

# Clinical Focus Session #2: Behavioral and Lifestyle Changes to Lower Blood Pressure

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# DISCLOSURES

- Consulting
  - Genentech
- Medical Advisory Board
  - Clocktree
  - Measure Labs
- Research Funding
  - Amgen
  - Microsoft Research

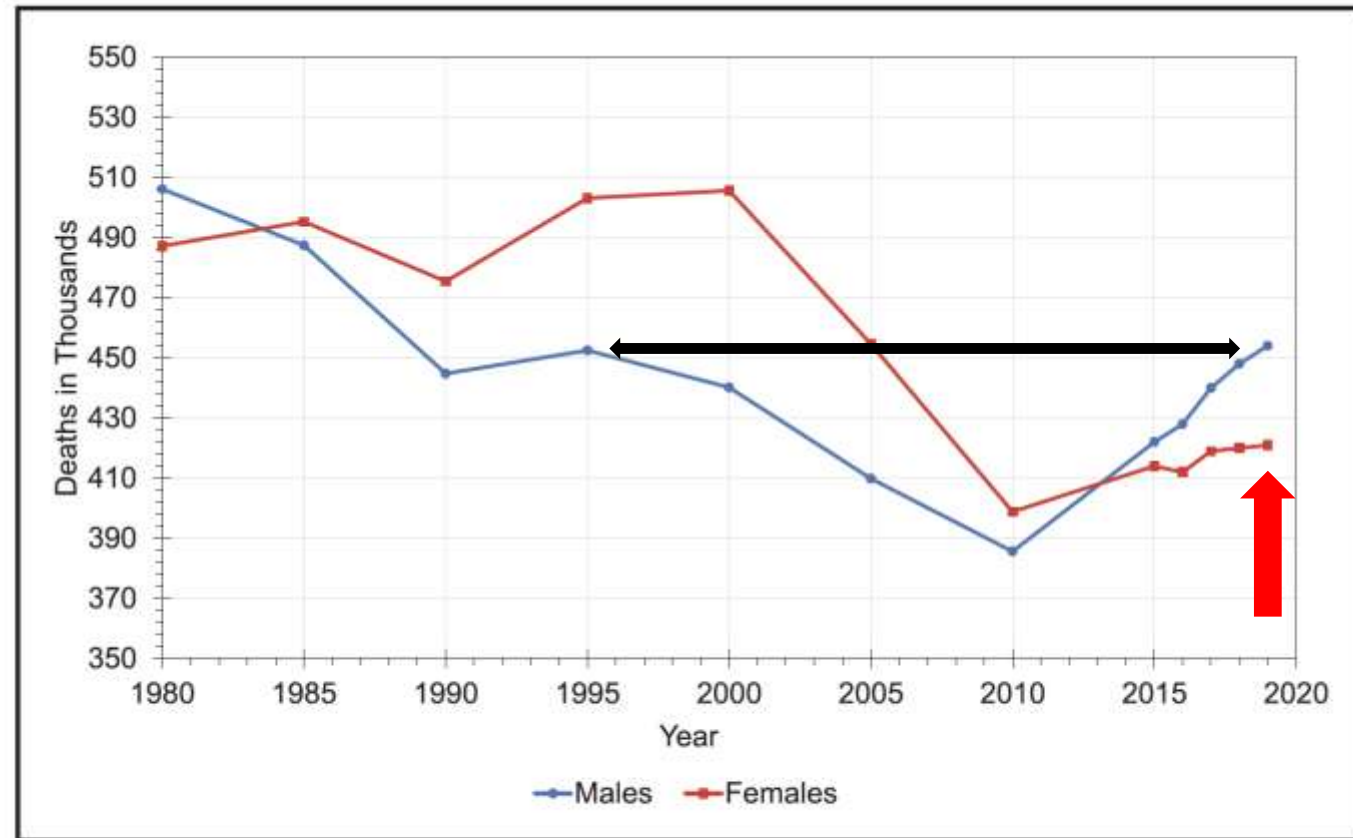
# OUTLINE

- Review current blood pressure guidelines (US and India)
- Discuss ways to improve blood pressure through lifestyle and behavioral changes
  - Case: Stage 1 Hypertension
- Take home points

# HYPERTENSION AND CARDIOVASCULAR DISEASE

- Hypertension is the leading cause of death and disability-adjusted life years worldwide
  - #3 cause of death and disability in India (IHME 2020)
- In the US, accounted for more CV deaths than any other modifiable CVD risk factor, second only to smoking as preventable cause of death from any cause
- >50% of deaths from CHD and stroke occurred among individuals with hypertension (NHANES survey)

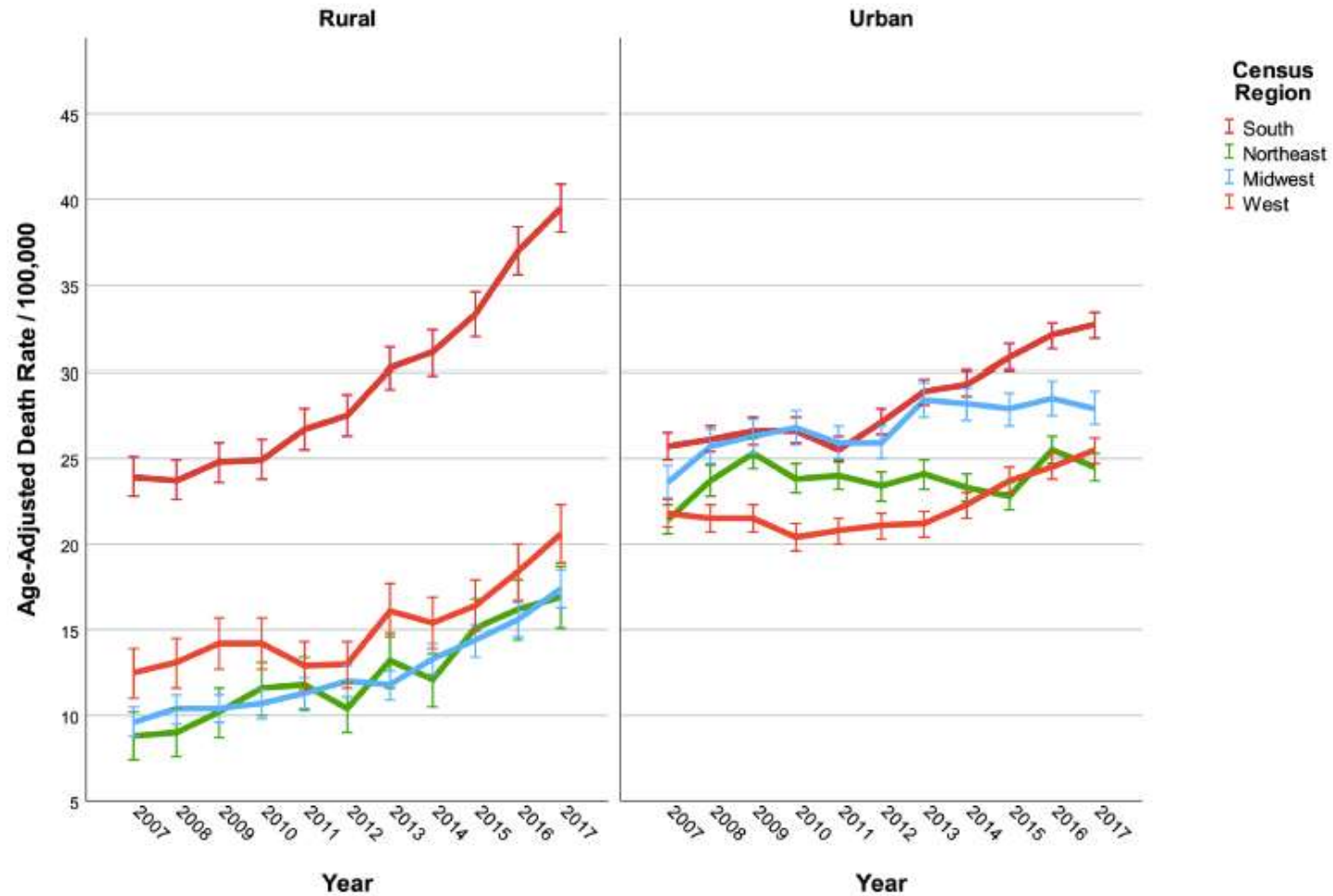
# US CVD MORTALITY RATE IS RISING



**Chart 14-12. CVD mortality trends for US males and females, 1980 to 2019.**

Tsao C, et al. Circulation. 2022.

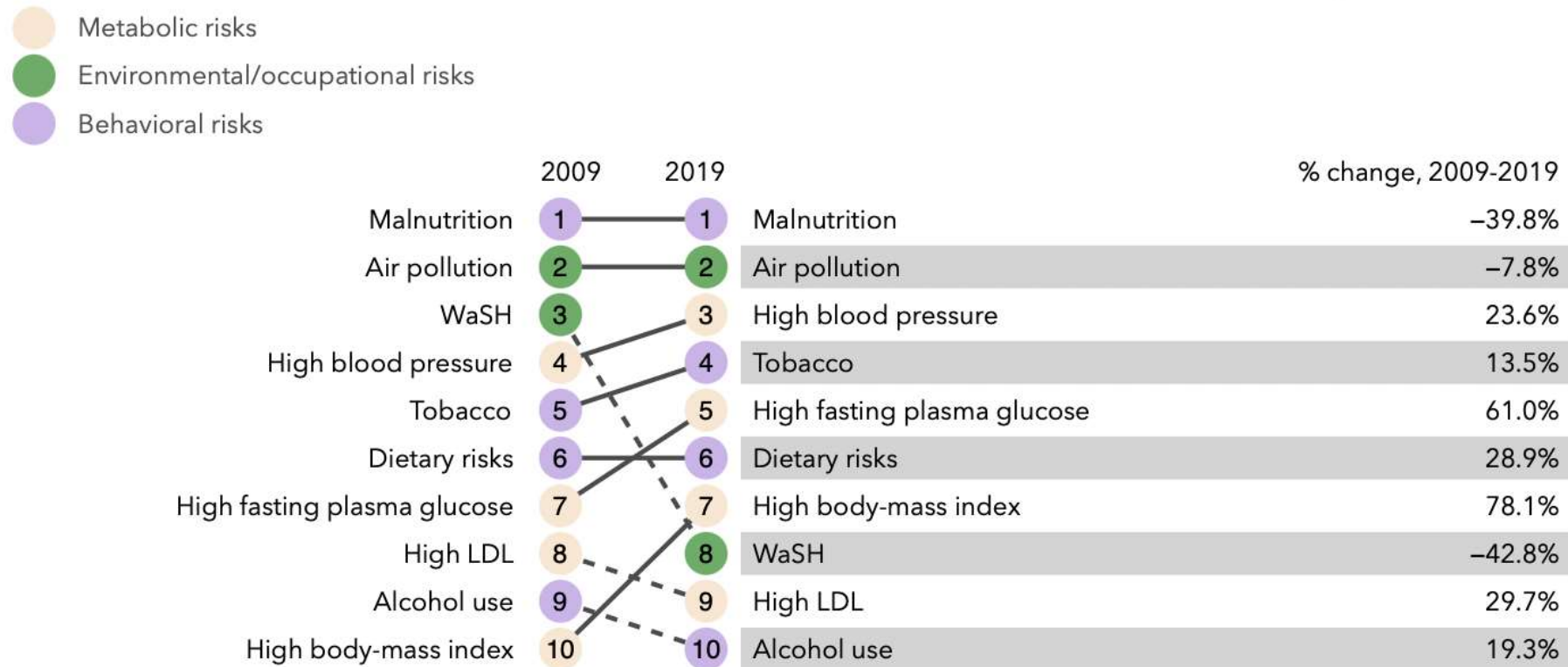
# HYPERTENSION RELATED CV MORTALITY INCREASING



Nambiar L, et al. DOI: <https://doi.org/10.1016/j.jacc.2020.03.009>.

# HIGH BLOOD PRESSURE IS A LEADING CAUSE OF DEATH AND DISABILITY IN INDIA

What risk factors drive the most death and disability combined?

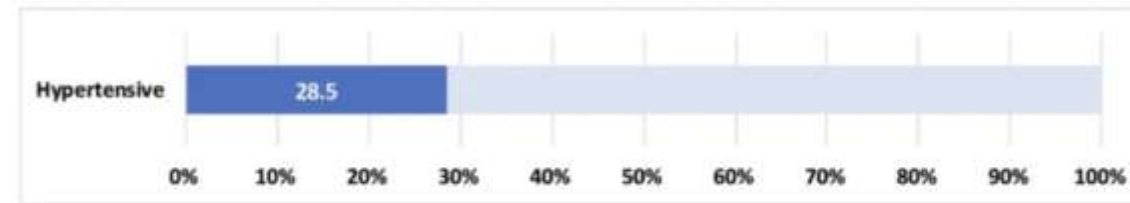


Lancet 2020;396:1204–22.

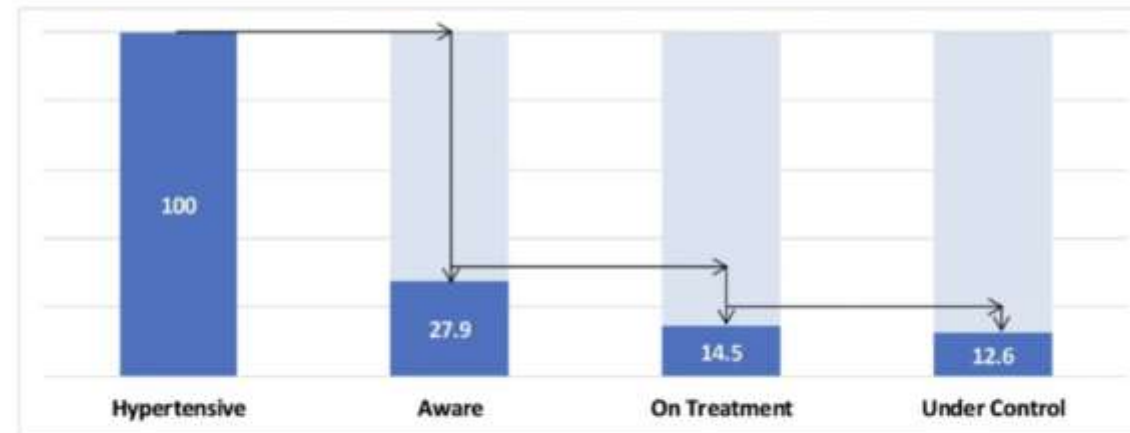


# HYPERTENSION RATES IN INDIA

Fig. 1



Prevalence of hypertension at Indian population



Awareness, treatment and control status among hypertensive population

Hypertension control cascade: gap in prevalence, awareness, treatment and control of hypertension. Panel 1: Prevalence of hypertension at Indian population. Panel 2: Awareness, treatment and control status among hypertensive population.

*J Hum Hypertens* (2022). <https://doi.org/10.1038/s41371-022-00692-y>



# CASE #1: STAGE 1 HYPERTENSION

- 47 year old black woman comes to your office to discuss her blood pressure. She has been monitoring her blood pressure every morning and it ranges from 132-139/82-88 mm Hg. She is not active, does not do any regular exercise. She works in tech and eats out for most of her meals or eats in the cafeteria at work. Eats a lot of processed foods for snacks (chips, cookies).
- Past Medical History:
  - Hypothyroidism
- Social and Family History:
  - Never smoked, drinks 2 glasses of wine daily
  - No FH of CAD in parents
- Current Medications:
  - Levothyroxine 75 ug daily

# CASE #1: STAGE 1 HYPERTENSION

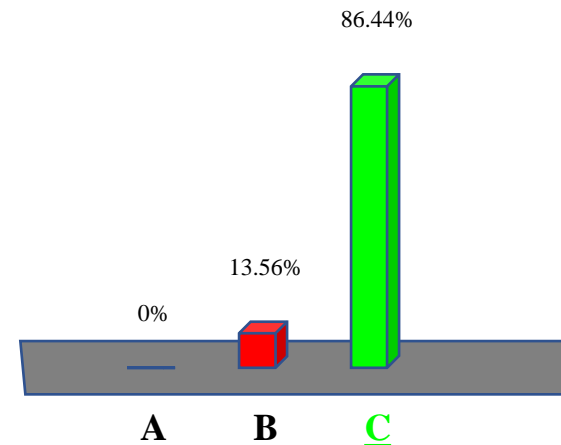
- Vital signs:
  - BP 135/82 mm Hg, P 72, BMI 29.5
- Exam is unremarkable

ECG is normal. BMP and TSH are normal, U/A is normal. Hba1c 5.5%

- Total cholesterol: 221
- Triglycerides: 178
- HDL: 49
- LDL: 136

# WHICH OF THE FOLLOWING DO YOU RECOMMEND?

- A. Reassure patient that she is fine, no need to do anything!
- B. Start blood pressure medication to lower BP <130/80 mm Hg
- C. Discuss lifestyle changes to reduce blood pressure



# WHICH OF THE FOLLOWING DO YOU RECOMMEND?

- A. Reassure patient that she is fine, no need to do anything!
- B. Start blood pressure medication to lower BP <130/80 mm Hg
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# 10 YEAR ASCVD RISK- POOLED COHORT EQUATION



ASCVD Risk Estimator Plus

Estimate Risk

Therapy Impact

Advice

**2.3%**

Current 10-Year  
ASCVD Risk

Lifetime ASCVD Risk: **39%** Optimal ASCVD Risk: **0.5%**

Current Age ⓘ \*

47

Age must be between 20-79

Sex \*

Male

✓ Female

Race \*

White

✓ African American

Other

Systolic Blood Pressure (mm Hg) \*

135

Value must be between 90-200

Diastolic Blood Pressure (mm Hg) ⓘ

82

Value must be between 60-130

Total Cholesterol (mg/dL) \*

221

Value must be between 130 - 320

HDL Cholesterol (mg/dL) \*

49

Value must be between 20 - 100

LDL Cholesterol (mg/dL) ⓘ ⓘ

136

Value must be between 30-300

History of Diabetes? \*

Yes

✓ No

Smoker: ⓘ \*

Yes

Former

✓ No

On Hypertension Treatment? \*

Yes

✓ No

On a Statin? ⓘ ⓘ

Yes

✓ No

On Aspirin Therapy? ⓘ ⓘ

Yes

✓ No

# 2017 ACC/AHA BLOOD PRESSURE CATEGORIES

Table 6. Categories of BP in Adults\*

BP Category	SBP		DBP
Normal	<120 mm Hg	and	<80 mm Hg
Elevated	120–129 mm Hg	and	<80 mm Hg
Hypertension			
→ Stage 1	130–139 mm Hg	or	80–89 mm Hg
Stage 2	≥140 mm Hg	or	≥90 mm Hg


\*Individuals with SBP and DBP in 2 categories should be designated to the higher BP category.

BP indicates blood pressure (based on an average of ≥2 careful readings obtained on ≥2 occasions, as detailed in Section 4); DBP, diastolic blood pressure; and SBP systolic blood pressure.

Whelton PK, et al. J Am Coll Cardiol. 2017.

# INDIAN GUIDELINES ON HYPERTENSION-IV (2019)

**Table 2** Classification of blood pressure for adults age 18 and older.

Category	Systolic (mmHg)		Diastolic (mmHg)
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

Journal of Human Hypertension (2020) 34:745–758.



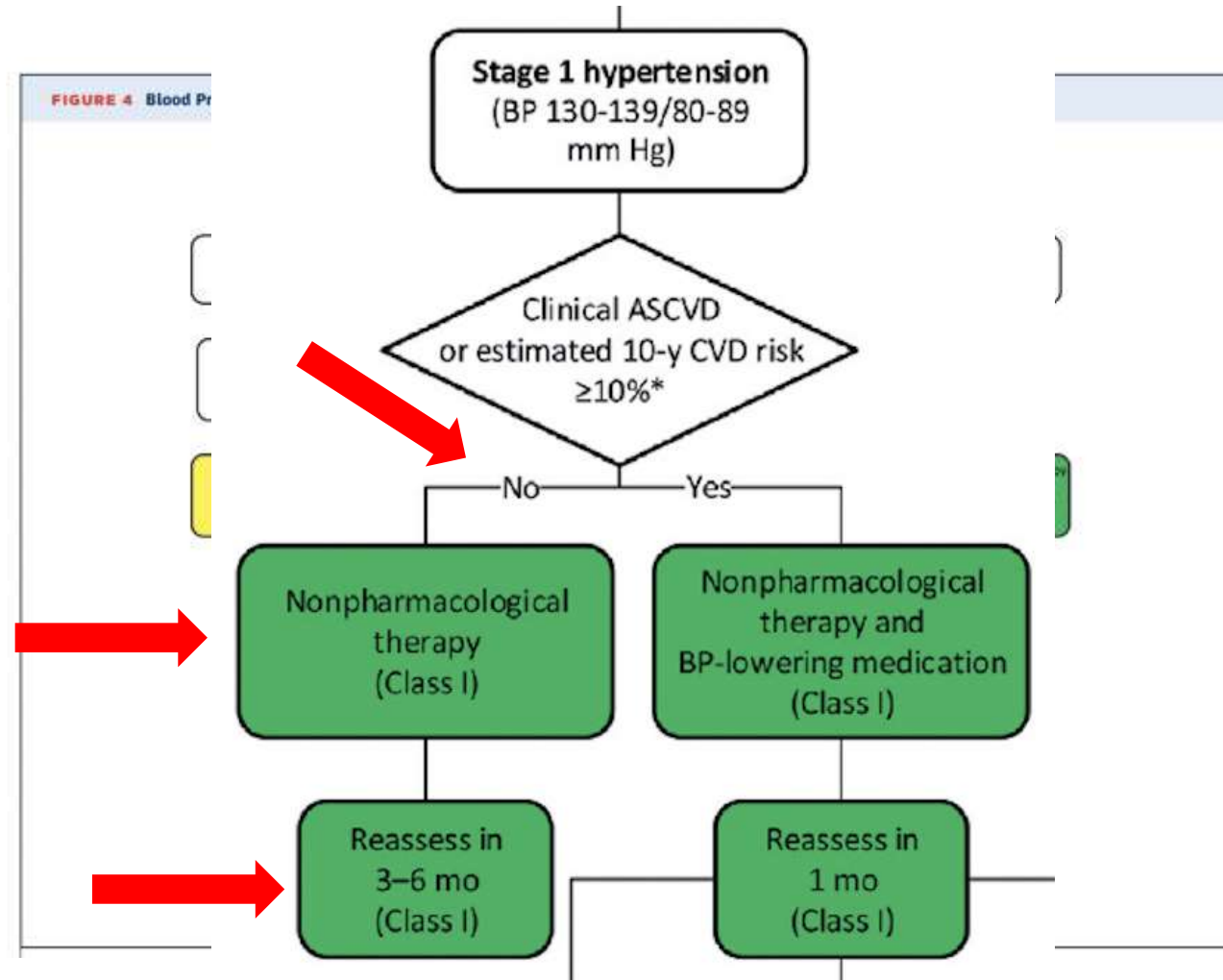
# GUIDELINE CONTROVERSIES–NO CONSENSUS!

- Major differences among BP guidelines:
  - Definition of hypertension stages
  - Threshold for treatment in specific populations
    - Older persons
    - Diabetes
    - Chronic kidney disease

# BP CATEGORIES AND TREATMENT THRESHOLDS

- 2017 ACC/AHA BP Guideline lowered threshold for Stage I HTN to  $\geq 130/80$  mm Hg
- 2018 ESC/ESH BP Guideline maintained treatment threshold at  $\geq 140/90$  mm Hg for Stage 1 HTN
- 2019 Indian Guidelines on Hypertension defines treatment threshold for Stage 1 HTN at  $\geq 140/90$  mm Hg

# ACC/AHA BP TREATMENT RECOMMENDATIONS



Whelton PK, et al. J Am Coll Cardiol. 2017.

# INDIAN BP GUIDELINE RECOMMENDATIONS

- A. Patient with high normal BP, no strong indication for pharmacologic therapy
- B. Treatment target for BP <130/80 mm Hg if age <60, or 130-140/80-90 mm Hg if age >60
- C. Focus on non-pharmacologic therapy

Journal of Human Hypertension (2020) 34:745–758.

# ACC/AHA NON-PHARMACOLOGIC INTERVENTIONS

**TABLE 15** Best Proven Nonpharmacological Interventions for Prevention and Treatment of Hypertension\*

	Nonpharmacological Intervention	Dose	Approximate Impact on SBP		
			Hypertension	Normotension	Reference
Weight loss	Weight/body fat	Best goal is ideal body weight, but aim for at least a 1-kg reduction in body weight for most adults who are overweight. Expect about 1 mm Hg for every 1-kg reduction in body weight.	−5 mm Hg	−2/3 mm Hg	(S6.2-1)
Healthy diet	DASH dietary pattern	Consume a diet rich in fruits, vegetables, whole grains, and low-fat dairy products, with reduced content of saturated and total fat.	−11 mm Hg	−3 mm Hg	(S6.2-6,S6.2-7)
Reduced intake of dietary sodium	Dietary sodium	Optimal goal is <1500 mg/d, but aim for at least a 1000-mg/d reduction in most adults.	−5/6 mm Hg	−2/3 mm Hg	(S6.2-9,S6.2-10)
Enhanced intake of dietary potassium	Dietary potassium	Aim for 3500–5000 mg/d, preferably by consumption of a diet rich in potassium.	−4/5 mm Hg	−2 mm Hg	(S6.2-13)
Physical activity	Aerobic	<ul style="list-style-type: none"> <li>■ 90–150 min/wk</li> <li>■ 65%–75% heart rate reserve</li> </ul>	−5/8 mm Hg	−2/4 mm Hg	(S6.2-18,S6.2-22)
	Dynamic resistance	<ul style="list-style-type: none"> <li>■ 90–150 min/wk</li> <li>■ 50%–80% 1 rep maximum</li> <li>■ 6 exercises, 3 sets/exercise, 10 repetitions/set</li> </ul>	−4 mm Hg	−2 mm Hg	(S6.2-18)
	Isometric resistance	<ul style="list-style-type: none"> <li>■ 4 × 2 min (hand grip), 1 min rest between exercises, 30%–40% maximum voluntary contraction, 3 sessions/wk</li> <li>■ 8–10 wk</li> </ul>	−5 mm Hg	−4 mm Hg	(S6.2-19,S6.2-31)
Moderation in alcohol intake	Alcohol consumption	In individuals who drink alcohol, reduce alcohol† to: <ul style="list-style-type: none"> <li>■ Men: ≤2 drinks daily</li> <li>■ Women: ≤1 drink daily</li> </ul>	−4 mm Hg	−3 mm Hg	(S6.2-22–S6.2-24)

Whelton PK, et al. J Am Coll Cardiol. 2017.

# LIFESTYLE RECOMMENDATIONS- THE RULE OF FIVES

		Dose	Impact on SBP- Hypertension	Impact on SBP- Normotension
Weight loss	Weight/body fat	Best goal ideal body weight- 1kg reduction = -1 mm Hg BP	- 5 mm Hg	-2/3 mm Hg
Healthy diet	DASH dietary pattern	Consume diet rich in fruits, vegetables, whole grains, low fat dairy	-11 mm Hg	-3 mm Hg
Reduced dietary sodium intake	Dietary sodium	Goal <1500 mg/d or 1000 mg/d from baseline	-5/6 mm Hg	-2/3 mm Hg
Enhanced intake of dietary potassium	Dietary potassium	Aim for 3500-5000 mg/d by consuming diet rich in potassium	-4/5 mm Hg	-2 mm Hg

# LIFESTYLE RECOMMENDATIONS- THE RULE OF FIVES

	Intervention	Dose	Impact on SBP- Hypertension	Impact on SBP- Normotension
Physical activity	Aerobic	80-150 min/wk	- 5/8 mm Hg	-2/4 mm Hg
Physical activity	Dynamic resistance	90-150 min/wk 6 exercises/3 sets/exercise, 10 reps/set	-4 mm Hg	-2 mm Hg
Physical Activity	Isometric resistance	4x2 min (hand grip), 1 min rest between 3 sessions/wk	-5 mm Hg	-4 mm Hg
Moderation in alcohol intake	Alcohol consumption	Individuals who drink alcohol, reduce to: Men $\leq$ 2 drinks/d Women $\leq$ 1 drinks/d	-4/5 mm Hg	-2 mm Hg



# INDIAN GUIDELINES- NON-PHARMACOLOGIC THERAPY

- Patient education: Patients need to be educated about the risks of high blood pressure, benefits to be gained by lifestyle changes, need for long-term adherence to treatment and need for regular monitoring and therapy.
- Weight reduction: Weight reduction of as little as 4.5 kg has been found to reduce blood pressure in a large proportion of overweight persons with hypertension [43].
- Physical activity: Regular aerobic physical activity promotes weight loss, increases functional status and decreases the risk of cardiovascular disease and all-cause mortality. A program of 30–45 min of brisk walking or swimming 3–4 times a week can lower SBP by 7–8 mmHg.
- Alcohol intake: Excess alcohol intake causes a rise in blood pressure, induces resistance to antihypertensive therapy and increases the risk of stroke [44, 45]. Alcohol consumption should be limited to no more than 2 drinks per day (24 oz beer, 10 oz wine, 3 oz of 80-proof whiskey) for most men and no more than one drink per day for women and lighter weight people [12].
- Salt intake: Epidemiological evidence suggests an association between dietary salt intake and elevated BP. Indian cooking involves a high usage of salt. An ICMR task force study conducted in 13 states documented daily salt intake of 13.8 g per day [46]. The SCRIPT study conducted across four regions of India showed that a region wise mean daily salt intake in north, east, west and south was 14.1, 9.8, 10.1, and 9.4 g per day respectively. These are much higher than the WHO recommendation of <5 g per day which is also our IGH guideline recommendation [47].

Patients should be advised to avoid added salt, processed foods, and salt- containing foods such as pickles, papads, chips, chutneys and preparations containing baking powder. Most breads, cereals, packaged namkeen, readymade soups, canned food, pizzas, and chinese takeaway are also high in salt content. The salt content of some commonly used food items is given in Table 8.

- Smoking: Consumption of tobacco in any form is the single most powerful modifiable lifestyle factor for prevention of CVD in hypertensives [48–50]. Cardiovascular benefits of cessation of smoking can be seen within one year in all age groups [43]. E-cigarettes, are also harmful and their use needs to be strongly discouraged.
- Yoga and meditation: Yoga, meditation, and biofeedback have been shown to reduce blood pressure in randomized controlled studies, including from India. The fall in SBP after yoga therapy has been between 2 and 6 mmHg. A recent study shows mean SBP reduction by 4 and 6 mmHg with lifestyle modification (LSM) and LSM + yoga respectively. Yoga also resulted in reduction of heart rate, waist circumference and lipid levels, all of which reduce CVD prevalence and mortality [51–55].

Journal of Human Hypertension (2020) 34:745–758.

# SODIUM INTAKE AND BLOOD PRESSURE



Yanomani  
Indigenous people



Yekwana  
Indigenous people

# SODIUM INTAKE AND BLOOD PRESSURE

- Recent study of Yanomani and Yekwana Indigenous people found association between diet and blood pressure
- Yanomani Indigenous people from age 1-60 studied; no significant increase in blood pressure over time; average BP 95/63 mm Hg
- Yekwana Indigenous people exposed to some processed foods/Western diet associated with higher BP (104/66 mm Hg)
  - BP increased by 0.25 mm Hg/year starting in early childhood
  - In US, BP increase 1.5 mm Hg/year for boys, 1.9 mm Hg/year for girls
  - BP 5.8 mm Hg higher by age 10; 15.9 mm Hg higher by age 50, compared to Yanomani

Mueller et al. JAMA Cardiol. 2018;3:1247-1249.

# SODIUM AND BLOOD PRESSURE

Variables
Factors related to lifestyle
24-hour sodium (mmol-med
Sodium/potassium ratio (me
BMI
Alcohol ingestion (%)
Blood pressure
Systolic BP (median)
Diastolic BP (median)
Hypertensive individuals (%)
Relation between systolic BP
(mm Hg/10 years)
* Systolic BP of 140 mmHg

Age	No of subjects	Systolic	
		Mean	SD
<i>Males</i>			
0-9	59	93.2	8.9
10-19	63	107.5	9.6
20-29	58	108.4	8.6
30-39	30	105.9	8.9
40-49	27	106.6	7.6
50+	7	100.0	8.2

Study
The other 48 centers
160
3.4
25.2
53.0
118.7
74.0
17.4
+5.0

Mancilha-Carvalho Jde J et al. Arg Bras Cardiol. 2003;80:289-300.



# INDIAN BP GUIDELINE- SODIUM/POTASSIUM FOODS

**Table 9** Foods with high potassium.

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

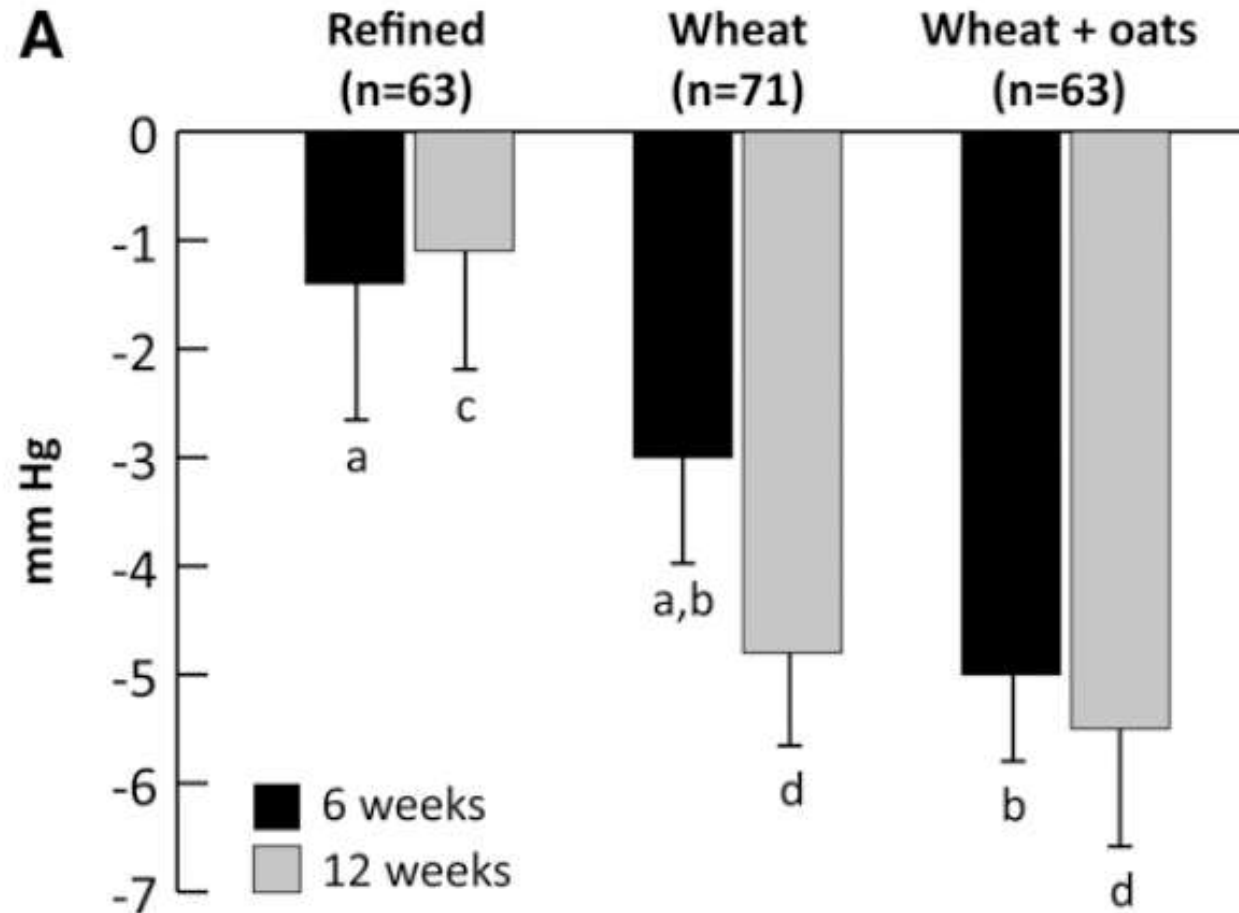
Journal of Human Hypertension (2020) 34:745–758.

# WHOLE GRAINS AND BLOOD PRESSURE

- Diet rich in whole grains associated with significant BP lowering
- Study of 233 overweight, non-hypertensive participants randomized to refined diet, wheat, and wheat + oats
  - 3 servings of whole grains daily
- Systolic BP reduced by 6 mm Hg at 16 weeks in the whole grains groups

Tighe P et al. Am J Clin Nutr 2010;92:733–40.

# WHOLE GRAINS AND BLOOD PRESSURE



Tighe P et al. Am J Clin Nutr 2010;92:733–40.



# FRUIT/VEGETABLE INTAKE AND BLOOD PRESSURE

- A. Oxford Fruit and Vegetable Study Group randomized 690 adults to 5 portions of fruits and vegetables/day
- B. Daily consumption prior to study was 3.4 portions/day
- C. Intervention group increased by 1.4 portions/day
- D. Control group increased by 0.1 portions/day
- E. Systolic BP was 4 mm Hg lower in the intervention group

John JH et al. Lancet 2002; 359: 1969–74.

# FRUIT/VEGETABLE INTAKE AND BLOOD PRESSURE

	n	Baseline, mean (SD)	Change at 6-months' follow-up, mean (SD)	Between-group difference in change (95% CI)	Adjusted difference in change* (95% CI)	p for adjusted difference
Self-reported daily intake of fruit and vegetables (portions)						
I	329	3.4 (1.7)	1.4 (1.7)	1.3 (1.1 to 1.6)	1.4 (1.2 to 1.6)	<0.0001
C	326	3.4 (1.5)	0.1 (1.3)			
Systolic blood pressure (mm Hg)						
I	344	130.2 (19.7)	-2.0 (13.5)	3.4 (1.3 to 5.5)	4.0 (2.0 to 6.0)	<0.0001
C	346	129.3 (19.6)	1.4 (14.6)			
Diastolic blood pressure (mm Hg)						
I	344	79.2 (11.4)	-1.6 (8.7)	1.4 (0.1 to 2.7)	1.5 (0.2 to 2.7)	0.02
C	346	79.9 (11.9)	-0.3 (8.7)			
Weight (kg)						
I	344	76.1 (13.8)	0.6 (2.6)	0.0 (-0.3 to 0.5)	0.1 (-0.4 to 0.6)	0.68
C	346	75.6 (14.9)	0.6 (2.6)			

I=intervention group. C=controls. \*Adjusted for baseline value and sex.

Table 3: Self-reported intake of fruit and vegetables, blood pressure, and bodyweight

John JH et al. Lancet 2002; 359: 1969–74.

# DASH-SODIUM TRIAL

- 412 adults with untreated BP 120-160/80-95 mm Hg
  - High proportion of black people (57%)
- Randomized to DASH diet (reduced total/saturated fat, high in fruits and vegetables) or control diet
- 3 different sodium intake levels (900 mg/day, 1800 mg/day, or 2700 mg/day)
- Evaluated blood pressures after 30 days at each sodium intake level

Ann Intern Med 2001;135:1019-28.

# DASH-SODIUM TRIAL

- In all subgroups, DASH diet and reduced sodium intake associated with lower blood pressures
- Greatest benefit for DASH diet and low sodium intake (11.5 mm Hg (HTN), 7.1 mm Hg (normotensive) versus control diet/high sodium intake
- Older age (>45), women, and blacks had greatest reductions in blood pressure

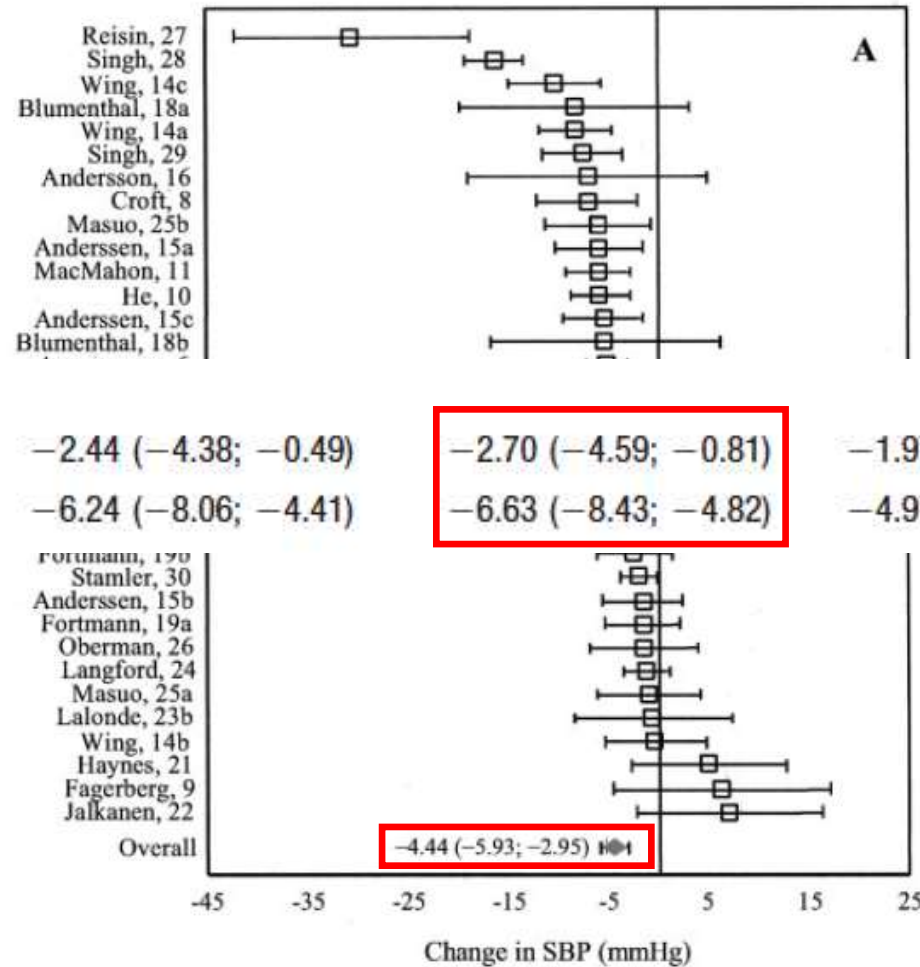
Ann Intern Med 2001;135:1019-28.

# WEIGHT REDUCTION AND BLOOD PRESSURE

- Obesity is linked to hypertension, dyslipidemia, insulin resistance/diabetes
- Weight reduction is associated with BP lowering
- Meta-analysis of weight loss trials found average systolic BP lowering of 4.4 mm Hg
  - >5 kg weight loss associated with ~7 mm Hg reduction in BP

Neter JE et al. Hypertension. 2003;42:878-884.

# WEIGHT REDUCTION AND BLOOD PRESSURE



## Weight reduction

≤5 kg	16	-2.44 (-4.38; -0.49)	-2.70 (-4.59; -0.81)	-1.97 (-3.71; -0.21)	-2.01 (-3.47; -0.54)
>5 kg	18	-6.24 (-8.06; -4.41)	-6.63 (-8.43; -4.82)	-4.97 (-6.62; -3.31)	-5.12 (-6.48; -3.75)

Neter JE et al. Hypertension. 2003;42:878-884.

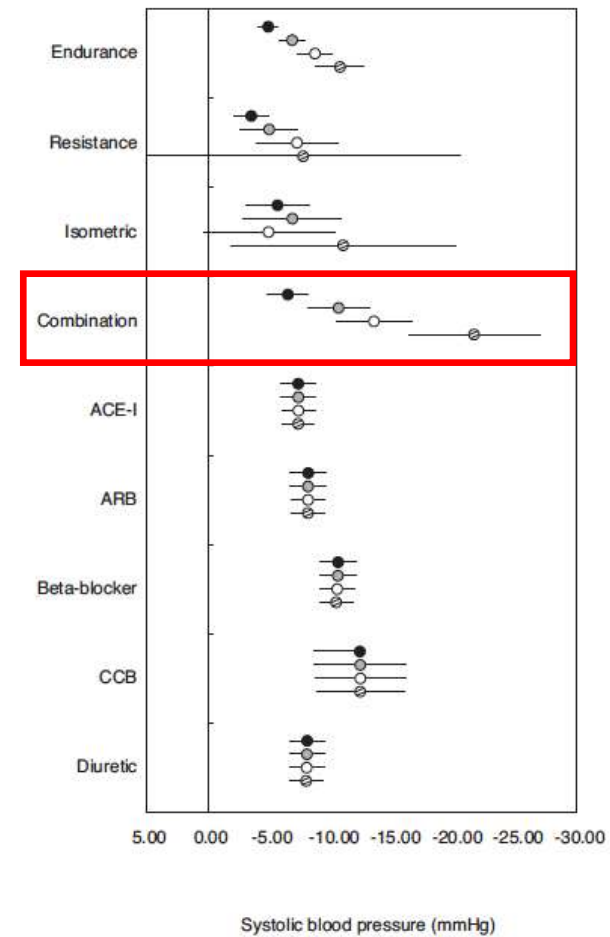
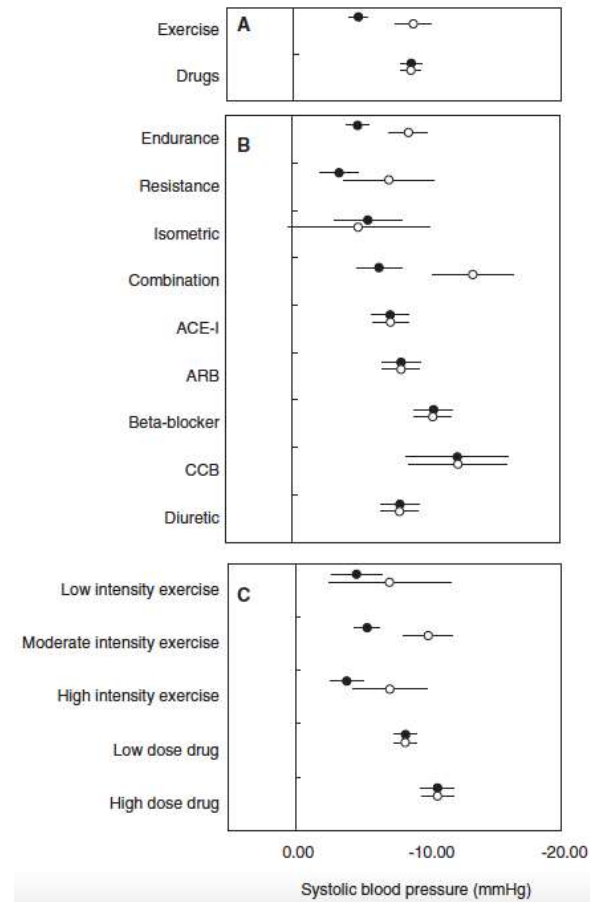
# EXERCISE AND BLOOD PRESSURE LOWERING

- Recent meta-analysis examined impact of resistance and endurance exercise training on BP
- All forms of exercise associated with BP lowering
- Combination of resistance and endurance training associated with greater BP lowering effect

Naci H, et al. Br J Sports Med 2018; doi:10.1136/bjsports-2018-099921



# EXERCISE AND BLOOD PRESSURE LOWERING



Naci H, et al. Br J Sports Med 2018; doi:10.1136/bjsports-2018-099921

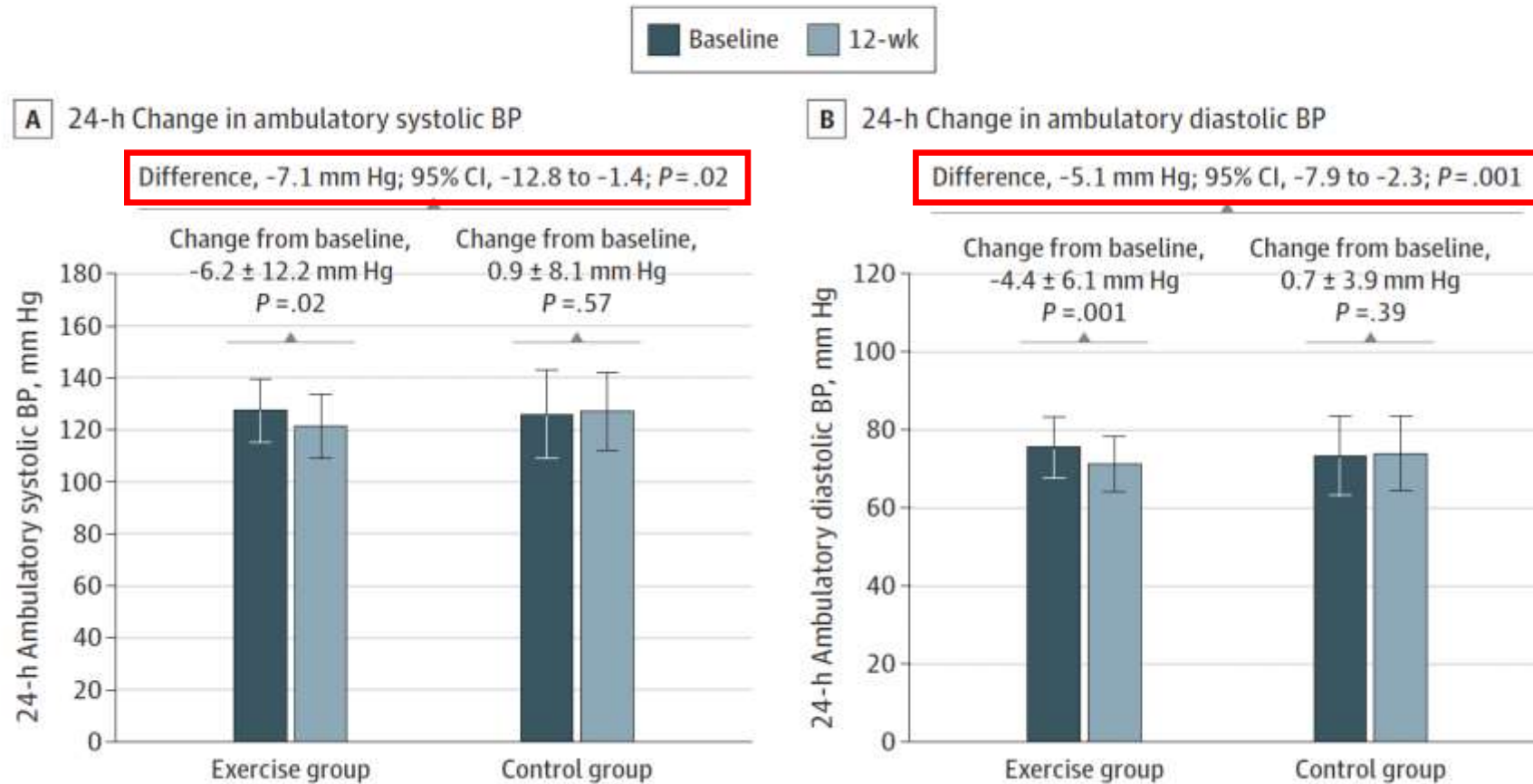
# EXERCISE IS THE BEST!

- The Exercise Training in the Treatment of Resistant Hypertension (EnRich) trial is a prospective, 2-center, single-blinded randomized clinical trial performed at 2 hospital centers in Portugal
- 60 patients with a diagnosis of resistant hypertension aged 40 to 75 years were prospectively enrolled
  - Average age ~60 years old, BMI ~30, 55% male, on 4.6-4.7 BP medications
- Randomized to 12 weeks of moderate intensity aerobic activity (50 minutes, 3x a week, 150 minutes total) versus usual care

JAMA Cardiol. 2021;6(11):1317-1323.

# EnRich TRIAL RESULTS

Figure 2. Changes in Ambulatory and Office Blood Pressure (BP)



JAMA Cardiol. 2021;6(11):1317-1323.

# OPPORTUNITY FOR IMPROVEMENT FOR INDIAN PEOPLE- MORE EXERCISE?

**Table 2: High vs. low acculturation by Asian subgroups for each CV risk factor, NHIS 2014-2018**

	Model 1 <i>OR (95% CI)</i>	Model 2 <i>OR (95% CI)</i>	Model 3 <sup>‡</sup> <i>OR (95% CI)</i>
Asian Indian	1.11 (0.81, 1.51)	0.95 (0.69, 1.31)	0.95 (0.69, 1.31)
Chinese	1.93 (1.37, 2.70)*	1.55 (1.09, 2.20)*	1.55 (1.10, 2.20)*
Filipino	1.67 (1.18, 2.38)*	1.57 (1.10, 2.26)*	1.59 (1.11, 2.27)*
Other Asian	1.43 (1.13, 1.82)*	1.17 (0.91, 1.50)	1.18 (0.93, 1.51)

Yang E, et al. In submission.

# ALCOHOL INTAKE AND BLOOD PRESSURE

- Study initially presented at ACC.19 examined US NHANES survey on self-reported alcohol consumption and impact on blood pressure
- Subjects split into three groups:
  - Never-drinkers
  - 7-13 drinks/week (moderate)
  - >14 drinks/week (heavy)
- Assessed risk of hypertension based on updated classification
  - Stage 1 (BP 130-139/80-89 mm Hg)
  - Stage 2 (BP >140/90 mm Hg)

# ALCOHOL INTAKE AND BLOOD PRESSURE

Table 2  
Association of alcohol consumption with blood pressure categories

Alcohol Consumption and Elevated Blood Pressure					
Alcohol Consumption	Participants N	Model 1 OR (95% CI)	p-value	Model 2 OR (95% CI)	p-value
Never drinker	387 (17.5%)	<i>Reference</i>		<i>Reference</i>	
Former drinker	747 (33.8%)	0.89 (0.77-1.04)	0.15	0.88 (0.75-1.04)	0.13
1-6 drinks/week	672 (30.4%)	0.91 (0.78-1.07)	0.28	0.95 (0.80-1.13)	0.55
7-13 drinks/week	180 (8.1%)	1.16 (0.93-1.45)	0.18	1.24 (0.97-1.59)	0.08
≥14 drinks/week	223 (10.1%)	1.48 (1.19-1.84)	0.0003	1.53 (1.20-1.96)	0.006
Alcohol Consumption and Stage I Hypertension					
Alcohol Consumption	Participants N	Model 1 OR (95% CI)	p-value	Model 2 OR (95% CI)	p-value
Never drinker	616 (16.8%)	<i>Reference</i>		<i>Reference</i>	
Former drinker	1280 (35.0%)	0.93 (0.81-1.05)	0.27	0.89 (0.77-1.03)	0.11
1-6 drinks/week	1062 (29.0%)	0.91 (0.79-1.04)	0.17	0.97 (0.81-1.10)	0.48
7-13 drinks/week	331 (9.0%)	1.33 (1.10-1.61)	0.002	1.51 (1.22-1.87)	0.0002
≥14 drinks/week	363 (9.9%)	1.49 (1.23-1.80)	<.0001	1.65 (1.33-2.05)	<.0001
Alcohol Consumption and Stage II Hypertension					
Alcohol Consumption	Participants N	Model 1 OR (95% CI)	p-value	Model 2 OR (95% CI)	p-value
Never drinker	838 (21.5%)	<i>Reference</i>		<i>Reference</i>	
Former drinker	1656 (42.7%)	1.01 (0.88-1.16)	0.82	0.97 (0.83-1.13)	0.67
1-6 drinks/week	785 (20.2%)	0.88 (0.76-1.03)	0.13	0.97 (0.81-1.15)	0.69
7-13 drinks/week	242 (6.2%)	1.37 (1.10-1.71)	0.004	1.55 (1.20-2.00)	0.0008
≥14 drinks/week	353 (9.1%)	2.16 (1.75-2.67)	<.0001	2.46 (1.93-3.14)	<.0001

Model 1 adjusted for age, sex, race, and total annual income.

Model 2 adjusted for model 1 plus physical activity, diabetes, body mass index, preexisting cardiovascular disease, creatinine clearance, low-density lipoprotein cholesterol, high-density lipoprotein cholesterol, lipid-lowering medications, C-reactive protein, and ever smoking.

Am J Cardiol 2021;160:60–66.

# CASE #1: STAGE 1 HYPERTENSION

- 47 year old black woman comes to your office to discuss her blood pressure. She has been monitoring her blood pressure every morning and it ranges from 132-139/82-88 mm Hg. **She is not active, does not do any regular exercise.** She works in tech and **eats out for most of her meals or eats in the cafeteria at work.** Eats a lot of **processed foods** for snacks (chips, cookies).
- Past Medical History:
  - Hypothyroidism
- Social and Family History:
  - Never smoked, **drinks 2 glasses of wine daily**
  - No FH of CAD in parents
- Current Medications:
  - Levothyroxine 75 ug daily



# CASE #1: STAGE 1 HYPERTENSION

- Vital signs:
  - BP 135/82 mm Hg, P 72, **BMI 29.5**
- Exam is unremarkable

ECG is normal. BMP and TSH are normal, U/A is normal. Hba1c 5.5%

- Total cholesterol: 221
- Triglycerides: 178
- HDL: 49
- LDL: 136

# CASE #1: STAGE 1 HYPERTENSION

- Treatment should focus on lifestyle changes including weight reduction, diet, exercise, alcohol intake
  - *Clinical pearl: Try 1-2 goals (ask patient what they think they can achieve), will not be able to change all behaviors at once*
- Reassess BPs and lifestyle changes in 3-6 months

# TAKE HOME POINTS

- Hypertension is a primary risk factor for cardiovascular disease
- Hypertension-related mortality rates are increasing in India and US
- “Rule of Fives”: focus on effective behavioral and lifestyle changes to reduce BP
  - Weight reduction
  - Exercise
  - Diet
  - Moderate alcohol consumption

# TAKE HOME POINTS

- Need to provide culturally specific interventions
  - Diet needs to reflect environment/culture
  - Dietary recommendations from many guidelines are based on Western diet (ACC/AHA, ESC/ESH)
- Provide patient with realistic goals
  - Can not change all behaviors at once
  - Shared decision making

# THANKS!



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