, the lowest rate (6%) of hypertension prevalence was found in the tribal population of Uttarakhand and the highest rate of prevalence (36%) was found among the tribes residing in Kerala. In both of these studies, the names of the tribe were not mentioned.

Manimunda et al. found an increasing trend in the prevalence of hypertension with increasing age among Nicobarese tribe. Similar findings were observed by Hathur

et al., who reported that hypertension among *Jenu Kuruba* tribe of Karnataka.

Discussion

Studies on the adverse health effects of high Blood Pressure (BP) or hypertension has already been recognized since early part of 19th century [35,36]. However, hypertension in tribal population received very little attention prior to 2000, since it was presumed that tribal populations with their customs and characteristics make them less prone to life-style diseases like hypertension. Subsequently, a wide range of prevalence of HTN in tribal populations are reported by various studies across the Indian states. However due to the diversity and heterogeneity of distribution of the population, it is very challenging to arrive at a precise prevalence among Indian tribal population. In the present scopic review, the prevalence rate of hypertension varied from 10% to 50.5% in tribal population of India.

The prevalence of HTN varies around the world. In tribal people it is also high similar to urban and rural adult population of the country. The prevalence of HTN was also varied from state to state as well, which might be due to various characteristics of these populations. A systematic review by Kearney et al.² reported that the lowest prevalence of HTN was in rural India (3.4% in men and 6.8% in women) and the highest prevalence in Poland (68.9% in men and 72.5% in women). The prevalence rates in Indian studies were lower than that recorded in Spain by Banegas (68.3%)³⁷ and in Italy by Modesti et al. (64.8%) in their study.³⁸ Geographical variation could be the reason for lower HTN in rural India. Komachi and Shimamoto³⁹ have shown that migration and urbanization/acclimatization cause a rise in BP levels, which is attributed to change in life style. People migrate to urban areas in search of opportunities and better livelihood. This rural-to-urban migration has resulted in large scale demand for housing, protected water supply, sanitation, health services, and other public utilities. Inadequate provision of these facilities has resulted in unhygienic condition, dilapidated housing, lack of basic amenities, poverty, and filth. All these factors indicate that the quality of living conditions is no better in these socially disadvantaged urban areas than in rural villages. McGarvey and Baker⁴⁰ suggested that selective migration and a form of bio-cultural adaptation to the modern environment may occur. They also suggested that there might be a limit on

the extent to which participation in a modern life style is associated with higher blood pressure levels.

National Nutrition Monitoring Bureau (NNMB) Tribal Survey-2008-09 conducted by the ICMR - National Institute of Nutrition, Hyderabad found the overall prevalence of hypertension among tribal adults as 24% (men 25%, women 23%), which is near to our findings.⁴¹ Kokiwar et al. in their study found the prevalence of hypertension as 19.04% in rural central India.⁴² While Rizwan et al. in their meta-analysis found the pooled estimate of prevalence of hypertension as 16.1%.⁴³ In the present study Hathur et al. conducted a study in Jenu Kuruba tribe and found overall prevalence of hypertension as 21.7%.¹⁷ The highest prevalence of hypertension (50.5%) was found among the Nicobarese tribe in Car Nicobar Islands,¹⁵ whereas the lowest was reported by Kshatriya et al. in the tribes of West Bengal, Odisha and Gujarat.²³ Similar study was reported by Mukhopadhyay et al.⁴⁴ who found remarkably high prevalence of definite, as well as borderline, hypertension among *Lepchas* of the Himalayas where approximately 34% of women and 45.3% of men. These high prevalence rates have been attributed to the regular use of millet beer in often large quantities and the regular inclusion of black tea with salt in the diet of the *Lepchas*. The relationship between salt intake and hypertension was established almost 60 years,^{45,46} back which applies to tribal population also.⁴⁷ Chakma et al. have observed a higher prevalence of hypertension among those who consume salt >10 g/per day, which indicates a positive association of salt intake with hypertension; as the mean salt intake increases blood pressure levels also increase.²⁶ Many other studies have also provided similar evidence that greater salt consumption is associated with higher levels of blood pressure.^{48,49} According to a study by Hazarika et al.^{50,51} the added salt in the tea and local alcohol consumption are significant risk factors of HTN among tea garden workers of Assam. Similar evidences had also been obtained among the Solomon Islanders tribes. These tribes lived away from the coast and had a salt intake below 2 g/day, only 1% of the population had a raised blood pressure level. In two other tribes with salt intakes between 3 and 8 g/day, 3% of the population had a raised levels of blood pressure. In a tribe, which lived on the coast and had a salt intake between 9 and 15 g/day, 8% of the population had a raised levels of blood pressure.⁵²

In the present research we tried to study several factors that are affected hypertension. A few factors such as sex, age and region were studied with hypertension. However, these important factors affect prevalence and need explanation. Majority of the studies shows that prevalence of hypertension has association with the gender. In the present study the prevalence of hypertension was higher among males than the females, which is similar to findings of other studies carried out in adult population of rural and

urban areas. According to Kumar et al.(2016), 32.3% men and 14.4% of women were found to be hypertensive.²¹ Hathur et al. studied hypertension among Jenu Kuruba tribe and found that the prevalence of hypertension was higher among men (28.2%) than among women (16.5%).¹⁷ Sharma et al. found higher prevalence of hypertension and pre-hypertension in males in a rural population in Madhya Pradesh.⁵³ According to Gupta et al. (2004), among the rural populations, hypertension prevalence is 24% among men and 17% among women.⁵⁴ However there are some findings which shows the higher prevalence of hypertension among females than the males.^{14,21,31} Similar studies were also reported by Kusuma et al (2004) where the overall prevalence of hypertension ranged from 7.83% (Khondh men) to 32.43% (Valmiki women) which indicated that the risk of hypertension escalates after the age of 44 years, and that the risk is relatively greater for women, suggesting some biological basis for gender bias.^{55,56} This could be attributed to the cardio-protective effect of higher circulating female hormone levels (particularly estrogens), which have been linked to a less atherogenic lipid profile in younger women. Higher atherogenic lipid profile, greater arterial distensibility, increased adiposity and obesity, and possibly changes in body fat distribution toward a more centripetal pattern, have all been implicated in this increased risk of hypertension among older women. Schall also reported that even in Pacific populations with more traditional lifestyles and low rates of hypertension, older women have higher BP levels than do older men, but explained that in traditional societies, body weight and mass decline with age.⁵⁷

Several researchers reported that among adults, primarily in developed countries, BP increases with advancing age, and the increase is particularly steep among women, to the extent that BP levels (especially SBP) among menopausal women exceed those among men.^{58,59} Similar study is reported by Manimunda et al., who found an increasing trend in the prevalence of hypertension with increasing age among Nicobarese tribe.¹⁵ Similar trend was also reported by Hathur et al. among Jenu Kuruba tribes.¹⁷ These studies are also similar with other studies.²⁰ According to the Non-Communicable Disease Risk Factor Survey (2007-08) - Madhya Pradesh, the overall prevalence of hypertension among rural population was 20% and the prevalence was increased with age (11% in 15-24 years to 43% in 55-64 years).⁶⁰ Similar findings were reported by Patel et al. who found that as the age increased, the prevalence of hypertension also increased. With the advance in age from 28 to 49 years, the prevalence was higher in men and, afterwards, the women took over.⁶¹ Haldiya et al. also reported that the prevalence of hypertension was increasing with increase in the age.⁶² Increase in BP with age was also reported in studies from other parts of the world.⁶³

A remarkably higher prevalence of hypertension and increasing BP along with age confirms the well-established phenomenon that high BP, and increasing BP levels with age, accompany the process of modernization. Age probably represents an accumulation of environmental influences and the effect of genetically programmed senescence in body systems.⁶⁴

Smoking and diabetes mellitus were also reported as the risk factors of hypertension among 4955 individuals in rural Kerala.⁶⁵ Similar studies were also reported by Radhakrisnan et al where smoking was the only modifiable risk factor, which had shown significant association with hypertension and the family history of hypertension, which was a nonmodifiable risk factor had also shown a statistical significant association for hypertension in both males and females.⁶⁶ The impacts of alcohol and smoking on diabetes have been discussed by many studies^{67,68} and it was found to be same in our study particularly among males. Family history of diabetes⁶⁹ was found to be a strong factor in both males and females among the various other factors, which influences the prevalence of diabetes and the findings is in par with various other studies.

Conclusion

This scoping review revealed that varied prevalence of hypertension in adult tribal population of India which is similarly to the prevalence observed in urban and rural population and also in both genders. Thus, we can conclude that the tribal are the also vulnerable to non-communicable diseases like hypertension and they require the urgent implementation of strategies to prevent and manage hypertension.

Conflicts of Interest: None

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