HYPERTENSION AND ITS CONTROL IN INDIA

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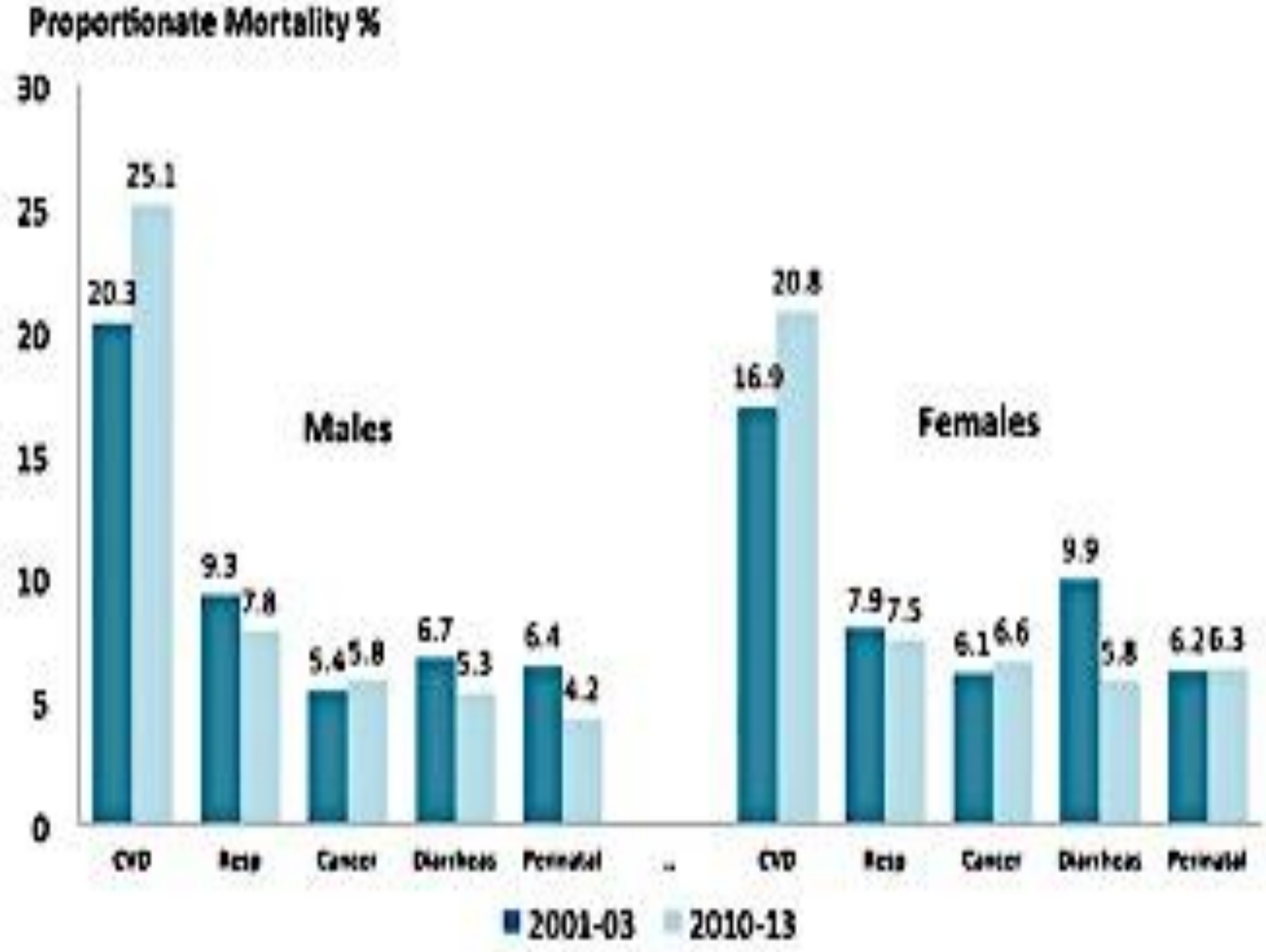
Introduction

Hypertension is the most common, important preventable condition seen in primary care and leads to Myocardial infarction, Stroke, Renal failure, and death if not detected early and treated appropriately.


Proportionate Mortality %
30
25
20
15
10
5
0
25.1
20.3
9.3
7.8
5.4
5.8
6.7
5.3
6.4
4.2
Males
20.8
16.9
7.9
7.5
6.1
6.6
9.9
5.8
6.2
6.3
Females
CVD
Resp
Cancer
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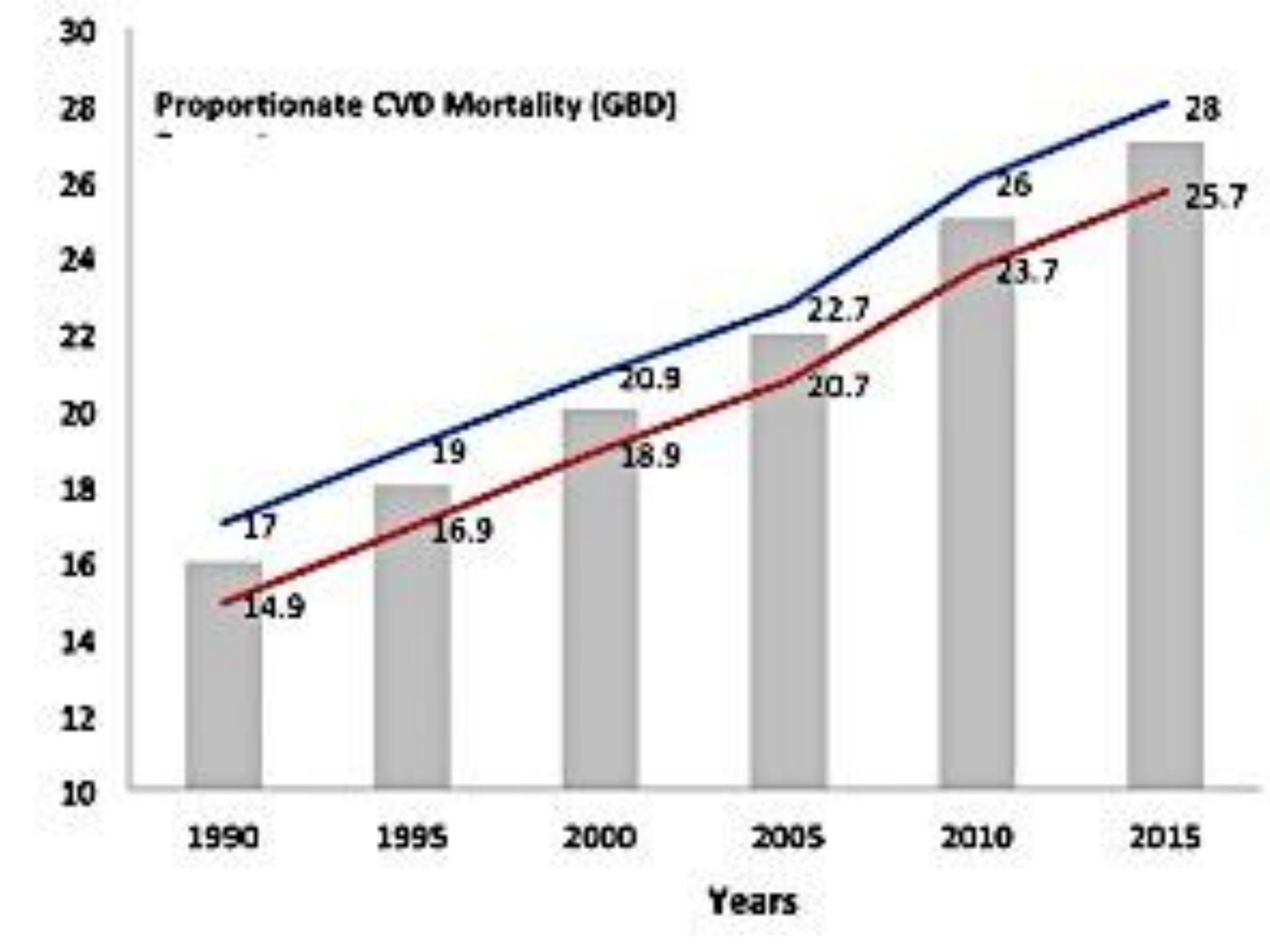
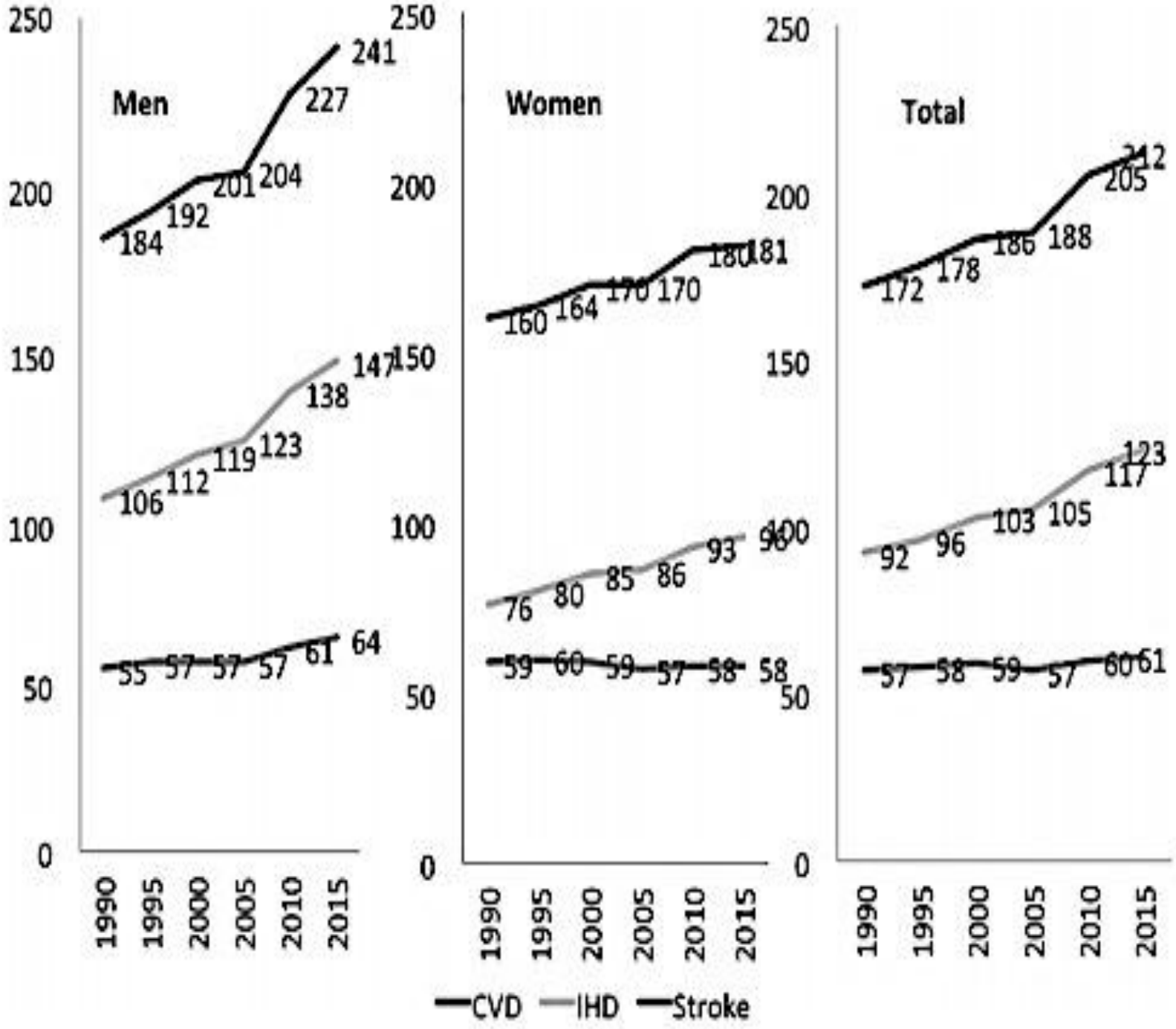
Perinatal
..
CVD
Resp
Cancer
Diarrhoea
Perinatal
2001-03
2010-13


Proportionate CVD Mortality (GBD)
30
28
26
24
22
20
18
16
14
12
10
17
19
20.9
22.7
26
28
14.9
16.9
18.9
20.7
23.7
25.7
1990
1995
2000
2005
2010
2015
Years


Men
Women
Total
250
200
150
100
50
0
241
227
204
201
192
184
147
138
123
119
112
106
64
61
57
57
57
55
181
180
170
170
164
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100
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242
205
188
186
178
172
123
117
105
103
96
92
61
60
59
58
57
1990
1995
2000
2005
2010
2015
CVD
IHD
Stroke

Epidemiology of Hypertension

- As per the World Health Statistics 2012, of all the deaths 36% are due to Non-Communicable diseases.
- The largest proportion of NCD deaths is caused by cardiovascular diseases (48%).
- In terms of attributable deaths, raised blood pressure is one of the leading factor to which 13% of global deaths are attributed.
- Hypertension is reported to be the fourth contributor to premature death in developed countries and the seventh in developing countries.

- The Global Burden of Diseases; Chronic Disease Risk Factors Collaborating Group has reported 35-year (1980-2005) trends in mean levels of body mass index (BMI), systolic BP and cholesterol in 199 high-income, middle-income and low-income countries.

- Mean systolic BP declined in high and middle-income countries but increased in low-income countries and is now more than in high-income countries.

- The India specific data are similar to the overall trends in low-income countries.

Global Burden of Hypertension

2012

- **26.4%** of world adult population had hypertension
- Total of **972 million** adults
- **established market economies** (eg

2025

- **29.2%** of world adult population will have hypertension
- Total of **1.56 billion** adults (**60%** overall; **24%** in developed nations, **80%** in developing nations)
- Highest prevalence will be in **economically developing continents** (eg, Asia, Africa)

The Natural History of Untreated Hypertension

- Untreated hypertension is a self-accelerating condition Evolving arteriolar hypertrophy, and endothelial dysfunction facilitate the later increase of BP transition to higher stage

- A summary of nearly all placebo-controlled early outcomes
  trials in hypertension indicated that

  - 1493 of 13,342 (11.2%) subjects in the placebo groups progressed in stages of hypertension

  - Compared with only 95 of 13,389 (0.7%) in the drug-treated groups

Attributable Risk

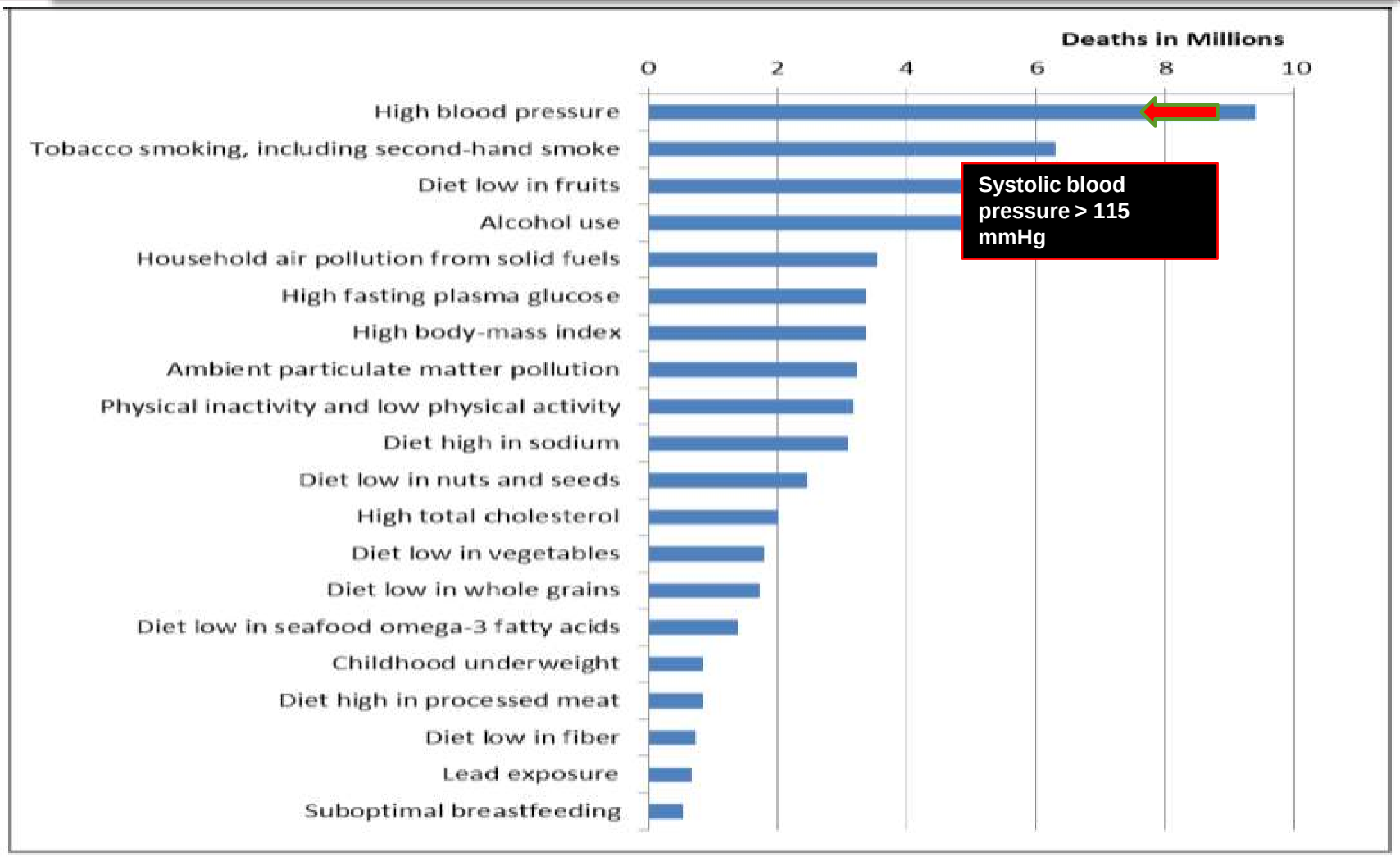
54% stroke

47% IHD

25% other CVD

13.5% Total mortality

Global Leading Risks for Death



Global Burden of Disease Study 2010 , *Lancet* 2012; 380: 2224–60

National

- The prevalence of hypertension in the late nineties and early twentieth century varied among different studies in India, ranging from 2-15% in Urban India and 2-8% in Rural India.

- Review of epidemiological studies suggests that the prevalence of hypertension has increased in both urban and rural subjects and presently is 25% in urban adults and 10-15% among rural adults .

- In a meta-analysis of multiple cardiovascular epidemiological studies, prevalence rates of coronary artery disease and stroke have more than trebled in the Indian population.

- In the INTERHEART and INTERSTROKE study, hypertension accounted for 17.9% and 34.6% of population attributable risk of various cardiovascular risk factors for coronary artery disease and stroke respectively.

Table 2 Population attributable risks (%) of various cardiovascular risk factors for coronary heart disease and stroke in [11,12]

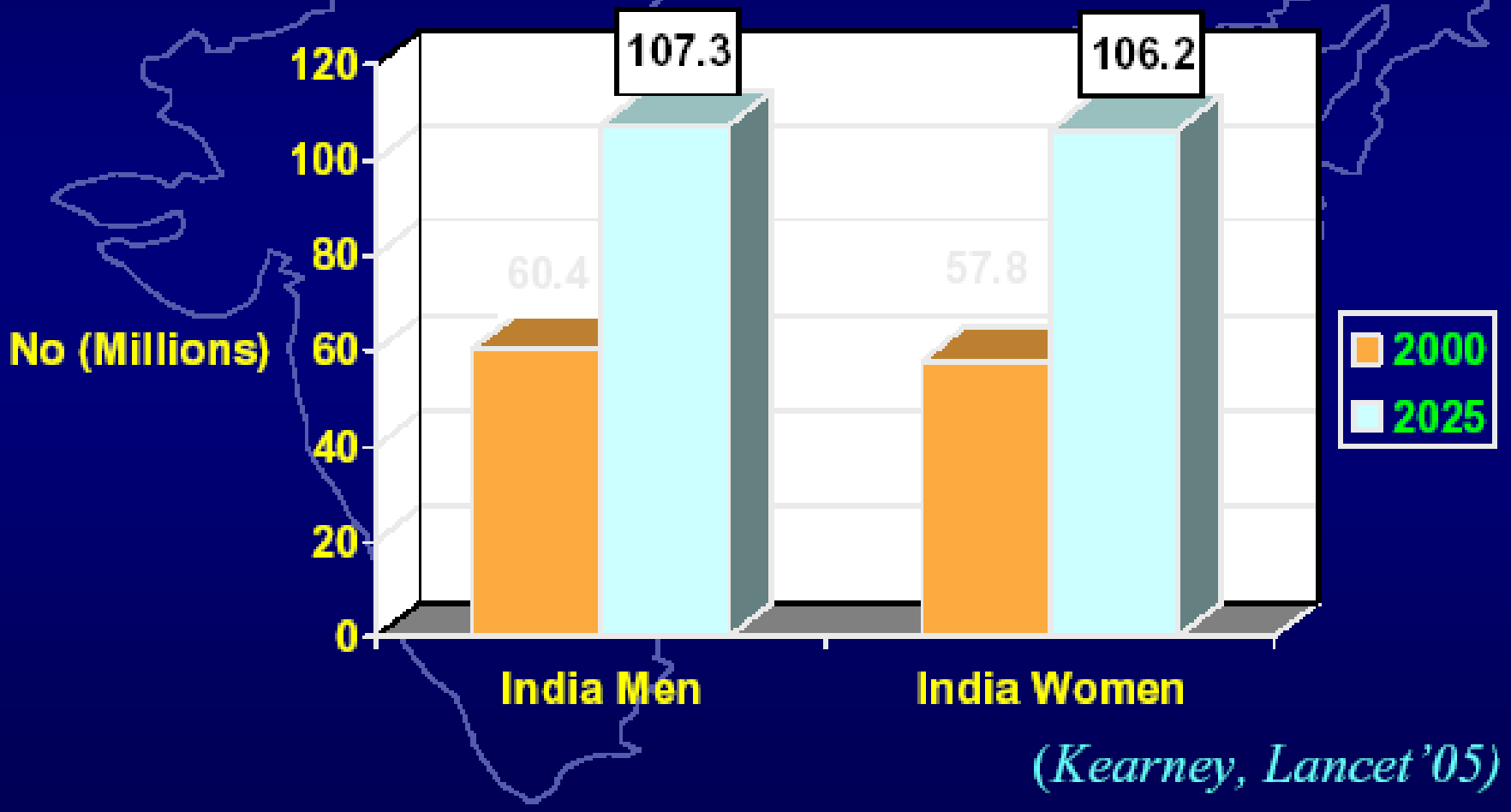
Risk factor	INTERHEART (acute myocardial infarction)	INTERSTROKE (thrombotic or hemorrhagic strokes)
Apolipoprotein A/B ratio	49.2	24.9
Hypertension	17.9 (history)	34.6
Smoking	35.7	18.9
Diabetes history	9.9	5.0
High waist-hip ratio	20.1	26.5
Psychosocial stress	32.5	9.8
Regular physical activity	12.2	28.5
Diet/diet score	13.7	18.8
Lack of alcohol intake	6.7	3.8
Cardiac causes	-	6.7

- As per the Registrar General of India and Million Death Study investigators (2001-2003), CVD was the largest cause of deaths in males (20.3%) as well as females (16.9%) and led to about 2 million deaths annually.

- The Global Status on Non- Communicable Diseases Report (2011) has reported that there were more than 2.5 million deaths from CVD in India in 2008, two-thirds due to coronary artery disease and one-third to stroke.

- These estimates are significantly greater than those reported by the Registrar General of India and shows that CVD mortality is increasing rapidly in the country.

Projected trends of Hypertension burden in India



(Kearney, Lancet'05)

- There are large regional differences in cardiovascular mortality in India among both men and women. The mortality is highest in south Indian states, eastern and north eastern states and Punjab in both men and women, while mortality is the lowest in the central Indian states of Rajasthan, Uttar Pradesh and Bihar.

- .

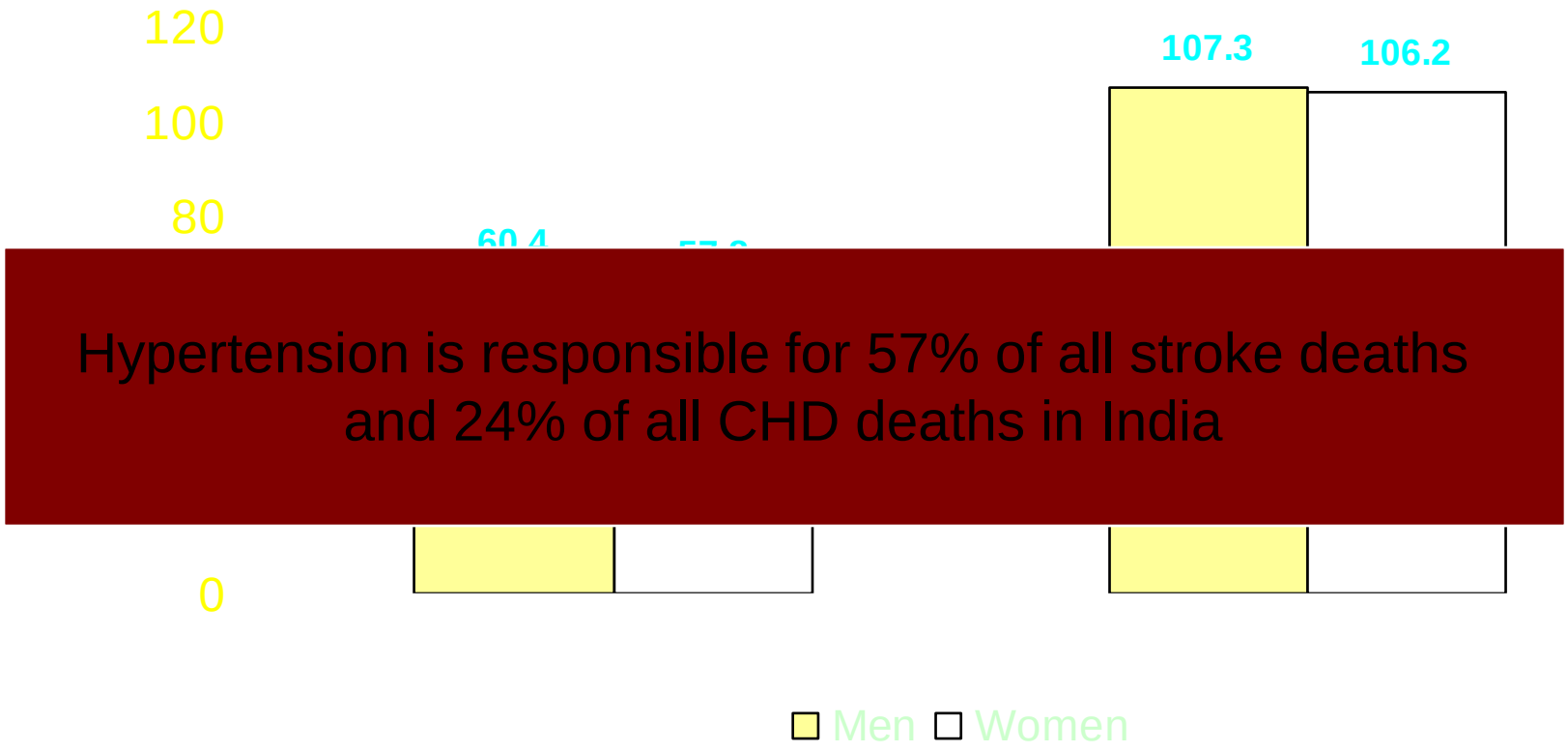
Hypertension prevalence in young men (15–54y) and women (15–49y) in India in National Family Health Survey-4.

State (alphabetic)	Sample size	Hypertension (known or BP ≥ 140/90 mmHg)		
		Men	Women	Total
Andaman & Nicobar	3219	27.9	9.0	18.5
Andhra Pradesh	11826	16.2	10.0	13.1
Arunachal Pradesh	16224	21.6	15.0	18.3
Assam	32307	19.6	16.0	17.8
Bihar	51243	9.4	5.9	7.7
Chandigarh	866	13.5	9.3	11.4
Chhattisgarh	28701	12.7	8.8	10.8
Delhi	6586	4.2	7.6	5.9
Goa	2457	13.2	8.5	10.9
Gujarat	28506	13.0	9.7	11.4
Haryana	25032	16.8	9.2	13.0
Himachal Pradesh	12114	21.9	12.1	17.5
Jammu & Kashmir	29384	13.7	11.6	12.7
Jharkhand	32866	12.2	7.8	10.0
Karnataka	30034	15.4	9.7	12.6
Kerala	12897	9.5	6.8	8.2
Madhya Pradesh	72313	10.9	7.9	9.4
Maharashtra	33957	15.9	9.1	12.5
Manipur	15342	20.4	11.4	15.9
Meghalaya	10347	10.4	9.9	10.2
Mizoram	13896	17.9	9.8	13.9
Nagaland	12230	23.1	16.0	19.6
Odisha	37930	12.5	9.0	10.8
Punjab	22511	21.8	13.2	17.5
Pondicherry	4618	15.1	9.1	12.1
Rajasthan	47857	12.4	6.9	9.7
Sikkim	6096	27.3	16.5	21.9
Tamilnadu	33614	15.5	8.3	11.9
Telangana	8625	18.2	10.1	14.2
Tripura	5623	13.6	12.6	13.1
Uttarakhand	19290	17.2	9.6	13.4
Uttar Pradesh	110600	10.1	7.6	8.9
West Bengal	20057	12.4	10.3	11.4

- The prevalence of hypertension in the last six decades has increased from 2% to 25% among urban residents and from 2% to 15% among the rural residents in India.
- According to Directorate General of Health, Government of India, the overall prevalence of hypertension in India by 2020 will be 159.46/1000 population.
- Factors responsible for this rising trend
  - increased life expectancy,
  - urbanization
  - lifestyle changes, sedantry habits
  - increasing salt intake
  - overall epidemiologic transition India is experiencing
  - increased awareness of HTN and its detection

India- Soon Heading Towards Being Hypertension Capital

At least 1 out of every 5 adult Indians has hypertension



Hypertension is responsible for 57% of all stroke deaths and 24% of all CHD deaths in India

- In last 2 decades the prevalence of hypertension has been seen to be static in some urban areas. The prevalence of smoking has declined while that of diabetes, metabolic syndrome, hypercholesterolemia and obesity has been increasing.
- Hypertension awareness, treatment and control status is low, with only half of the urban and a quarter of the rural hypertensive individuals being aware of its presence.
- It has been seen that only one in five persons is on treatment and less than 5% are controlled.
- Rural location is an important determinant of poor hypertension awareness, treatment and control.
- It has been said that in India the rule- of-halves is not valid and only a quarter to a third of subjects are aware of hypertension.

The Rule of Halves

- **Only 1/2 have been diagnosed**
- **Only 1/2 of those diagnosed have been treated**
- **Only 1/2 of those treated are adequately controlled**
- **Thus, only 12.5% overall are adequately**

Prospective Urban Rural Epidemiology (PURE)

PURE STUDY

- To asses hypertension prevalence,awareness, treatment and control in urban and rural communities in multiple countries.

Overall Prevalence of Hypertension by Location, Smoking status, Gender, Cooking Fuel

Variable	Category	Adjusted rate	P Values
Smoking Status	Not Smoker	9.9	0.062
	Smoker	8.1	
Gender	Female	8.4	0.283
	Male	9.5	
Location	Rural	6.3	<.0001
	Urban	12.7	
Cooking Fuel	Other	11.7	<.0001
	Solid Fuel	6.8	
Female smoking status	Not smoker	10.1	0.086
	Smoker	7.0	
Male smoking status	Not smoker	9.8	0.450
	Smoker	9.2	

Conclusion
PURE STUDY

- Highly prevalent in all communities
- Awareness is low
- Once aware ,substantial proportion are treated but control of BP is poor
- Few people with HTN are on 2 or more drugs
- Alternative strategies to detect (systematic screening) by simplified algorithm algorithms and early use of combination therapies (polypill) are critical to controlling this epidemic

Table 2: Previous Studies (1963 – 1999) on prevalence of hypertension in Urban and Rural Indian population

Author	Place	Year	Age Group (Years)	Hypertension Criteria (mm Hg)	Prevalence			
					Men		Women	
					%	Sample size	%	Sample size
Urban India								
Mathur	Agra	1963	>20	>160/95	3.98	(1408)	6.64	(227)
Malhotra	Railways	1970	20-58	>160/95	6.2[a] 15.2[b]	(2638) (1594)	—	—
Gupta SP	Rohtak	1978	>20	>160/95	6.00	(1151)	7.00	(872)
Dalal PM	Mumbai	1980	>18	Variable	15.63	(3148)	15.38	(2575)
Wasir	New Delhi	1984	20-60	≥160/95	3.80	(1767)	1.45	(688)
Ahmed	Karnataka	1988	>21	DBP >90	10.20	(698)	2.00	(102)
Hussain	Rajasthan	1988	20-60	>140/90	6.15	(1561)	7.33	(1103)
Chaddha	New Delhi	1990	25-64	>160/90	11.66	(637)	13.68	(7351)
Gupta R	Jaipur	1995	≥ 20	>140/90	30.00	(1415)	34.00	(797)
Rural India								
Gupta SP	Haryana	1977	20-69	>160/95	3.50	(1154)	3.69	(891)
Wasir	Delhi	1983	>20	>160/95	3.20	(441)	7.50	(464)
Baldwa	Rajasthan	1984	21-60	>141/91	6.93	(447)	8.81	(465)
Puri	Himalayas	1986	15-82	>160/95	2.44	(1592)	2.38	(1511)
Hussain	Rajasthan	1988	20-60	>140/90	5.72	(1328)	6.43	(1150)
Kumar	Rajasthan	1991	>21	>160/95	4.00	(3742)	3.60	(3098)
Joshi	Maharashtra	1993	>16	>160/95	4.85	(227)	3.17	(221)
Jajoo	Maharashtra	1993	>20	>160/95	2.89	(2247)	4.06	(1798)
Agarwal	Uttar Pradesh	1994	>20	>160/95	1.57	(3760)	—	—
Malhotra	Haryana	1999	16-70	>140/90	3.00	(2559)[f]	5.80	—

[a]North Indians; [b]South Indians; [f]Overall prevalence and total sample size for men and women; *Overall prevalence for men and women

Table 3 : Recent studies (2000 – 2012) on prevalence of hypertension in urban and rural Indian population

First author	Year	Place	Age (yr)	Sample Size	Prevalence (%)
Urban Population					
Anand MP	2000	Mumbai	30-60	1662	34.0
Gupta PC	2004	Mumbai	≥ 35	88653	47.9
Prabhakaran D	2005	Delhi	20-59	2935	30.0
Reddy KS	2006	National	20-69	19973	27.2
Mohan V	2007	Chennai	≥ 20	2350	20.0
Kaur P	2007	Chennai	18-69	2262	27.2
Yadav S	2008	Lucknow	≥ 30	1746	32.2
Rural Populations					
Hazarika	2004	Assam	>30	3180	33.3
Thankappan	2006	Kerala	>30	2159	36
Krishnan A	2008	Harayana	15-64	2828	9.3
Todkar SS	2009	Maharashtra	≥ 20	1297	7.2
Vijaykumar G	2009	Kerala	≥18	1990	36.1
Bhardwaj R	2010	Himachal	≥ 18	1092	35.9
Kinra S	2010	National	20-69	1983	20.0

PREVALENCE OF HYPERTENSION IN INDIA

2001 - 118 million → 2025 - 214 million

- Till early 1980s – prevalence 3 - 4%
- Mid 1990s: urban areas 25 – 29%, rural areas 10-13% (ICMR, 1994)
- Sentinel Surveillance Project, documented 28% prevalence of hypertension (criteria: =JNC VI) from 10 regions of the country in the age group 20-69 years
- Gupta (1994, 2001, 2003) through 3 serial epidemiological studies (Criteria>=140/90 mm of Hg) demonstrated rising prevalence of hypertension (30%, 36%, and 51% respectively among males and 34%, 38% and 51% among females)

Farag et al. BMC Nephrology 2014, 15:42
http://www.biomedcentral.com/1471-2369/15/42

BMC Nephrology

RESEARCH ARTICLE Open Access

Burden and predictors of hypertension in India: results of SEEK (Screening and Early Evaluation of Kidney Disease) study

Youssef MK Farag[1†], Bharati V Mittal[1†], Sai Ram Keithi-Reddy[1], Vidya N Acharya[2], Alan F Almeida[3], Anil C[4], Ballal HS[5], Gaccione P[1], Issacs R[6], Sanjiv Jasuja[7], Kirpalani AL[8], Kher V[9], Modi GK[10], Georgy Nainan[11], Jai Prakash[12], Mohan M Rajapurkar[13], Rana DS[14], Rajanna Sreedhara[15,4], Sinha DK[16], Bharat V Shah[17], Sham Sunder[18], Raj Kumar Sharma[19], Sridevi Seetharam[4], Tatapudi Ravi Raju[20] and Ajay K Singh[1*]

Abstract

Background: Hypertension (HTN) is one of the major causes of cardiovascular morbidity and mortality. The objective of the study was to investigate the burden and predictors of HTN in India.

Methods: 6120 subjects participated in the Screening and Early Evaluation of Kidney disease (SEEK), a community-based screening program in 53 camps in 13 representative geographic locations in India. Of these, 5929 had recorded blood pressure (BP) measurements. Potential predictors of HTN were collected using a structured questionnaire for SEEK study.

Results: HTN was observed in 43.5% of our cohort. After adjusting for center variation ($p < 0.0001$), predictors of a higher prevalence of HTN were older age ≥40 years ($p < 0.0001$), BMI of ≥ 23 Kg/M^2 ($p < 0.0004$), larger waist circumference ($p < 0.0001$), working in sedentary occupation ($p < 0.0001$), having diabetes mellitus ($p < 0.0001$), having proteinuria ($p < 0.0016$), and increased serum creatinine ($p < 0.0001$). High school/some college education ($p = 0.0016$), versus less than 9th grade education, was related with lower prevalence of HTN. Of note, proteinuria and CKD were observed in 19% and 23.5% of HTN subjects. About half (54%) of the hypertensive subjects were aware of their hypertension status.

Conclusions: HTN was common in this cohort from India. Older age, BMI ≥ 23 Kg/M^2, waist circumference, sedentary occupation, education less, diabetes mellitus, presence of proteinuria, and raised serum creatinine were significant predictors of hypertension. Our data suggest that HTN is a major public health problem in India with low awareness, and requires aggressive community-based screening and education to improve health.

Keywords: Hypertension, CKD, Awareness

THE CONTROL OF HYPERTENSION

IMPROVING HYGEINE

INFECTION CONTROLSTEPS

BETTER DRUGS & VACCINES

BASIC MEDICAL FACILITY AVAILABLE

TO COMMON MAN

THE CONTROL OF HYPERTENSION

INCREASE STRESS LEVELS

SMOKING

ALCOHOLISM

CHANGING FOOD HABITS

SEDENTARY JOBS

NO PHYSICAL EXCERCISE

THE PROBLEM

10 - 20% PREVALENCE OF HYPERTENSION ALL OVER THE WORLD

APPLY TO INDIAN SCENARIO

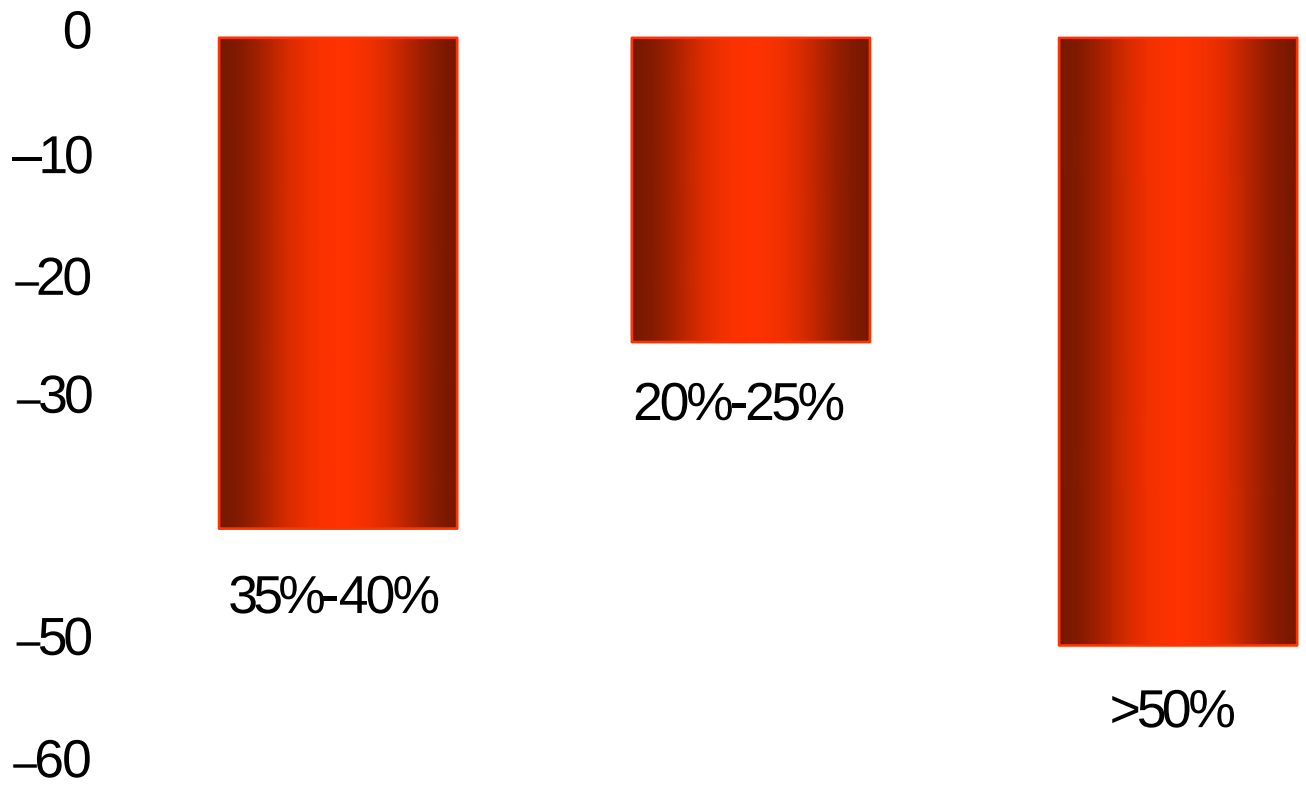
THE HYPERTENSIVE POPULATION IS APPROXIMATELY 12CRORES

THE PROBLEM OF HYPERTENSION

A MAJOR HEALTH PROBLEM

COMPLEX AND MULTIDIMENSIONAL APPROACH

Long-Term Antihypertensive Therapy Significantly Reduces CV Events



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Indian Heart Journal

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Review Article

Hypertension: The most important non communicable disease risk factor in India

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ABSTRACT

Non-communicable diseases are important causes of mortality and morbidity in India. Data from the Registrar General of India, World Health Organization and Global Burden of Disease (GBD) Study have reported that cardiovascular diseases (CVD) are the most important causes of death and disability. Age-adjusted mortality from these conditions has increased by 31% in last 25 years. Case-control studies have reported that hypertension is most important risk factor for CVD in India. GBD Study has estimated that hypertension led to 1.6 million deaths and 33.9 million disability-adjusted life years in 2015 and is most important cause of disease burden in India. Intensive public health effort is required to increase its awareness, treatment and control. UN Sustainable Development Goals highlight the importance of high rates of hypertension control for achieving target of 1/3 reduction in non-communicable disease mortality by 2030. It is estimated that better hypertension control can prevent 400–500,000 premature deaths in India.

Top ten Category 2 (broad categories) and Category 3 (specific factors) risk factors for disease burden (disability adjusted life years) and mortality in India: Global Burden of Disease Study 2015.

Ranking	Category 2 risk factors	Category 3 risk factors
1	Air pollution	High blood pressure
2	Dietary risks	High fasting blood glucose
3	Child and maternal malnutrition	Ambient particulate matter
4	High systolic blood pressure	Household air pollution
5	High fasting blood glucose	Smoking
6	Unsafe water, sanitation	High total cholesterol
7	Tobacco smoke	Low whole grains intake
8	High total cholesterol	Low glomerular filtration
9	Alcohol and drug use	Unsafe water
10	High body mass index	Low fruit intake

THE INDIAN SCENARIO

MYTHS & FACTS

MYTH - HYPERTENSIVES ARE SYMPTOMATIC

FACT - 90% ARE ASYMPTOMATIC

MYTH HYPERTENSION IS DISEASE OF ELDERLY

FACT NO AGE FOR HYPERTENSION

MYTH - ONCE DIAGNOSED START DRUGS

FACT - EVALUATE FOR SECONDARY HTN, STRESS ON LIFE STYLE MODIFICATION

MYTH - STOP DRUGS ONCE BP IS NORMAL

FACT- HYPERTENSION CAN BE CONTROLLED NOT CURED

MYTH - **REGULAR INTAKE OF DRUGS CAN PRODUCE SIDE EFFECTS**

FACT **UNCONTROLLED HTN PRODUCES ENDORGAN DAMAGES**

INDIAN GUIDELINES ON HYPERTENSION

- Hypertension is a major contributor to cardiovascular morbidity and mortality in India and worldwide. In view of our special geographical and climatic conditions, ethnic background, dietary habits, literacy levels and socio- economic variables, there could be some areas where significant differences need to be addressed. With this in mind, the Association of Physicians of India (API), Cardiological Society of India (CSI), the Indian College of Physicians (ICP), and the Hypertension Society of India (HSI) developed the "FIRST INDIAN GUIDELINES FOR THE MANAGEMENT OF HYPERTENSION - 2001."
- NOW THE THIRD REVISION HAS BEEN DONE BY API IN 2013

- **The primary aim of these guidelines is to offer balanced information to guide clinicians, rather than rigid rules that would constrain their judgment about the management of individual adult patients, who will differ in their personal, medical, social, economic, ethnic and clinical characteristics.**

Methodology

- In consonance with the first and second guidelines, a revised format was evolved by the Core committee which was then reviewed by 300 physicians and specialists from across the country whose inputs have been incorporated. Like the previous guidelines, this document has also been studied, reviewed, and endorsed by the CSI, Hypertension Society of India (HSI), Indian College of Physicians (ICP), Indian Society of Nephrology (ISN), Research Society for Study of Diabetes in India (RSSDI) and Indian Academy of Diabetes (IAD).

Definition and classification

- There is a continuous relationship between the level of blood pressure and the risk of complications. Starting at 115/75 mmHg, CVD risk doubles with each increment of 20/10 mmHg throughout the blood pressure range.
- All definitions of hypertension issued by various international authorities are arbitrary. There is some evidence that the risk of cardiovascular events in Asian Indians is higher at relatively lower levels of blood pressure (BP).
- Hypertension in adults age 18 years and older is defined as systolic blood pressure (SBP) of 140 mmHg or greater and/or diastolic blood pressure (DBP) of 90 mmHg or greater or any level of blood pressure in patients taking antihypertensive medication.

Classification

- Cardiovascular risk has long been recognized.
- This relationship is strong, continuous, graded, consistent, independent, predictive and etiologically significant for those with and without CAD.

- For persons over age 50, SBP is more important than DBP as a CVD risk factor. SBP is more difficult to control than DBP. SBP needs to be as aggressively controlled as DBP.

- Therefore, although classification of adult blood pressure is somewhat arbitrary, it is useful for clinicians who make treatment decisions based on a constellation of factors along with the actual level of blood pressure.

Classification of blood pressure for adults age 18 and older[3,9,10]

Category	Systolic (mm Hg)		Diastolic (mm Hg)
Optimal**	<120	and	<80
Normal	<130	and	<85
High-normal	130–139	or	85–89
Hypertension***			
Stage 1	140–159	or	90–99
Stage 2	160–179	or	100–109
Stage 3	>180	or	>110
Isolated systolic hypertension			
Grade 1	140–159	and	<90
Grade 2	>160	and	<90

* Not taking antihypertensive drugs and not acutely ill. In addition to classifying stages of hypertension on the basis of average blood pressure levels, clinicians should specify presence or absence of target organ disease and additional risk factors.

** Optimal blood pressure with respect to cardiovascular risk is below 120/80 mmHg. However unusually low readings should be evaluated for clinical significance.

*** Based on the average of two or more blood pressure readings taken at least on two visits after an initial screening.

- This classification is for individuals who are not taking antihypertensive medication and who have no acute illness and is based on the average of two or more blood pressure readings taken at least on two subsequent occasions, one to three weeks apart, after the initial screening.

- When SBP and DBP fall into different categories, the higher category should be selected to classify the individual's blood pressure.

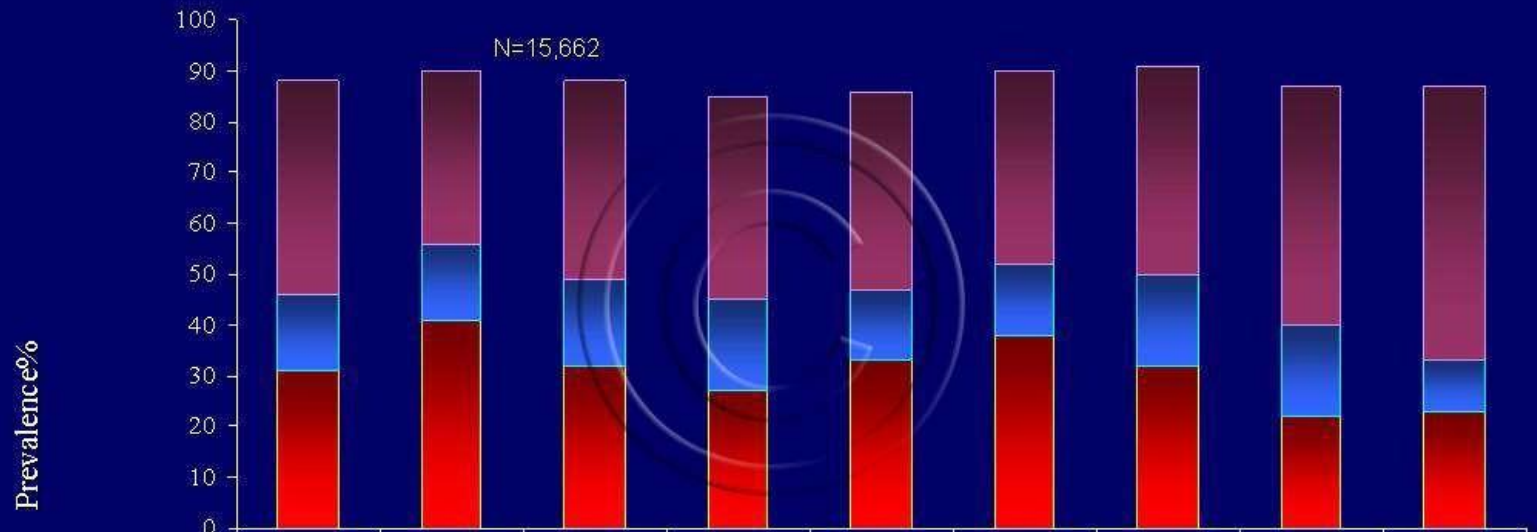
- The term 'Prehypertension' introduced in the JNC VII guidelines includes a wide range of BP from normal to high normal. It is felt that the term "prehypertension" is more likely to create anxiety in a large subset of population. Hence, they do not recommend the use of the term "pre- hypertension."

- There is emerging evidence that the high normal group needs to be treated sometimes in the presence of family history of hypertension and concomitant diseases like diabetes and (TOD).

Prehypertension

- SBP 120–139 or DBP 80–89
- CV risk increases progressively from levels as low as 115 mmHg SBP
- 54% of stroke and 46% of ischemic heart disease events occurring in persons with blood pressures in this range

Prevalence of Known Hypertension, Newly Detected Hypertension and Prehypertension in India



	Total	Maharashtra	Delhi	Gujarat	West bengal	Madhya Pradesh	Andhra Pradesh	Tamilnadu	Kamataka
Prehypertension	42	34	39	40	39	38	41	47	54
Newly diagnosed	15	15	17	18	14	14	18	18	10
Known	31	41	32	27	33	38	32	22	23

Joshi S. Diabetes Technology and Therapeutics 2012; 14

Progress to HTN

- Among patients > 35 yr or more than **17% of those with normal BP** and **37% of those with BP in the prehypertensive range** progress to overt hypertension within 4 years without changes in lifestyle or pharmacological intervention

Most Common Causes of Secondary Hypertension by Age*

Age groups	*Percentage of hypertension with an underlying cause*	*Most common etiologies†*
Children (birth to 12 years)	70 to 85	Renal parenchymal disease Coarctation of the aorta
Adolescents (12 to 18 years)	10 to 15	Renal parenchymal disease Coarctation of the aorta
Young adults (19 to 39 years)	5	Thyroid dysfunction Fibromuscular dysplasia Renal parenchymal disease
Middle-aged adults (40 to 64 years)	8 to 12	Aldosteronism Thyroid dysfunction Obstructive sleep apnea Cushing syndrome Pheochromocytoma

*—Excluding dietary and drug causes and the risk factor of obesity.
†—Listed in approximate order of frequency within groups.

Management of hypertension

- **Goals of therapy**
- The primary goal of therapy of hypertension should be effective control of BP in order to prevent, reverse or delay the progression of complications and thus reduce the overall risk of an individual without adversely affecting the
-

Initiation of therapy

- Having assessed the patient and determined the overall risk profile, management of hypertension should proceed as follows:
- In low risk patients, it is suggested to institute life style modifications and observe BP for a period of 2-3 months, before deciding whether to initiate drug therapy.
- In medium risk patients, institute life style modifications and initiate drug therapy after 2-4 weeks, in case BP remains above 140/90.
- In high and very high-risk groups, initiate immediate drug treatment for hypertension and other risk factors in addition to instituting life-style modification

Table 6 : Factors influencing risk of cardiovascular disease

Risk factors for coronary artery disease (RF)	Target organ damage (TOD)	Associated clinical conditions (ACC)
• Age > 55 years*	• Left ventricular hypertrophy detected by ECG and/or echocardiogram	• Cerebrovascular disease - Transient ischemic attack - Ischemic stroke - Cerebral haemorrhage
• Male sex	• Microalbuminuria/ proteinuria and/or elevation of serum creatinine (1.2-2.0 mg/dl)**	• Heart disease - Myocardial infarction - Angina - Coronary revascularization - Congestive heart failure
• Post-menopausal women	• Urinary ACR (albumin creatinine ratio)***	• Renal disease - Diabetic nephropathy - Renal failure (serum creatinine > 2.0 mg/dl)
• Smoking and tobacco use	• Ultrasound or radiological evidence of atherosclerotic plaques in the carotids	• Vascular disease - Peripheral arterial disease including non-specific aortoarteritis - Aortic dissection
• Diabetes mellitus	• Hypertensive retinopathy	• Advanced hypertensive retinopathy - Haemorrhages or exudates - Papilledema
• Family history of premature coronary artery disease (Males < 55 years, Female < 65 years)		
• Increased Waist:hip ratio		
• Obesity and Obstructive Sleep Apnoea (OSA)		
• High LDL or Total cholesterol		
• Low HDL cholesterol and High triglycerides		
• High sensitivity C-reactive protein (hs-CRP)		
• Estimated GFR <60 mL/min (MDRD)		
• Lipoprotein-a is a genetic risk factor		

*Coronary artery disease is known to occur 10 years earlier in South Asians than in other ethnic groups.; **Microalbuminuria 30-300mg/24hours; ***Albumin-Creatinine Ratio(ACR) ≥22 (M) or ≥31 (F) mg/g creatinine

Table 7: Risk stratification of patients with hypertension

Stage	Other risk factors and disease history	Blood pressure (mm Hg)		
		Stage 1	Stage 2	Stage 3 (severe hypertension)
		SBP 140-159 or DBP 90-99	SBP 160-179 or DBP 100-109	SBP>180 or DBP>110
I	No other risk factors	Low risk	Medium risk	High risk
II	1-2 risk factors[a]	Medium risk	Medium risk	Very high risk
III	3 or more risk factors or TOD[b] or diabetes	High risk	High risk	Very high risk
IV	ACC[c]	Very high risk	Very high risk	Very high risk

Risk strata (typical 10 year risk of stroke or myocardial infarction): Low risk = Less than 15% Medium risk = about 15-20% High risk = about 20-30% Very high risk = 30% or more [a]See Table 6; [b]TOD: Target Organ Damage see Table 6; [c]ACC: Associated clinical conditions, including clinical cardiovascular disease or renal disease see Table 6

Management Strategy

Non- Pharmacological therapy

- **Life style measures**
- **Patient education**
- **Weight reduction**

Lifestyle interventions for blood pressure reduction are given below[10]

Intervention	Recommendation	Expected systolic blood pressure reduction (range)
Weight reduction	Maintain ideal body mass index below 23 kg/m^2	5–20 mm Hg per 10 kg weight loss
DASH* eating plan	Consume diet rich in fruits, vegetables, low-fat dairy products with reduced content of saturated and total fat.	8–14 mmHg
Dietary sodium restriction	Reduce dietary sodium intake to <6 g salt or < 2.4 g sodium.	2–8 mmHg
Physical activity	Engage in regular aerobic physical activity, for example, brisk walking for at least 30 min most days	4–9 mmHg
Alcohol moderation	Men < 60 ml per day, twice a week Women < 30 ml per day, twice a week. Abstinence is preferred.	2–4 mmHg
Tobacco	Total abstinence	

* DASH = Dietary Approaches to Stop Hypertension

Sodium content of foods per 100 gms are given below[10,15,16]

<25 mg Low		25–50 mg Moderate	50–100 mg Moderately High	>100 mg High
Amla	Cow pea	Raisins	Cauliflower	Amaranth
Bitter gourd	Horse gram	Broad beans	Fenugreek	Bacon
Bottle gourd	Ragi	Carrots	Lettuce	Egg
Brinjal	Vermicelli	Reddish white	Field beans	Lobster
Cabbage	Semolina	Black gram dal	Beetroot	
Lady finger	Wheat	Green gram dal	Water melon	
Colocasia	Maida	Red gram dal	Bengal gram dal	
Cucumber	Milk	Lentil whole	Red gram tender	
French beans	Grapes	Bengal gram whole	Liver	
Peas	Sweetlime	Banana	Prawns	
Onion	Papaya	Pineapple	Beef	
Potato	Orange	Apple	Chicken	
Tomato ripe	Sapota	Mutton		
Yam				

Food items to be avoided in hypertensives are given below[10,15,16]

A	B
Table salt	**Salt preserved foods**
Mono sodium glutamate (Ajinomoto)	Pickles and canned foods
Baking powder	Ketchup and sauces
Sodium bicarbonate	Prepared mixes
Fried foods	Ready to eat foods
Alcohol	**Highly salted foods**
	Potato chips, cheese, peanut butter, salted butter, *papads*
	Bakery products: Biscuits, cakes, breads and pastries

Foods with high potassium are given below[10,15,16]

Fruits		Vegetables	
Amla	Plums	Cabbage	Raddish white
Sapota	Lemons	Bitter gourd	Brinjal
Peaches	Sweetlime	Ladies finger	Pumpkin
Orange	Pineapple	Cauliflower	French beans
Papaya	Apple	Spinach	Colocasia
Banana	Watermelon	Potato	Tapioca
		Drumstick	

Pharmacologic therapy

- **Principles of drug treatment:**
- Over the past decade, the goals of treatment have gradually shifted from optimal lowering of blood pressure, which is taken for granted, to patient's overall well-being, control of associated risk factors and protection from future target organ damage.
- Achieve gradual reduction of blood pressure. Use low doses of antihypertensive drugs to initiate therapy.
- Four classes of drugs can be recommended as first line treatment for stage 1–2 hypertension These include :1) ACE inhibitors, 2) angiotensin II receptor blockers, 3) calcium channel blockers, 4) diuretics

- once daily administration ensures smooth and sustained control of blood pressure; which in turn is expected to provide greater protection against the risk of major cardiovascular events and target organ damage. Once daily administration also improves patient compliance.

- Although antihypertensive therapy is generally lifelong, an effort to decrease the dosage and number of antihypertensive drugs should be considered after effective control of hypertension (step-down therapy).

- Due to a greater seasonal variation of temperatures in India, marginal alterations in dosages of drugs may be needed from time to time.

Guidelines for selecting the most appropriate first-line antihypertensive drugs are given below[10]

Class of drugs	Definite indication/s	Possible indication/s	Definite contraindication/s	Relative contraindication/s
Diuretics	Heart failure Elderly patients Systolic hypertension	Diabetes	Gout	Dyslipidemia
β-blockers	Angina Post-myocardial infarction Tachyarrhythmia Heart failure	Pregnancy Diabetes	Heart block	Dyslipidemia Physically active Peripheral vascular disease Elderly persons > 50 years Asthma and chronic pulmonary disease (COPD)
CCBs	Metabolic syndrome Angina Elderly Systolic hypertension Diabetes	Peripheral vascular disease CVA	Heart block	Congestive heart failure*
ACE inhibitors	Metabolic syndrome Heart failure Left ventricular dysfunction Post-myocardial infarction Significant proteinuria Diabetes	CVA	Pregnancy and lactation Bilateral renal artery stenosis Hyperkalemia	Moderate renal failure (Creatinine levels >3 mg/dl)
Angiotensin II Receptor Blockers (ARBs)	Metabolic syndrome Diabetes mellitus Proteinuria LV dysfunction ACE inhibitor induced cough	Heart failure CVA	Pregnancy and lactation Bilateral renal artery stenosis Hyperkalemia	Moderate renal failure (Creatinine levels >3 mg/dl)

SIMPLIFIED TREATMENT OFHYPERTENSION

AGE LESS THAN 60 YEARS

1. ACE Inhibitors like Enalapril
2. If intolerant : Angiotensin Receptor Blockers like Losartan/Telmisartan
3. Add Calcium Channel Blockers like Amlodipine if not controlled
4. Beta Blockers only for Tachycardia/Anxiety

AGE MORE THAN 60 YEARS

1. Calcium Channel Blockers like Amlodipine
2. Diuretics like Chlorthalidone
3. Add ACE Inhibitors like Enalapril or Angiotensin Receptor Blockers like Losartan/Telmsartan if not controlled
4. Beta-Blockers only for Ischemic Heart Disease

Consensus Target

Area of Concern	BP Target (mmHg)
General CAD prevention	<140/90
High CAD risk*	<130/80
Stable Angina	<130/80
Unstable Angina/NSTEMI	<130/80
STEMI	<130/80
LV Dysfunction	<120/80

Conclusion

- India and its prevalence is rapidly increasing among both urban and rural populations. In fact, hypertension is the most prevalent chronic disease in India.
- The prevalence of hypertension ranges from 20-40% in urban adults and 12-17% among rural adults.
- The number of people with hypertension is projected to increase from 118 million in 2000 to 214 million in 2025

- Reducing blood pressure can decrease cardiovascular risk and this can be achieved by lifestyle measures in mild cases and should be the initial approach to hypertension management in all cases.
- But unlike in Western countries, stress management is often given greater emphasis in India.

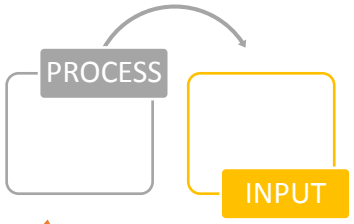
Indians<130/85 and <120/80 for those with diabetes or heart failure.

- Comprehensive hypertension management should focus not only on reducing the blood pressure, but reducing the cardiovascular risk by lifestyle measures, lipid management, smoking

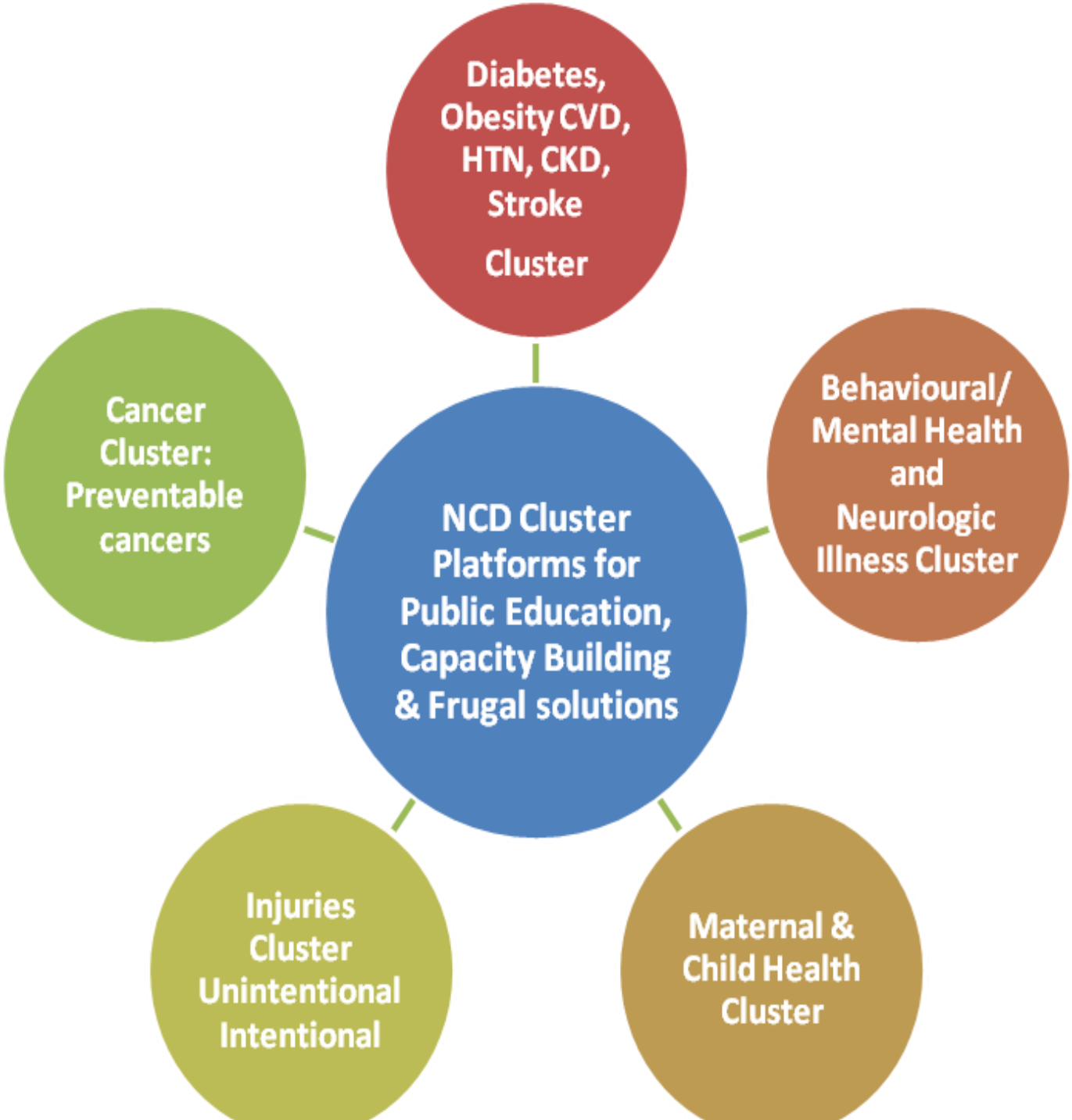
JIPMER INTERNATIONAL SCHOOL OF PUBLIC HEALTH

LOGIC FRAMEWORK FOR JISPH

- **A. MANPOWER**
  - MPH/ PhDs/ DrPH/ Joint Degrees/ Dual Degrees
  - 70 Trainees per year
- **B. RESEARCH & INNOVATION**
  - Care Delivery Models – Scalable & Sustainable
  - Longitudinal Cohorts for evidence generation
  - Health Service Research – Systems evaluation
- **C. HEALTH SYSTEM STRENGTHENING**
  - Disease Surveillance (CDs & NCDs)
  - Evaluation of Programme/ Projects/ Scheme
  - Adopting villages with NGOs
- **D. LEVERAGING EXTERNAL FUNDING**
  - International & National



1. Division of Epidemiology
2. Division of Biostatistics
3. Division of Communicable Disease & Surveillance
4. Division of Non-communicable disease
5. Division of Health Policy & Management
6. Division of Environmental Health & Disaster Management
7. Division of Behavioural Sciences & Medical Sociology
8. Division of Health Communication
9. Division of Health Economics
10. Division of International Health
11. Division of Public Health Nutrition
12. Division of Maternal & Child Health


Diabetes, Obesity CVD, HTN, CKD, Stroke
Cluster
Cancer Cluster: Preventable cancers
NCD Cluster Platforms for Public Education, Capacity Building & Frugal solutions
Behavioural/ Mental Health and Neurologic Illness Cluster
Injuries Cluster Unintentional Intentional
Maternal & Child Health Cluster

THANK YOU